

Project ID:

24-25J-185

1. Topic (12 words max)

AI-Based Training and Assessment Tool for Vocational Education

2. Research group the project belongs to

Artificial Intelligence and Machine Learning

3. Research area the project belongs to

Artificial Intelligence (AI)

4. If a continuation of a previous project:

Project ID	
Name	

5. Brief description of the research problem including references (200 – 500 words max) – references not included in word count.

The rapid advancements in technology, particularly in Artificial Intelligence (AI), have revolutionized various sectors, including education. Vocational education, which focuses on equipping students with specific skills for the workforce, has traditionally relied on hands-on, in-person training methods. However, these traditional methods face challenges in scalability, personalization, and engagement. The integration of AI into vocational education presents a promising solution to these challenges, enabling more adaptive, personalized, and engaging learning experiences.

Research Problem

Vocational education aims to prepare individuals with the necessary skills to meet the demands of the evolving job market. Traditional vocational training programs, while effective in certain contexts, often struggle with several key issues:

Lack of Personalization: Traditional vocational education often follows a one-size-fits-all approach, failing to address the unique learning needs and paces of individual students. This can result in disengagement and suboptimal learning outcomes.

Engagement Challenges: Keeping students engaged in vocational training can be difficult, especially when the training lacks interactive and immersive elements. Traditional methods may not fully capture students' interest or simulate real-world scenarios effectively.

Assessment and Feedback: Providing timely and personalized feedback in vocational training is essential for skill development. Traditional assessment methods can be time-consuming and may not provide the immediate feedback needed for effective learning.

Administrative Burden: Managing vocational training programs involves significant administrative tasks, including scheduling, tracking progress, and record-keeping. These tasks can be resource-intensive and detract from the core focus on education.

Solution Approach

The proposed research focuses on integrating AI to address these challenges through four main components:

Skill-Based Adaptive and Personalized Learning Path: Utilizing AI algorithms to create personalized learning paths that adjust in real-time based on individual student performance and skill levels. This ensures that each student receives the right content at the right time, enhancing learning efficiency and outcomes.

Gamification and Game-Based Learning for Vocational Education: Incorporating game-based learning and gamification elements to make vocational training more engaging. AI will adapt game mechanics based on student performance, providing a challenging yet enjoyable learning experience.

Intelligent Tutor and Automated Assessment System: Developing AI-driven intelligent tutors that offer personalized guidance and feedback. Automated assessment systems using natural language processing (NLP) will evaluate student submissions in real-time, providing immediate and constructive feedback.

AI Chatbot Integration for Personalized Vocational Training Support: Creating an AI chatbot that offers personalized support and answers student queries in real-time. The chatbot will be integrated with the learning platform to access student data and provide context-aware assistance, enhancing the overall learning experience.

References:

- Chassignol, M., Khoroshavin, A., Klimova, A., & Bilyatdinova, A. (2018). Artificial intelligence trends in education: A narrative overview. *Procedia Computer Science*, 136, 16-24.
- Huang, G.-B., Zhu, Q.-Y., & Siew, C.-K. (2006). Extreme learning machine: theory and applications. *Neurocomputing*, 70(1-3), 489-501.
- Jean-Charles, A. (2018). Internet of things in education: Artificial intelligence voice assistant in the classroom. *Society for Information Technology & Teacher Education International Conference*, 883-885.
- Patrick, S., Kennedy, K., & Powell, A. (2013). Mean what you say: Defining and integrating personalized, blended and competency education. *International Association for K-12 Online Learning*.

6. Brief description of the nature of the solution including a conceptual diagram (250 words max)

The proposed solution leverages Artificial Intelligence (AI) to revolutionize vocational education by addressing personalization, engagement, assessment, and support challenges. The system integrates four main components:

Skill-Based Adaptive and Personalized Learning Path:

AI algorithms create dynamic, personalized learning paths based on real-time analysis of student performance and skill levels. This ensures that each student receives tailored content, optimizing their learning experience and outcomes.

Gamification and Game-Based Learning for Vocational Education:

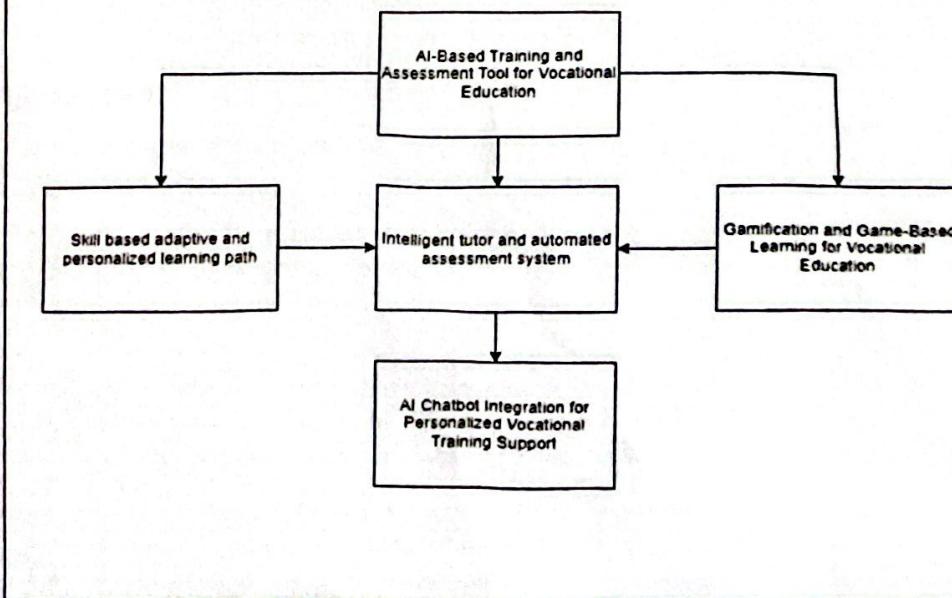
Educational games and gamification elements are incorporated to make learning more engaging. AI adapts game mechanics and content to match the student's abilities, providing a challenging yet enjoyable learning environment that simulates real-world scenarios.

Intelligent Tutor and Automated Assessment System:

AI-driven intelligent tutors provide personalized guidance and feedback, enhancing the learning process. Automated assessment systems, using natural language processing (NLP), evaluate student submissions in real-time, offering instant, constructive feedback and detailed performance analysis.

AI Chatbot Integration for Personalized Vocational Training Support:

An AI chatbot offers real-time, personalized support to students, answering queries and providing guidance based on the student's data and context. This chatbot is integrated with the learning platform, ensuring seamless access to relevant information and support.



7. Brief description of specialized domain expertise, knowledge, and data requirements (300 words max)

Specialized Domain Expertise

Artificial Intelligence and Machine Learning:

- developing AI algorithms for curriculum development, adaptive learning, and real-time analytics.
- Knowledge of machine learning techniques for predicting industry trends, assessing student performance, and personalizing learning experiences.

Natural Language Processing (NLP):

- Skills in sentiment analysis, text classification, speech recognition, and language generation to accurately evaluate written and spoken responses.
- NLP techniques for analyzing text and speech.

Educational Psychology:

- Understanding of learning theories and pedagogical strategies for designing effective vocational training programs.
- Ability to create adaptive assessments that cater to various learning styles and paces.

Industry-Specific Expertise:

- Collaboration with industry professionals to identify essential skills and competencies required in the workforce.

Knowledge Requirements

Curriculum Development:

- Understanding of curriculum design principles and integration of AI-driven updates.
- Familiarity with competency-based education and alignment with industry standards.

Assessment Design:

- Expertise in creating valid and reliable assessment tools for a wide range of skills and competencies.
- Knowledge of adaptive testing methods for personalized assessments.

Data Analytics:

- Skills in data collection, analysis, and interpretation to derive insights from student performance data.
- Proficiency in using analytics tools to monitor and evaluate training program effectiveness.

Data Requirements

Student Data:

- Information on student demographics, prior knowledge, and learning preferences for personalized learning.
- Continuous performance data to adapt learning paths and provide real-time feedback.

Industry Trends:

- Data on current and emerging industry trends to keep the curriculum relevant.
- Job market information and employer feedback to align training with workforce needs.

Assessment Data:

- Detailed records of student responses, including written and spoken outputs.
- Performance metrics and feedback data for real-time analytics and tool improvement.

8. Objectives and Novelty

Main Objective

The main objective of the AI-based training and assessment tool for vocational education is to transform learning experiences by integrating advanced artificial intelligence and machine learning technologies. This tool aims to personalize learning journeys, automate assessments with real-time feedback, accurately diagnose practical issues based on symptoms, and enhance student engagement through gamified training modules. By achieving these goals, the tool seeks to optimize vocational education outcomes, ensuring learners acquire and retain essential skills effectively in fields such as automotive repair, HVAC systems, and electronics.

Member Name	Sub Objective	Tasks	Novelty
Vilajini.Y	Intelligent Tutor and Automated Assessment System with AI Viva Session	<ul style="list-style-type: none"> • Develop Intelligent Tutoring Systems • Automate Assessments • Enhance AI Viva Experience • Develop AI-Driven Viva Sessions • Integration with Learning Management Systems (LMS) 	<p>Advanced NLP for Assessment Leverages cutting-edge natural language processing (NLP) techniques to evaluate written assignments, offering detailed, context-aware feedback and suggestions for improvement almost instantaneously.</p> <p>AI-Driven Viva Sessions Introduces an AI viva session as the final assessment, where the AI assistant interacts with learners through voice, providing a realistic simulation of oral exams and interviews.</p>

Saseena.M.U.F	AI powered Virtual mentor and Support System	<ul style="list-style-type: none"> • Develop AI Chatbot • Choose Multilingual Speech Recognition Service. • Implement ASR to accurately transcribe voice input into text for Tamil, Sinhala, and English. • Design and implement a user interface that allows users to easily record and submit voice notes. • Include a microphone button for starting and stopping the recording. 	<p>Multi-Lingual Voice Recognition:</p> <p>The AI chatbot supports voice control and can detect and transcribe voice inputs into multiple languages, specifically Tamil, Sinhala, and English, catering to diverse linguistic needs</p>
Sujeevan .R	Skill Based Adaptive and Personalized Learning Path	<ul style="list-style-type: none"> • Develop Adaptive Assessment Algorithms • Design Real-time Performance Evaluation Modules • Implement Predictive Complexity Adjustment Mechanisms • Develop Dynamic Skill Evaluation Techniques • Create Personalized Learning Pathway Algorithms • Integrate Real-time Feedback Systems • Implement Immediate Performance Insight Systems 	<p>Predictive Complexity Adjustment</p> <ul style="list-style-type: none"> • The AI adjusts the complexity of questions based on student performance in real-time, providing a tailored assessment experience. • A student performing well on initial questions is presented with more complex scenarios, ensuring accurate placement and ongoing challenge. • This novelty ensures that each student's assessment experience is unique and tailored to their current level, • promoting effective learning and skill development.

			<p>Real-time Feedback and Recommendations</p> <p>Students receive instant insights into their performance, allowing them to understand their current skill level and get specific strategies to improve in their weaker areas.</p>
Niles A.P	<p>Gamification and Game-Based Learning for Vocational Education</p> <ul style="list-style-type: none"> • Develop and Implement Gamified Learning Modules • Design virtual scenarios for Electricians and Auto Mobile engineers • Implementing Collaborative learning • Provide a Progress tracking method for learners and instructors 	<p>Gamified Learning Module</p> <p>Developing a 2D game-based learning platform for both electricians and automobile engineers to put their theoretical knowledge to the test.</p> <p>Integration of Advanced Game Elements</p> <p>Using advanced game elements like avatars, points, badges, and leaderboards to create an emotionally, socially, and cognitively engaging learning environment.</p> <p>Interactive Learning Modules</p> <p>Develop interactive modules that incorporate quizzes, puzzles, and memory games related to electrical systems and automotive mechanics. These modules can help reinforce theoretical knowledge through practical application.</p> <p>Collaborative Learning</p>	

1. Supervisor checklist

a) Does the chosen research topic possess a comprehensive scope suitable for a final-year project?

Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>
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b) Does the proposed topic exhibit novelty?

Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>
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c) Do you believe they have the capability to successfully execute the proposed project?

Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>
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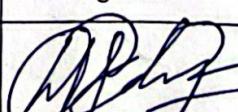
d) Do the proposed sub-objectives reflect the students' areas of specialization?

Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>
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e) Supervisor's Evaluation and Recommendation for the Research topic:

Recommended -

2. Supervisor details

	Title	First Name	Last Name	Signature
Supervisor	Prof.	Pradeep	Abyguneswara	
Co-Supervisor	Mrs.	Supriya	Karunathilaka	
External Supervisor				
Summary of external supervisor's (if any) experience and expertise				

This part is to be filled by the Topic Screening Panel members.

Acceptable: Mark>Select as necessary

Topic Assessment Accepted	
Topic Assessment Accepted with minor changes (should be followed up by the supervisor)*	✓
Topic Assessment to be Resubmitted with major changes*	
Topic Assessment Rejected. Topic must be changed	

* Detailed comments given below

Comments

Advised to do some minor changes and approved the topic

The Review Panel Details

Member's Name	Signature
Dr. B.N. Silva	
Ms. Jenny Krishara	<u>Jenny</u>