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A HYBRID APPROACH FOR ASSESSING DISTANCE LEARNING INSTRUCTIONAL VIDEOS USING ARTIFICIAL INTELLIGENCE

R. Hamzaoui Y.A. Bachiri E. Ouassam H. Mouncif B. Bouikhalene

Innovation Laboratory in Mathematics, Applications and Information Technologies, Moulay Sliman University, Beni Mellal, Morocco, radoine.hamzaoui@usms.ac.ma, younes-aziz.bachiri@usms.ma, elhoucine.ouassam@usms.ac.ma, h.mouncif@usms.ma, b.bouikhalene@usms.ma

Abstract- The COVID-19 pandemic has necessitated a rapid shift towards distance learning, presenting unique challenges and opportunities for educational institutions worldwide. Sultan Moulay Slimane University has responded to these challenges by pioneering the integration of artificial intelligence (AI) to enhance hybrid learning models. This study explores the development and implementation of AI-driven methodologies for automatic question generation from video transcripts, with the aim of improving student engagement and assessment in distance learning environments. Utilizing state-of-the-art machine learning algorithms and natural language processing (NLP) techniques, we demonstrate the potential of AI to facilitate personalized, efficient, and effective e-learning experiences. Our findings reveal that AI-generated questions not only match but, in some instances, surpass the quality of human-generated counterparts in terms of accuracy, relevance, and the ability to diversify assessment strategies. This investigation underscores the transformative impact of AI in educational settings, offering insights into its role in fostering adaptive and inclusive learning environments in the post-pandemic era. Furthermore, the study addresses critical research questions concerning the optimization of NLP for educational content, the development of robust models for educational question creation, and the utilization of AI-generated assessments to reduce instructor workload while enhancing personalization and engagement in hybrid learning contexts. By providing data-driven insights and frameworks, this research aims to guide the adoption of AI for next-generation online pedagogies, assessments, and learning experiences, highlighting the potential of human-AI collaboration to transform assessment in online education.

Keywords: Hybrid Learning Enhancement, AI in Education, Automatic Question Generation, E-Learning Assessment, Natural Language Processing, COVID-19, Digital Education.

1. INTRODUCTION

The COVID-19 outbreak has brought major changes to education globally, requiring rapid adaptation to remote and online modalities. At Sultan Moulay Slimane University (USMS) in Morocco, courses were suddenly forced to transition mid-semester to distance formats. Although instructors have improvised to deliver practical training through recorded lectures and videos, challenges remain in ensuring effective learning experiences [1].

These days, any device may be used to support courses, completely changing the way that learning is conducted. There are several ways to learn (or teach) remotely, some of which are already well-established in the educational landscape and include (videoconferencing and synchronous learning) [2], Specifically, retaining information from passive video watching is difficult - students benefit more from active retrieval and assessment of concepts. This testing effect, also called retrieval practice, enhances learning compared to mere content review [3]. Furthermore, developing self-regulated learning skills is critical for student success. Educators must foster abilities to organize, monitor, and direct one's own learning [4]. The abrupt shift online has impacted teaching of these key competencies.

In response, hybrid learning has gained immense interest, requiring new techniques to personalize instruction. Automated question generation using artificial intelligence (AI) represents a promising approach to actively test comprehension of videos and transform remote education [5]. AI also enables automating rote grading tasks, while providing adaptive activities tailored to each student's needs and pace [6]. However, research on optimally integrating AI in education to improve student outcomes remains limited, as a result, technologies are included as educational materials as well as learning and assessment environments that support learning creation as well as cooperation and engagement [7].

Therefore, this study seeks to address the following research questions:

- RQ1: How can advanced natural language processing enable automatic generation of assessment questions from video content to enhance distance learning?

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- RQ2: What deep learning architectures allow building robust models for educational question creation spanning speech recognition, summarization, and text generation?
- RQ3: How can automatically generated questions match the quality, diversity, and relevance of human-authored counterparts?
- RQ4: How can instructors leverage auto-created tests to reduce workload while improving personalization and engagement in hybrid contexts?

By investigating these underexplored areas through an AI-driven question generation system for educational videos, this research aims to provide data-driven insights and frameworks to guide adoption of AI for next-generation online pedagogies, assessments, and learning experiences.

The paper goes like this. Section 2 examines pertinent research on applying AI in education and automated question generation. Section 3 explains the hybrid learning model adopted by USMS during the pandemic. Section 4 analyzes USMS's evaluation approaches. Section 5 details the proposed methodology for automatically creating questions from videos using NLP. Section 6 presents quantitative and qualitative analyses of the deep learning model results. Finally, Section 7 summarizes conclusions and implications.

2. RELATED WORKS

The development of university education is inextricably intertwined with the advancement of new technologies and the computing capacities of the next generation of intelligent machines. In this field, advancements in artificial intelligence present new opportunities and difficulties for teaching and learning in higher education and have the potential to radically alter the governance and internal architecture of colleges and universities [5].

Joshi, et al. [8] main goal was to try to accurately forecast students' learning outcomes by seeing a live feed of their faces as they worked through a series of math problems. They have trained classifiers that can predict whether a student will succeed or fail in answering a question as soon as they start working on the material by analyzing facial clues captured from a live video feed.

Bachiri and Mouncif [9], [10] developed a plugin for the automatic generation of multilingual questions, which transforms the course into a point-based, badge-based game. To address this critical issue, to increase the appeal of MOOCs, they have thought of using new automatic natural language processing techniques and creating criteria for choosing an appropriate learning management system. They created a plugin that automatically creates multilingual questions and turns the course into a game with badges and points to do this.

Standardized NLG measures based on n-gram overlap are often used to assess question generation (QGen) algorithms. In order to determine if these measure improvements result in real-world benefits, Laban et al. [11] focused on the use case of helping instructors create reading comprehension tests automatically.

In order to increase automatic QG approaches' usefulness for educational applications, Wang, et al. [12] looked into ways to better understand how instructors create questions and pinpoint touchpoints that might improve the underlying NLP models. They compiled the criteria and thought processes of eleven teachers from seven institutions after conducting a thorough needs assessment, which they then used to create questions. In the field of computational linguistics, AQG has gained the utmost interest from researchers. The paper [13] examines ongoing research on natural language processing (NLP) methods for generating automatic questions from text.

An overview of automatic question generating and evaluation techniques based on textual and visual learning materials was given in the work [14]. The survey's goal was to compile the most cutting-edge methods for creating questions automatically and assessing answers. Zhao, et al. suggested a unique approach for creating high-cognitive-demand questions that involves first learning the question type distribution of an input story paragraph and then summarizing relevant events. To train the event-centric summarizer, they improved a pre-trained transformer-based sequence-to-sequence model using silver examples of educational question-and-answer pairs [15].

3. USMS EMERGING MODEL FOR EDUCATION BASED ON HYBRID STRATEGIES

The Covid-19 outbreak had a profound impact on all aspects of life, including education. This disruption spurred educational institutions to demand protocols and practices that ensure continuing education for all learners. During the epidemic, USMS institutions and colleges utilized remote learning experiences to identify issues such as access, ability, and fairness. As confinement orders lapse, the Sultan Moulay Slimane University (USMS) investigates the most effective means of engaging with students remotely and holding campus meetings [16]. In a hybrid framework, the emphasis is placed on interpersonal connections between teachers and students. The hybrid model integrates in-person meetings with online tools like Microsoft Teams to help students communicate with one another and maximize the use of their synchronous class time. It emphasizes student voice, choice, and agency through real-world, relevant learning.

In hybrid classrooms, students and teachers work together to plan and execute their own learning while also receiving feedback and guidance from one another. Considering the worldwide health emergency, Sultan Moulay Slimane University has implemented a plan to continue its students' education via distant education. Since March 16, USMS teaching and administrative staff have been deployed to ensure the continuance of distance learning (Table 1). Educational systems that are transitioning to a hybrid learning environment must prioritize certain elements to ensure that their students and instructors have the resources necessary for success. The five components of hybrid learning are the following: Learning environment, Lesson design, Engagement and interactivity, and Assessment and feedback [17].

Table 1. Distribution of students via hybrid Learning platforms and USMS institutions

Faculty of Beni Mellal	Platforms		
	Moodle	Teams	Others
FLSH	754	55	324
FST	475	801	289
FP-BM	1070	1525	816
ENSG	31	95	59
ENSA	87	23	0
EST	644	105	0
ENS	125	236	140
FP-KH	1187	13	18
ENSA-KH	970	191	205
EST-KH	217	5	10
EST-FK	119	20	26

4. EVALUATION AND EFFECTIVE ASSESSMENT IN HYBRID LEARNING

Improvement of the students is the main goal of teaching. Formative and summative assessments are used to measure students' development. Formative assessment is used to check in on how well a student is doing throughout a topic or lesson [18]. Both students and teachers benefit from formative assessments because they reveal which topics should be revisited in greater depth. Formative assessment does not need to be graded for accuracy because it is not the instructor's primary responsibility to ensure that students are understanding the material during a unit of instruction.

Students can "fail" until they succeed in gaining a deep understanding of the material when they know they will not be penalized for making mistakes on these tests. With the help of formative assessment, students can rely on feedback and gain insight into where they can make improvements. Students who participate in formative assessments are more likely to adopt a growth mindset and acquire transferable skills useful in both the classroom and the workplace.

Valid examples of formative evaluation reveal that students can:

- Solve sample problems in the cloud-based note-taking app.
- Fill out a survey, mock exam, or attendance/exit ticket.
- Create a summary of what they learned from a video or in-person lesson.
- Use an app to complete a visual organizer.
- Find the correct Word answers to concept-based questions.

Summative evaluations are used to evaluate the effectiveness of a unit of study and the knowledge gained by the students [19]. Summative assessment is graded and conclusive, while formative assessment is not graded for accuracy and instead relies on instructor feedback. Traditional forms of summative evaluation include both objective tests and written essays. Teachers can also gauge their students' development through the use of other assessment tools as shown in Figure 1.

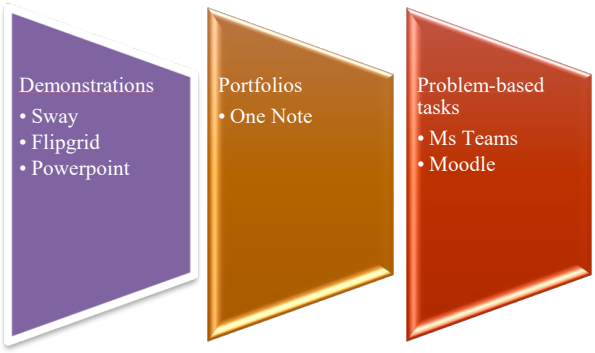

Figure 1. A selection of assessment tools used by the USMS

Teachers can assess their students' understanding of a topic by having them give a demonstration. Sway, PowerPoint, and Video Editor are all great tools for students to use when they have to present information to a particular group. Flipgrid and the screen recording tools in PowerPoint and Stream give students another option for creating instructional videos in which they can demonstrate their understanding of a topic or guide their peers through the steps of a problem-solving process. OneNote can be used as a student's digital portfolio. Learning can be reflected upon, assessed, and demonstrated by the student through the use of genuine work. After finishing a unit of study, students can utilize their portfolios to answer to a central important question or a Flipgrid prompt.

5. METHODOLOGY

In recent years, there has been a major increase in demand globally, including in the country of Morocco, for educational resources and instructors to provide quality learning experiences. Teachers face mounting pressures not only in terms of the time-consuming process of grading student work, but also in terms of the considerable effort required to constantly develop, write, and prepare quizzes and assessments to evaluate student learning outcomes and comprehension of educational materials. For example, the designers of massive open online courses (MOOCs) need to diligently review all chapter videos on a weekly basis in order to craft appropriate quiz questions that effectively test whether students grasped the concepts covered in the video lectures. However, the manual process of watching lengthy videos and formulating good questions is incredibly time intensive. Therefore, we explored approaches to automate this process as much as possible for the current project, as diagrammed in the architecture of the proposed system shown in Figure 2. Specifically, we present a computational tool to assist instructors and curriculum developers in automatically generating assessment questions from video content.

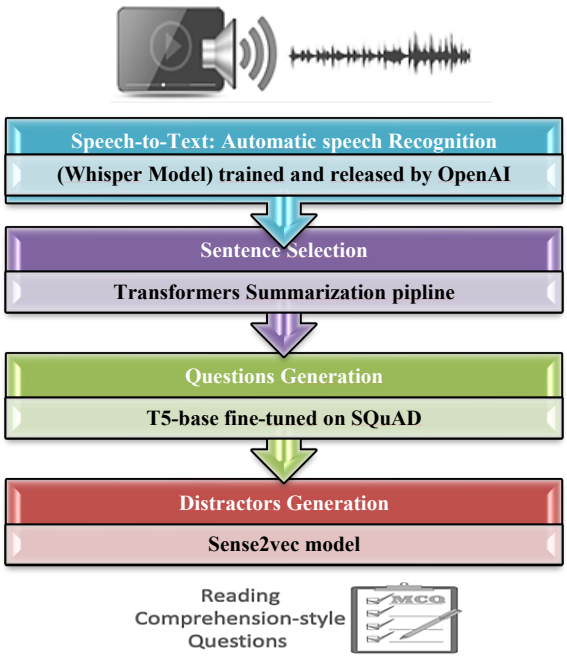

Figure 2. The architecture of the proposed system

5.1. Automatic Speech Recognition and Sentence Selection

For this application, we utilized Whisper, a powerful web-based automatic speech recognition (ASR) system that has been trained on over 680,000 hours of supervised speech data across a diverse array of languages, accents, and contexts. Training on such large and varied datasets enables the model to be highly robust to noise, specialized jargon, and regional variations in pronunciation and dialect. Furthermore, Whisper allows for speech transcription across many different languages and can translate to and from English. The developers have made their models and inference code publicly and freely available, which facilitates the development of downstream applications and exploration of more advanced speech processing techniques built on top of this state-of-the-art foundation.

Once the long-form video is transcribed to text via the speech recognition model, the key challenge is to condense this lengthy transcript down to only the most salient sentences that capture the core concepts. This process of shortening a document while retaining the most important information is known as automatic summarization in the field of natural language processing. Some summarization techniques work by directly extracting relevant snippets of text from the original document, while more advanced methods can generate entirely new sentences and paraphrase the ideas in novel ways [20].

To enable quick testing and the utilization of state-of-the-art models for our summarizing work, we utilized the Hugging Face transformers package, which is an extensive open-source library containing thousands of pretrained natural language processing models for a vast array of language tasks [21]. We leveraged these available summarization models to create concise extracts from the educational video transcripts technological learning challenges related to the evaluation topic.

5.2. Question and Distractor Generation

With the videos transcribed and summarized, we could then focus on the core task of automatically generating assessment questions. For this, we adapted a Text2Text generation Model based on open-source PyTorch code for the UniLM architecture [22]. Text2Text models are designed to learn the mapping between two text snippets, such as generating a question from a given statement. The model code is conveniently available via GitHub and PyPI for easy installation and integration into our question generation pipeline.

Recent developments in natural language processing approaches, such as the UniLM model, enable powerful new applications in education, assessment, and beyond. Frameworks like PyTorch have been instrumental in allowing researchers to easily build On top of cutting-edge models for text production and sharing their own extensions with the broader machine learning community [22]. As illustrated in Figure 3, our model takes the summarized video transcript text and target keyword as input, and automatically outputs a relevant question probing comprehension of that concept.

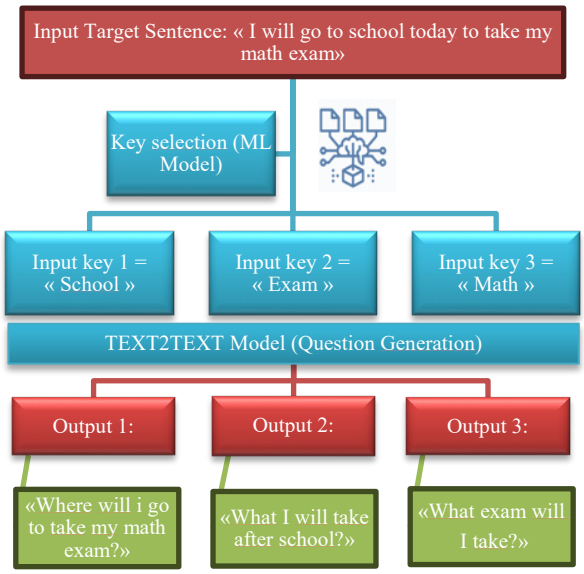

Figure 3. A sample of questions generated by the text2text model

In order for questions to be in a multiple-choice format, the system must not only produce the correct answer but also generate plausible incorrect options, known as distractors, to serve as the false responses. Existing question generation systems can leverage resources like WordNet, internet searches, and word sense disambiguation techniques to find related concepts that can serve as distractors.

In our implementation, we utilized a module called Sense2Vec, which enables the creation of enhanced word embeddings that effectively capture semantic meaning and relationships [23]. We extracted the key terms present in each correct response, and input those into the Sense2Vec model to identify other highly related phrases and sentences. By filtering out any identical matches, we obtain distractors that are as similar as possible to the truth while still being incorrect.

6. EXPERIMENT

6.1. Research Objective

The principal aim of this scholarly inquiry was to ascertain the effectiveness of artificial intelligence (AI) in augmenting the pedagogical framework of Massive Open Online Courses (MOOCs) through the automated generation of evaluative questions derived from video lecture transcripts. This research was predicated on the exigencies imposed by the COVID-19 pandemic, which precipitated an expedited shift towards virtual learning environments. Harnessing Advanced natural language processing (NLP) and machine learning paradigms, the study endeavored to validate the hypothesis that AI can significantly contribute to the personalization, efficiency, and efficacy of the e-learning experience.

6.2. Research Design and Methodology

A quasi-experimental study methodology was used to systematically evaluate the implementation of an AI-driven question generation system. This system was predicated on cutting-edge NLP algorithms capable of processing extensive video transcripts and generating a suite of assessment questions that could effectively gauge student comprehension and foster engagement within a MOOC setting.

6.3. Participant Selection

The study engaged a select cohort of MOOC educators who were tasked with the evaluation of the AI-generated questions. These educators were instrumental in providing critical insights into the system's precision, relevance, and educational impact. The participant pool comprised 10 educators, each with experience in delivering MOOC content across various disciplines.

6.4. Materials and Analytical Procedures

The AI question generation system was designed using a combination of NLP models and machine learning methods. This included the deployment of automatic speech recognition (ASR) technology for the transcription of video content and text summarization algorithms to distill pivotal concepts. The system was calibrated to generate multiple-choice questions (MCQs) replete with plausible distractors, thereby facilitating a robust assessment of student comprehension.

6.4.1. Video Transcription and Conceptual Summarization

MOOC video lectures were transcribed verbatim using an ASR system trained on a corpus that spanned a multitude of languages and dialects. Subsequent to transcription, summarization algorithms were applied to extract and emphasize the salient points, thereby streamlining the subsequent question generation process.

6.4.2. Generation of Questions and Distractors

Employing a Text2Text generative model, the system synthesized questions that were directly tethered to the summarized content, with particular emphasis on key terminologies and concepts. Distractors were crafted using semantic similarity models to ensure their pertinence and to introduce an appropriate level of challenge.

6.4.3. System Evaluation and Feedback Mechanisms

The educators were tasked with assessing the quality and pertinence of the AI-generated questions by integrating them into their MOOC assessments. Student performance on these AI-generated questions was juxtaposed with their performance on traditional human-generated questions. Feedback was systematically collected to ascertain levels of student satisfaction and engagement.

6.5. Data Collection and Statistical Analysis

Quantitative data were amassed through the meticulous analysis of student performance metrics, which included the accuracy rates and the time expended on AI-generated versus human-generated questions. Qualitative feedback was solicited from MOOC educators via structured surveys, which probed the system's usability, the caliber of the questions generated, and the pedagogical impact thereof. Statistical analyses were conducted to draw comparisons between the efficacy of AI-generated questions and conventional question generation methodologies.

This experimental section delineates the methodological rigor and comprehensive approach adopted to scrutinize the potential of AI in automating the generation of assessment questions from video transcripts within a MOOC context. The study's methodological framework, encompassing the development of an AI-driven system, the engagement of MOOC educators, and the execution of meticulous data analysis, highlights the transformative potential of AI in reshaping educational assessment strategies within a digital learning paradigm.

7. RESULTS AND DISCUSSION

7.1. Analysis of Quiz and Question Structure in MOOCs

In Figure 4, we delve into the structure of comprehension questions utilized within this research, originating from video materials in the USMS MOOC. The design of each question encompasses several key elements: firstly, a specific word under examination (the target word), secondly, a selected segment of the video transcript that features this word, thirdly, the accurate response to the question, and finally, three carefully crafted incorrect choices (distractors) [5] [24]. This question format is strategically employed to assess a learner's grasp of the pivotal word's context and their analytical ability to engage with video-based content, ensuring that among the quartet of provided options, only one is correct. This methodological approach not only tests comprehension but also encourages deeper engagement with the educational material presented in the video format.

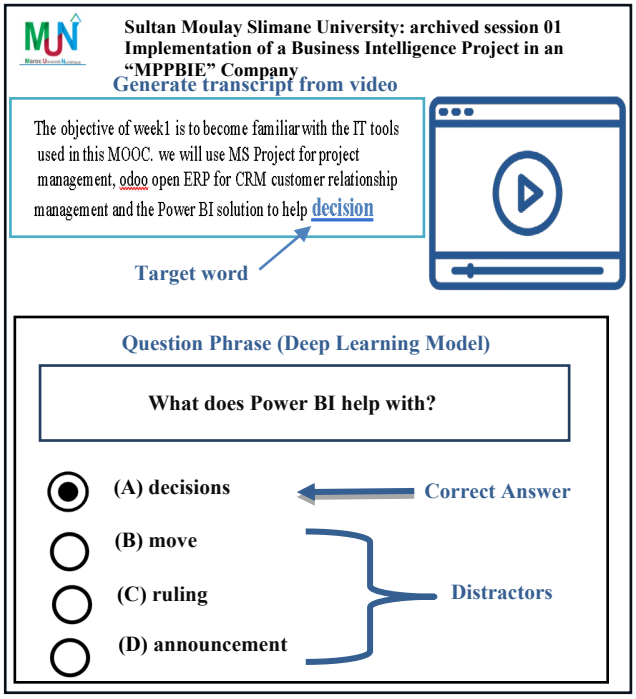

Figure 4. A Sample question generated from the video's transcript

We emphasize the importance of selecting the most appropriate word or phrase from the instructional content to function as a key element in the question design process. This selection is vital in determining the focus of the question, guiding the learners' attention to specific aspects of the learning material. Following this, we discuss the outcomes achieved by the various models implemented in our study.

To support this process, we developed a Django-based web application. This application boasts a user-friendly, responsive graphical interface that simplifies the task of graphical post-editing. It includes features such as the ability to filter and rank queries, as well as the capability to store data in a structured relational database. This technological advancement plays a crucial role in streamlining the question generation and editing process.

Each quiz has the following characteristics:

- Randomization of the order of the questions
- Quiz scores are stored separately for each user
- Previous quiz results are available on the category page
- Correct responses might be displayed following each question or all at once at the conclusion.
- Users who are logged in can return to an incomplete quiz to complete it, and users who are not logged in can complete a quiz if their session continues
- The quiz may have a time limit of one try per person.
- A category and subcategory can be assigned to a question
- On a progress page, the success rate for each category may be viewed
- Each response to a question may be explained.
- Passing marks can be established
- Type of multiple-choice question
- Type of essay question
- Along with the question, a picture is included.
- Individuals who pass or fail a quiz receive a customized message
- Addition of a custom permission (view sittings), which enables users with that permission to view quiz results submitted by other users
- A quiz completion page that may be sorted by quiz or user and is used to grade essay questions
- After selecting a bigger pool of questions, a quiz can be configured to display a random selection of those questions rather than the entire pool
- Exams are scheduled to begin and conclude at certain times

7.2 Survey Evaluation of AI-Enhanced Question Generation

In the realm of Massive Open Online Courses (MOOCs), the integration of AI for the generation of assessment questions represents a significant innovation aimed at enhancing the pedagogical process. To empirically evaluate the effectiveness of such AI-assisted systems, a survey was conducted among MOOC educators who utilized the system for question generation. The survey aimed to capture educators' perceptions of the system's usability, the quality of the generated questions, and the overall impact on their teaching workflow. The results, as depicted in Table 2, provide a quantitative and qualitative assessment of the AI system's performance from the educators' perspective.

Table 2. Educators' Survey Ratings of AI-Assisted Question Generation System

Criteria	Rating	Comments
Ease of Use	4.3	"Intuitive and straightforward, even for those not tech-savvy."
Quality of Generated Questions	4.0	"Questions were relevant, but some lacked depth."
Distractor Quality	4.1	"Distractors were mostly plausible, enhancing the challenge."
Time Efficiency	4.6	"Significantly reduced the time needed to create quizzes."
Cost Effectiveness	3.9	"Good value, though concerns about potential subscription costs."
ASR Performance	4.4	"Accurate transcription, with minor errors in technical terms."
Pedagogical Impact	4.5	"Enabled more dynamic assessments, positively affecting learning."
Overall Satisfaction	4.5	"Very satisfied with the system's impact on reducing workload."

• Note: Ratings are based on a survey of 10 educators who used the AI-assisted question generation system over an academic semester. Comments are summarized from open-ended responses in the survey.

The data presented in Table 2 elucidates the educators' generally favorable reception of the AI-assisted question generation system. The high ratings for ease of use (4.3) and time efficiency (4.6) underscore the system's user-friendly interface and its capacity to significantly reduce the time required for creating assessment materials. This is particularly salient in the context of the Covid-19 pandemic, which has necessitated a rapid transition to online learning models and placed additional demands on educators' time and resources.

The quality of the generated questions (4.0) and distractor quality (4.1) suggest that while the AI system is adept at producing relevant and well-structured questions, there is an opportunity for enhancement, particularly in terms of the depth and complexity of the questions to foster higher order thinking skills. The plausible and challenging distractors are indicative of the system's ability to effectively differentiate between varying levels of student understanding, thereby contributing to the robustness of the assessments.

The ASR performance (4.4) reflects the system's proficiency in accurately transcribing spoken content into text, which likely contributes to the overall ease of use. The pedagogical impact (4.5) rating highlights the system's contribution to learning outcomes by enabling more frequent and varied assessments, aligning with the broader goals of leveraging AI to create personalized, efficient, and effective e-learning experiences.

Overall satisfaction (4.5) with the system indicates its success in meeting educators' needs for efficient, diverse, and high-quality question generation. This positive reception is pivotal for the continued integration and development of AI technologies in educational settings, particularly as the sector adapts to the challenges posed by pandemic and shift towards hybrid learning models.

The educators' survey ratings of the AI-assisted question generation system reveal a strong foundation for the use of AI in enhancing e-learning through automated question generation. The system's ease of use, time efficiency, and the quality of its output contribute significantly to its pedagogical impact, supporting the study's findings on the potential of AI to transform educational assessment and learning experiences. Future research should focus on refining the AI system to address areas for improvement, such as the depth of generated questions, and exploring its application across diverse learning environments and disciplines.

7.3. Engineering Case Studies

To illustrate the practical applications of the proposed AI-driven question generation system in engineering education, we present two case studies focusing on complex problem-solving scenarios.

7.3.1. Case Study 1: Fluid Dynamics

In the first case study, the AI system was employed to generate assessment questions from a video lecture on fluid dynamics. The AI-generated questions effectively tested students' understanding of key concepts such as Bernoulli's principle, Reynolds number, and boundary layer theory. The system provided a diverse set of questions that probed various aspects of topic, enabling instructors to quickly assess student comprehension and identify areas requiring further explanation.

7.3.2. Case Study 2: Finite Element Analysis

The second case study involved the use of the AI system to generate questions from a video tutorial on finite element analysis (FEA) for structural engineering. The AI system successfully extracted core concepts from the video, such as mesh generation, boundary conditions, and convergence criteria, and generated multiple-choice questions with plausible distractors. The questions assessed students' understanding of FEA principles and their ability to apply this knowledge to real-world engineering problems, fostering the development of critical thinking and problem-solving skills.

The case studies demonstrate the potential of AI-driven approaches, such as automatic speech recognition (ASR) and question generation, in creating accessible and effective learning materials and assessments for engineering education. ASR technology can transcribe video lectures and tutorials, making content more accessible to students with diverse learning needs. Automatic question generation can significantly reduce educators' workload in creating assessments while providing students with personalized and adaptive learning experiences. The integration of AI-generated questions into online learning platforms can address the unique challenges faced by engineering educators in the era of remote learning, such as dealing with complex problem-solving scenarios and promoting creativity through personalized assessments. By leveraging AI technologies, educators can enhance student engagement, improve learning outcomes, and better prepare engineering students for challenges of the modern world.

7.4. Discussion

Our analysis, supported by output figure and table, indicates that Whisper's performance, while not outperforming specialized models in narrow benchmarks, offers broader applicability in real-world educational settings. This is particularly relevant in engineering education, where the content is not only diverse but also rapidly evolving. The ability of Whisper to adapt to various accents, dialects, and specialized terminologies without extensive retraining or fine-tuning presents a significant advantage.

The case studies demonstrate the system's ability to handle complex technical content in engineering disciplines, such as fluid dynamics and finite element analysis. By generating questions that challenge students to apply their knowledge to real-world problems, the system fosters the development of critical thinking and problem-solving skills essential for engineering practice. The successful application of the system in these case studies highlights its potential to create accessible and inclusive learning materials, catering to a diverse student population with varying linguistic backgrounds and learning needs.

Whisper's architecture is a simple encoder-decoder Transformer that is implemented from start to finish. Other known approaches frequently employ smaller, more closely connected audio-text training datasets [25], or extensive yet unsupervised audio pretraining. [26], [27], [28] Whisper does not outperform models that specialize in LibriSpeech performance, a notoriously competitive benchmark in speech recognition, because it was trained on a vast and diversified dataset and was not tuned to a specific one. However, when measuring Whisper's zero-shot performance over numerous heterogeneous datasets, we find that it is significantly

more flexible and produces 50% lower error rates than the other models.

In engineering disciplines, the ability to accurately transcribe and translate technical discussions, lectures, and instructional videos is paramount. The application of Whisper and similar AI-driven models can facilitate the creation of more accessible and inclusive learning materials. For instance, engineering case studies often involve complex problem-solving scenarios that can be better understood through detailed transcriptions and translations, enabling students from different linguistic backgrounds to engage with the content effectively. Text-to-Text models are designed to determine the relationship between two texts. The most common configurations for these devices are T5, T0, and BART [29]. These models are trained to do a variety of tasks, including summarizing, translating, and creating queries.

UNILM [22] was fine-tuned to 22.12 on the training set over 10 epochs with the SQuAD question generator BLEU-4 (3.75 absolute improvement). They used a batch size of 32, a masking probability of 0.7, and a learning rate of 2e-5. Smoothing of labels occurs at a rate of 0.1. The remaining hyperparameters were consistent with those used during pre-training. It is useful to assess knowledge with MCQs at various times and learning stages. This evaluation can be performed for prospective, instructive, formative, and summative objectives, utilizing a variety of methods (voting boxes, MCQ generation applications). However, it should be highlighted that the intrinsic usage of these technologies in the tasks is not what motivates the students[30]. Principal components of an active learning viewpoint include the type and methods of inquiry used to frame them, as well as the analysis of the responses obtained.

The findings from our study align with the broader objectives of enhancing engineering education through AI-driven methodologies. By leveraging models like Whisper, educators can create more accessible and inclusive learning materials, cater to a diverse student population, and address the unique challenges presented by technical terminology and problem-solving scenarios in engineering disciplines. Furthermore, the ability to automatically generate high-quality, relevant assessment questions from video transcripts can significantly reduce educators' workload and provide students with more personalized and effective learning experiences.

However, it is important to acknowledge the limitations of our study and identify areas for future research. While the case studies and survey results provide promising evidence of the system's effectiveness, further validation across a wider range of engineering disciplines and educational settings is necessary. Additionally, the system's performance in generating questions that assess higher order thinking skills and promote deep learning requires further investigation. Future work should also explore the integration of advanced techniques, such as semantic analysis and knowledge graph integration, to enhance the depth and complexity of the generated questions.

Despite these limitations, our study makes significant contributions to the field of educational technology and online learning. By demonstrating the potential of AI-driven question generation to transform assessment practices in engineering education, we provide a framework for the development and implementation of personalized, adaptive learning experiences that cater to the diverse needs of students in the era of remote learning. The insights gained from this research can guide the adoption of AI technologies in engineering education and beyond, fostering a more inclusive, engaging, and effective learning environment that prepares students for the challenges of the modern world.

In conclusion, our investigation into the application of AI-driven question generation in engineering education highlights the transformative potential of these technologies in enhancing student engagement, improving learning outcomes, and supporting educators in the face of the challenges posed by the COVID-19 pandemic. By leveraging state-of-the-art natural language processing techniques and machine learning algorithms, our proposed system offers a promising solution to the unique needs of engineering education, enabling the creation of accessible, personalized, and effective learning experiences that cater to a diverse student population. As the demand for innovative e-learning solutions continues to grow, the insights and frameworks provided by this research will be invaluable in guiding the development and implementation of AI technologies in engineering education and beyond.

8. CONCLUSION

This study explores a novel application of artificial intelligence to enhance assessment generation for online education. The introduction motivates the need for automated question creation to facilitate personalized, efficient learning. we analyze prior work on applying AI and NLP for educational question generation. We then explain the hybrid model for distance learning adopted by Sultan Moulay Slimane University in response to Covid-19. A key priority is developing effective online assessments, which we detail along with formative and summative evaluation approaches.

The recourse to "Distance Education" and "alternated teaching" as an educational choice, instead of the usual face-to-face education, in light of the spread of the global pandemic "Covid-19", highlighted problems and difficulties that the education system has never experienced before, such as the reduction in the volume of school hours, and the emergence of numerical differences between students and teachers, which has forced the adoption of certain pedagogical practices [22].

In conclusion, this research highlights the potential of human-AI collaboration to transform assessment in online education. Automated generation alleviates instructor workload while enabling personalized, adaptive experiences. Although focused on multiple choice questions for videos, the modular architecture could be extended to new domains. By combining AI and human expertise, we can continue improving inclusive, engaging education at scale post-pandemic.

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BIOGRAPHIES

Name: **Radoine**
Surname: **Hamzaoui**
Birthday: 04.06.1985
Birthplace: Beni Mellal, Morocco
Bachelor: Computer Science, Computer Department, National School of Applied Sciences, Fez, Morocco, 2009
Master: Education of Mathematics and Technology, Computer Department, Higher Normal School, Abdelmalek Essaadi University, Tetouan, Morocco, 2015
Doctorate: Student, E-learning, Computer Department, Polydisciplinary Faculty, Sultan Moulay Sliman University, Beni Mellal, Morocco, Since 2021
The Last Scientific Position: ICT Teacher Trainer, Training Center, Beni Mellal, Morocco, Since 2019
Research Interests: E-learning, Educational Technology, Intelligent Artificial
Scientific Publications: 3 Papers

Name: **Younes Aziz**
Surname: **Bachiri**
Birthday: 21.08.1986
Birthplace: Beni Mellal, Morocco
Bachelor: Computer Science, Computer Department, Faculty of Science Ben M'Sick, Hassan II University, Casablanca, Morocco, 2010
Master: Computing and Systems Engineering, Computer Department, Sultan Moulay Slimane University, Beni Mellal, Morocco, 2017
Doctorate: Computer Science, Computer Department, Sultan Moulay Sliman University, Beni Mellal, Morocco, 2023
The Last Scientific Position: Teacher, Computer Science, Ministry of National Education, Beni Mellal, Morocco, Since 2011
Research Interests: Artificial Intelligence and Deep Learning, E-Learning and MOOCs, Automatic Question Generation, Natural Language Processing
Scientific Publications: 12 Papers

Name: **Elhoucine**
Surname: **Ouassam**
Birthday: 14.10.1991
Birthplace: Azilal, Morocco
Bachelor: Mathematics and Computer Sciences, Department of Mathematics and Computer Sciences, Sultan Moulay Slimane University, Beni Mellal, Morocco, 2014
Master: Business Intelligence, Department of Mathematics and Computer Sciences, Sultan Moulay Slimane University, Beni Mellal, Morocco, 2018
Doctorate: Computer Science, Computer Department, Sultan Moulay Sliman University, Beni Mellal, Morocco, 2023
The Last Scientific Position: Teacher, Ministry of National Education, Beni Mellal, Morocco, Since 2018
Research Interests: Artificial Intelligence, Education, Big Data
Scientific Publications: 8 Papers

Name: **Hicham**
Surname: **Mouncif**
Birthday: 01.01.1975
Birthplace: Beni Mellal, Morocco
Bachelor: Applied Mathematics, Mathematics Department, Faculty of Science and Technology of Beni Mellal, Sultan Moulay Slimane University, Beni Mellal, Morocco, 2000
Master: Engineering Sciences, Computer Department, Faculty of Science BenMscik, Hassan II University, Casablanca, Morocco, 2002
Doctorate: Computer Sciences, Department of Science and Technology, Faculty of Sciences, Hassan II University, Mohammedia, Morocco, 2005
The Last Scientific Position: Prof., Mathematics, Sultan Moulay Slimane University, Beni Mellal, Morocco, Since 2008
Research Interests: Mathematics and Applications, Decision Information Systems, E-learning, Artificial Intelligence and GIS-Technology Application
Scientific Publications: 60 Papers

Name: **Belaid**
Surname: **Bouikhalene**
Birthday: 01.01.1970
Birthplace: Agadir, Morocco
Bachelor: Mathematics, Mathematics Department, Ibn Zohr University, Agadir, Morocco, 1993
Master: Telecommunication and Computer Science, Computer Department, Ibn Tofel University, Kenitra, Morocco, 2001
Doctorate: Mathematics, Mathematics Department, Ibn Tofel University, Kenitra, Morocco, 2007
The Last Scientific Position: Prof., Mathematics, Sultan Moulay Slimane University, Beni Mellal, Morocco, Since 2008
Research Interests: Mathematics and Applications, Decision Information Systems, E-learning, Pattern Recognition and Artificial Intelligence
Scientific Publications: 93 Papers