IT4010 Research Project – 2025 July

Topic Assessment Form

Project ID : 25-26j-233

1. Topic (12 words max)

E-learning platform - Personalized Micro-Learning with Adaptive Content Structuring and Progress Analytics

2. Research group the project belongs to

TIM - Technology Integration and Management

3. Specialization of the project belongs to

Information Technology (IT)

4. If a continuation of a previous project:

Project ID	
Year	

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

Despite the increasing availability of digital educational resources, current e-learning platforms often fail to provide structured, personalized, and engaging learning experiences that align with formal curriculum. Students particularly in school and undergraduate levels struggle to remain consistently engaged and often lack tailored support to address individual learning gaps.
Our proposed solution is a **Learning Platform app** that's designed for two key actors: Teachers and students. the app empowers Grade 10–11 students and undergraduates by offering personalized daily lessons, adaptive quizzes, and gamified progress tracking(quizzes leaderboards) and these help teachers keep track of student performance as well. The platform uses uploaded content (e.g., textbooks, teacher guides) to generate daily learning tasks and interactive challenges inspired by micro-learning principles.

Ai models can be used for this task too one core issue is that most AI models, while powerful, lack the ability to stay within the educational scope of a teacher's intent, often overwhelming students with irrelevant information. To address this, our ***Education Content Extraction and Structuring Engine*** uses teacher guides to filter and deliver only the most relevant content automating a traditionally manual and inconsistent process [A. Mostrady, E. Sanchez-Lopez, and A. F. Gonzalez-Sanchez, "Microlearning and its Effectiveness in Modern Education: A Mini Review," *Acta Pedagogia Asiana*, vol. 4, no. 1, pp. 33–42, 2025].

We also implement an ***Intelligent Learning Pathway Generator*** that uses performance data to adapt the student's journey through the curriculum. This builds upon proven frameworks in adaptive learning that emphasize personalization as a key to improved retention and outcomes [A. Donevska-Todorova, K. Dziergwa, and K. Simbeck, "Individualizing Learning Pathways with Adaptive Learning Strategies: Design, Implementation and Scale," *Proc. Int. Conf. Educ. Technol. Res.*, pp. 576–583, 2025.].

To promote consistency, our ***Progress Monitoring and Streak Analytics System*** is inspired by consumer apps like Snapchat, where streaks are proven to foster daily user engagement. This not only keeps students involved but also gives teachers a real-time view of student participation and progress through leaderboard metrics [Snapchat, 2024].

Finally, our ***Micro-Learning via Daily Challenges*** integrates short, focused quizzes and lessons. Research supports that microlearning enhances attention and retention in secondary education, especially when paired with gamified experiences [M. A. M. Attia, M. A. A. Ahmed, and L. A. A. Abdalsmd, "Integration of Adaptive Microlearning in Secondary Education," *Int. J. Innov. Sci. Res. Technol.*, vol. 10, no. 1, pp. 751–755, Jan. 2025].

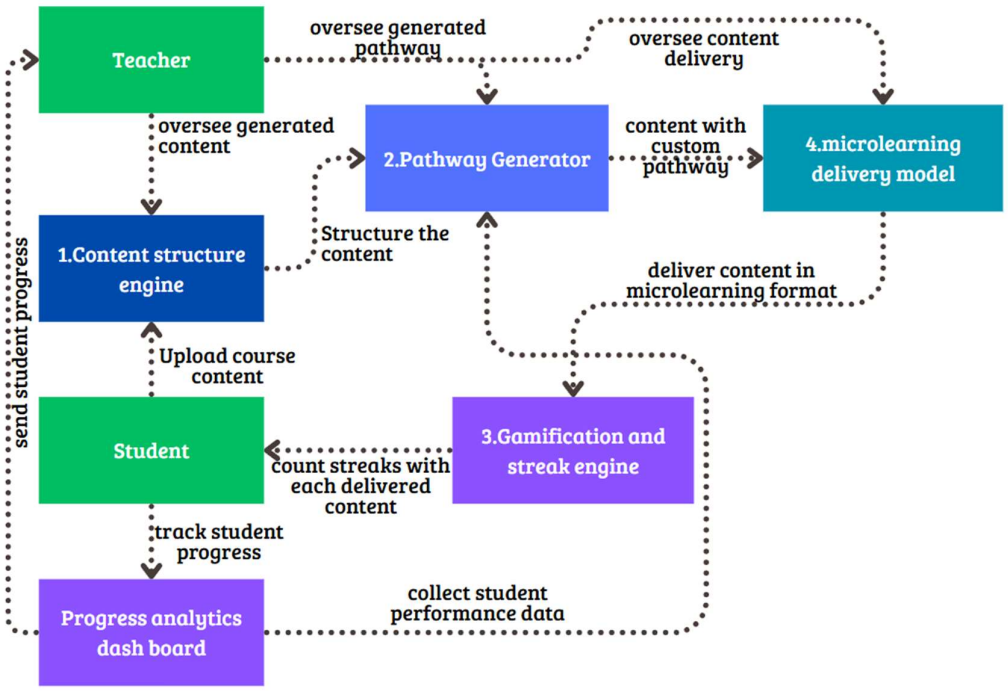
6. Brief description of the nature of the solution including a conceptual diagram (250 words max)

The proposed solution is a smart learning platform designed to deliver personalized and curriculum-aligned learning experiences for Grade 10–11 students and undergraduates. The system allows students to upload educational content such as textbooks, lecture slides, and teacher's guides. Using these inputs, the platform intelligently extracts and structures relevant lessons, ensuring that the material delivered stays within the scope outlined by subject experts.

Central to the solution is an AI-powered **Education Content Structuring Engine** that reads teacher guides and reorganizes uploaded by the **student** into content into short, focused lessons, the teacher **oversees** if the content is relevant and is in scope. A **Intelligent Learning Pathway Generator** analyzes student performance data to build adaptive learning routes that evolve based on quiz results, skipped topics, and repeated mistakes.

The platform incorporates gamification through **streaks, badges, and leaderboards**, managed by a **Progress Monitoring and Streak Analytics System**, which not only motivates students through habit-forming features but also provides teachers with engagement insights.

To encourage consistency, the system delivers **daily micro-challenges** in the form of brief quizzes and tasks, similar to Duolingo's model. These tasks are guided by structured content and teacher-approved logic, maintaining educational credibility. The result is a personalized, interactive, and adaptive learning journey designed to improve engagement, retention, and academic outcomes.



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

This project falls under the **Technology Integration and Management (TIM)** research cluster, requiring specialized knowledge in educational technology, requirement engineering, user engagement strategies, and human-computer interaction (HCI). The proposed learning platform integrates multiple components content structuring, adaptive learning pathways, progress tracking, and gamified micro-learning all of which combines computing, teaching strategies, and behavioral insights.

To develop the **Education Content Extraction and Structuring Engine**, foundational knowledge in natural language processing (NLP) and curriculum design is necessary. The ECESE engine must understand how to interpret teacher's guides and textbooks, extract learning objectives, and map them to structured learning content all while maintaining curriculum scope and relevance.

The **Intelligent Learning Pathway Generator** requires an understanding of adaptive learning systems, learner profiling, and personalized recommendation logic. Familiarity with data-driven learning platforms and pathway generation techniques (e.g., decision trees, rule-based engines) is essential.

Building the **Progress Monitoring and Streak Analytics System** involves working with engagement analytics, motivation theory, and streak-based behavioral tracking. Expertise in usability analytics and social gamification will support the design of features like leaderboards, streak indicators, and actionable insights for teachers.

To implement **Micro-Learning via Daily Challenges**, the team must be able to design concise, educationally effective lessons and assessments requiring a grasp of instructional design, HCI principles, and gamification frameworks.

Data Requirements include:

- Publicly available textbooks, teacher guides, and past exam papers (Grade 10–11 and undergraduate level).
- User interaction data such as quiz performance, task completion rates, and streak logs (collected via trials or simulations).
- Teacher or domain expert feedback to validate content alignment and adaptive recommendations.

8. Objectives and Novelty

Main Objective Design and develop a personalized learning platform for Grade 10–11 students and undergraduates that delivers structured micro-learning content, adapts to individual performance, and enhances engagement through intelligent scheduling, gamification, and teacher-guided content structuring.			
Member Name with Registration No	Sub Objective	Tasks	Novelty
Iroshan B IT22901262	Extract and structure curriculum-aligned content from uploaded materials	Develop NLP-based parser for textbooks & teacher's guides, scope filter, and lesson structuring algorithm	Education Content Extraction and Structuring Engine based on subject scope
Ahamed M.N.A IT22243508	Design adaptive learning paths based on student performance	Analyze quiz data, implement remediation engine, and generate learning roadmaps dynamically	Intelligent Learning Pathway Generator
Weerasekara W.M.P.S IT22215406	Track user engagement through streaks, task completions, and leaderboard metrics	Build dashboard for teachers, track streaks, analyze drop-off points, and rank learners by consistency	Progress Monitoring and Streak Analytics System, and find the impact of streaks in learning platforms
Ahmed M.N.A IT22920386	Deliver short daily challenges and quizzes to build micro-learning habits, and track student weaknesses.	Design task generator, quiz logic, delivery scheduler, and teacher review mechanism	Micro-Learning via Daily Challenges, and compare the results between micro learning and clustered learning

9. Individual component description of how it is complied with the specialization.

Member Name with Registration No	Description

10. Supervisor details

	Title	First Name	Last Name	Signature
Supervisor	Mrs	Geethanjali	Wimalaratne	23.6.25
Co-Supervisor				
External Supervisor				
Summary of external supervisor's (if any) experience and expertise				

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Topic Assessment Form

<u>This part is to be filled by the Topic Screening Staff members.</u>

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

Yes		No	

b) Does the proposed topic exhibit novelty?

Yes		No	

c) Do you believe they have the capability to successfully execute the proposed project?

Yes		No	

d) Do the proposed sub-objectives reflect the students' areas of specialization?

Yes		No	

e) Supervisor's Evaluation and Recommendation for the Research topic:

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Topic Assessment Form

Acceptable: Mark/Select as necessary

Topic Assessment Accepted	
Topic Assessment Accepted with minor changes*	
Topic Assessment to be Resubmitted with major changes*	
Topic Assessment Rejected. Topic must be changed	

* Detailed comments given below

Comments

Staff Member's Name	Signature

*__Important__:

1. According to the comments given by the evaluator, make the necessary modifications and get the approval by the **Evaluator**.
2. If the project topic is rejected, identify a new topic, and request the RP Team for a new topic assessment.