

Project ID:

24-25J-103

1. Topic (12 words max)

Educational tool for elementary children to enhance language skills and comprehension.

2. Research group the project belongs to

Autonomous Intelligent Machines and Systems (AIMS)

3. Research area the project belongs to

E-learning and Education (ELE)

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.

The research problem revolves around the need for effective educational tools that can enhance language skills and comprehension in elementary children. Traditional learning methods often fail to engage young learners or cater to their individual learning styles, resulting in a lack of motivation and slower progress in language acquisition [1]. Given the increasing reliance on technology, there is a pressing need to develop adaptive, interactive, and engaging educational tools that can provide personalized learning experiences [2].

Recent studies indicate that gamification and adaptive learning technologies can significantly improve student engagement and learning outcomes [3]. Gamification involves the use of game design elements in non-game contexts to motivate and enhance user engagement. When applied to education, it can make learning more enjoyable and rewarding, thereby increasing students' intrinsic motivation to learn [4]. Adaptive learning technologies use artificial intelligence (AI) to tailor educational content to the individual needs of each learner, providing a more personalized and effective learning experience [5].

However, integrating these technologies into a cohesive educational tool poses several challenges. These include designing an engaging and age-appropriate interface, developing algorithms that can accurately assess and adapt to individual learning needs, and ensuring the tool is accessible and usable for children of varying skill levels and backgrounds [6]. The integration of ICT in educational policies further underscores the significance of technology in modernizing education, as discussed by Yusuf (2010) [7]. Barab and Squire (2004) emphasize the necessity of design-based research in creating effective educational technologies, which helps in addressing real-world educational challenges through systematic, iterative methodologies [8]. Additionally, Baker and Inventado (2014) highlight how educational data mining and learning analytics can revolutionize educational settings by adapting learning environments to meet the needs of students through actionable insights [9].

Furthermore, the NMC Horizon Report (2014) provides insights into the future of educational technologies, including the potential challenges and impacts these technologies may have on K-12 education, setting a framework for innovation and implementation [10].

References:

[1]. J. Hamari, J. Koivisto, and H. Sarsa, "Does gamification work?--a literature review of empirical studies on gamification," in Proceedings of the 47th Hawaii International Conference on System Sciences, 2014, pp. 3025-3034.

[2]. Knewton, Inc., "Adaptive Learning: Changing the Way We Learn," 2013. [Online]. Available: <https://www.knewton.com/infographics/adaptive-learning-infographic/>.

[3]. S. Deterding, D. Dixon, R. Khaled, and L. Nacke, "From game design elements to gamefulness: defining 'gamification'," in Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments, 2011, pp. 9-15.

[4]. J. P. Gee, "What video games have to teach us about learning and literacy," Computers in Entertainment (CIE), vol. 1, no. 1, pp. 20-20, 2003.

[5]. P. Brusilovsky and E. Millán, "User models for adaptive hypermedia and adaptive educational systems," in The Adaptive Web, Berlin, Heidelberg: Springer, 2007, pp. 3-53.

[6]. J. L. Plass, B. D. Homer, and C. K. Kinzer, "Foundations of game-based learning," Educational Psychologist, vol. 50, no. 4, pp. 258-283, 2015.

[7]. M. O. Yusuf, "Information and communication technology and education: Analyzing the Nigerian national policy for information technology," International Education Journal, vol. 6, no. 3, pp. 316-321, 2010.

[8]. S. A. Barab and K. Squire, "Design-based research: Putting a stake in the ground," *Journal of the Learning Sciences*, vol. 13, no. 1, pp. 1-14, 2004.

[9]. R. S. Baker and P. S. Inventado, "Educational data mining and learning analytics," in *Learning Analytics: From Research to Practice*, J. A. Larusson and B. White, Eds., New York, NY: Springer, 2014, pp. 61-75.

[10]. L. Johnson, S. Adams Becker, V. Estrada, and A. Freeman, "NMC Horizon Report: 2014 K-12 Edition," Austin, Texas: The New Media Consortium, 2014.

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

The proposed solution is an efficient learning tool for teaching in elementary school children, incorporating game design and specific learning process. The tool will contain a graphical user interface of the frontal type, at least some of the links and pages will be interactive based on 'games, quizzes' etc.

Key components of the solution include:

1. Dynamic Virtual Rewards and Gamification System

flexible and integrated virtual rewards and game component to encourage children and make learning fun. It has badges, points, and other incentives that are constantly updated by machine learning algorithms according to the child's engagement and accomplishment.

2. Skill Diagnosis and Adaptive Learning Modules

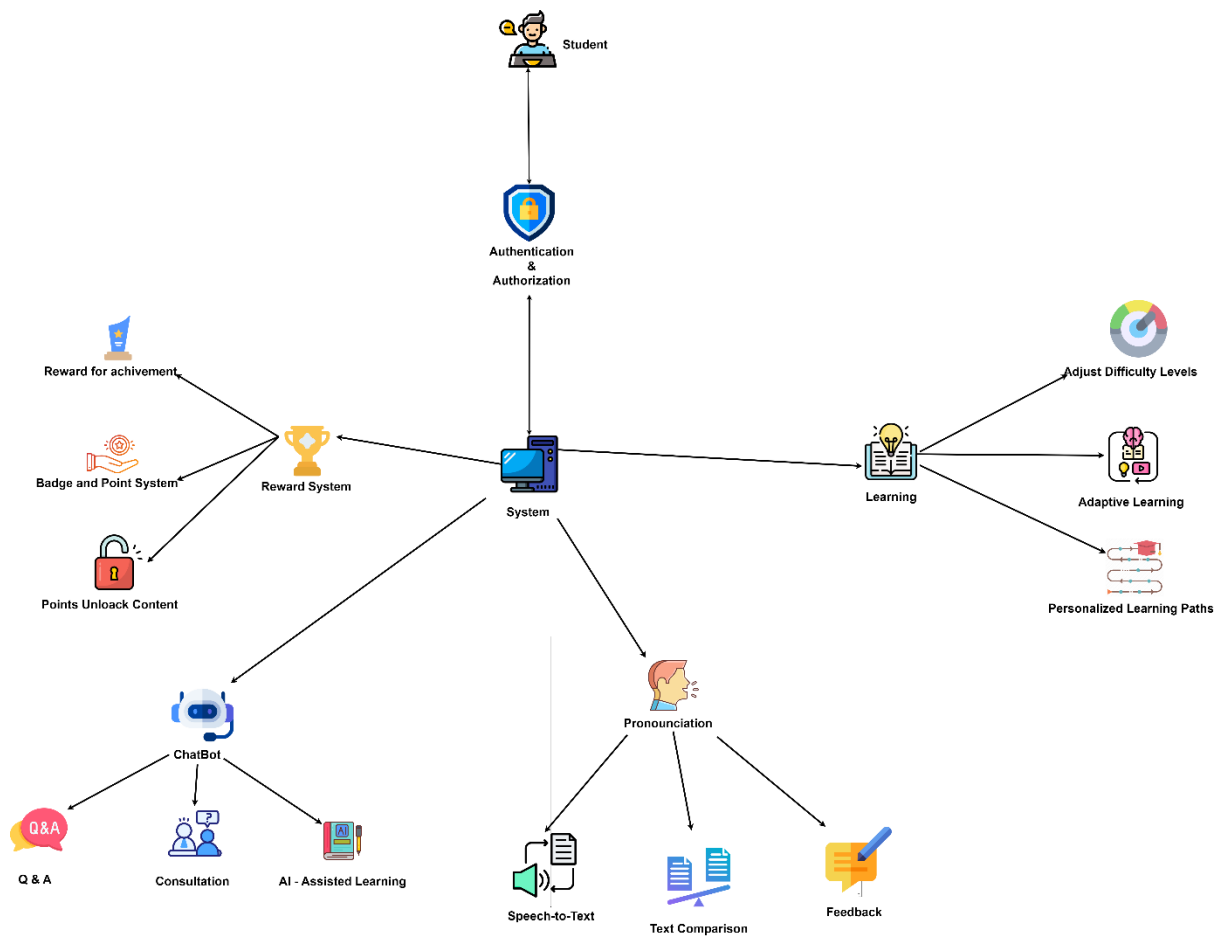
Assesses the child's skill levels through quizzes and activities, adapting the difficulty of learning modules accordingly. This ensures that each child receives personalized content that matches their learning pace and style.

3. Interactive Chatbot

This AI animated character improves elementary education because it provides personal and rather playful answers to the questions asked by the learners; it is, therefore, interesting because it's designed in a format that all children will find easy to use when learning whatever they want to learn.

4. Pronunciation Checker

pronunciation check that alerts the child if they are reading incorrectly. This feature applies speech recognition technology and text comparison algorithms to enable correction of pronunciations.



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

Developing this adaptive educational tool requires expertise in several specialized domains, including:

Artificial Intelligence and Machine Learning: Outsourcing IT specialty is crucial as it provides the knowledge needed for the creation of algorithms for adaptive learning and gamification. These algorithms should be able to interpret user data, personalize content and tune learning processes in real-time.

Natural Language Processing (NLP): These features imply the need for NLP knowledge to create the chatbot and the tool to check the pronunciation of the text. The chatbot for children should be able to answer children's questions correctly, and the pronunciation checker, requires accurate transcription of speech to text and accurate comparison.

Educational Psychology: It is crucial to comprehend what children learn and the processes they employ and what propels them to learn. These are in areas such as cognition, learning theories and motivation strategies that are effective for the children.

User Interface (UI) and User Experience (UX) Design: Competences in the UI/UX design field are required to establish an enjoyable, comprehensible, and age-adapted design. Finally, the design should be intelligible to the needs and capabilities of elementary school children so that the tool is both effective and fun for the child.

Data Management and Security: There is a responsibility to take care of the data collected from users and ensure that is protected. Proficiency in data management and confidentiality guarantees that the tool adheres to disclosure laws and data security.

8. Objectives and Novelty

Main Objective Design an educational platform for elementary school students to improve their language proficiency and their skills to understand what they read. The platform will include strong components to drive children's interaction and developmentally appropriate content for young learners. Given the educational theories and approaches appropriate for the concept of elementary education, the project aims at developing the platform to help the learners to use language, comprehend texts, and think critically while studying in an entertaining manner.			
Member Name	Sub Objective	Tasks	Novelty
Sirisena B G K D	Apply a dynamic virtual rewards and gamification system with the help of AI and machine learning to engage elementary children and improve their reading skills and desire to learn.	List down the functional and nonfunctional requirements for the Virtual rewards and gamification system. Identify the audience to be reached (elementary children) and the content knowledge useful in to develop their skills and their interest in reading.	Unlike most conventional learning paradigms, this system uses algorithms to constantly update the incentives and game elements according to the actual interactions and effectiveness of the learners. Using AI, the system learns the child's

		<p>Develop a gamification structure in form of virtual rewards such as badges and points for achievements that align with educational objectives and mission.</p> <p>Ensure that the components to be incorporated as part of the game enhances the accomplishment of the educational objectives and raise the level of learning amongst elemental children.</p> <p>Implement relevant gamification mechanics to the simulations, collect end-users feedback with regards to the mechanics, and optimize the mechanics for functionality and efficiency.</p>	<p>proficiency level, preferred learning style, and can present challenges, form of rewards including badges and points, as well as educative content in a personalized manner. In addition, the integration of machine learning means the fact that the mechanics of gamification can be learned using feedback from students and will always provide motivation and educational results in the long term.</p> <p>Implementation of this approach does not only targets enhancement of reading skills but also foster the spirit of learning</p>
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			among elementary kids making education to be more effective and interesting.
Niyangoda S A N S H	Implement an option where there is a diagnosis of the skill levels of a child, and the difficulty levels for the learning modules automatically adapt based on performance.	<p>Design detailed diagnostic tools that measure a broad range of skills relating to academic knowledge, cognitive capabilities, and socio-emotional competencies.</p> <p>Create frontloaded assessment protocols to establish a baseline for each child with different methods, such as quizzes, interactive activities, and observational checklists.</p> <p>Periodically reassessment for progression monitoring and learning path updating is</p>	<p>One of the novelties of our system lies in the integrated state-of-the-art machine learning algorithms that analyze and adapt to the individual, unique learning patterns of the child to offer them an enriched, entertaining educational experience.</p> <p>Our system could achieve so much more with these real-time adaptation mechanisms in developing personalized learning pathways according to the requirements of individual</p>

		<p>taken care of.</p> <p>Design the algorithms for dynamically changing the difficulty of activities based on children's performance, create personalized learning modules, define clear metrics and set criteria for the difficulty level, and monitor student engagement to calibrate the difficulty of activities in such a way that the learning environment is continuously optimized.</p>	<p>learners and their learning paces. The system will not only establish academic progress but, with additional cognitive, emotional, and behavioral assessments of each child, will give a holistic understanding of the ability that a child carries in them. This is made possible through dynamic delivery of content, proper feedback loops, and, above all, scalability in terms of being pervasive in any environment and effective in varied educational settings.</p>
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Dewinda A G T	Develop an interactive chatbot that can answer questions, provide information, and give advice to elementary children.	Identify how to gather user inputs properly by being mindful of appropriate interfaces for different ages. Design NLP models that will enable the software to effectively interpret user queries in order to identify their intention and extract relevant information concerning educational matters. Integrate a chatbot or other AI techniques to provide more relevant and detailed answers to users' questions. Connect with a knowledge base or academic materials to search and deliver content and answers to the students' queries appropriately.	It uses sophisticated NLP algorithms to understand and answer questions, prioritizing relevance and knowledge delivery overemphasizing randomness like regular chatbots. An interactional pattern can be managed by a personalized advisory module that gives advice based on the interaction the person has had making it engaging for all. Some of them include games, quizzes, and other forms of multimedia that support education and learning concepts can be used in teaching and learning and taught in a way or format
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			that can be easily grasped by all learners. From the functional perspective, the user interface of the proposed chatbot is designed in child-oriented colors and fonts, which in its turn, makes the application’s usage more convenient and accessible for children. In total, this component marks a progressive step forward in the advancement of educational technologies where a combination of sophisticated artificial intelligence functionality with improved pedagogical approaches that is specifically catered for the
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			elementary education level could enhance students' overall learning and interest in a new and effective way.
Gamage M I S	Implementing a feature to check student's pronunciation based on their reading of a paragraph.	<p>To check the pronunciation for students, the first step is to present a paragraph for the student to read on the graphical user interface of the system.</p> <p>Appropriate recording technology will be used to record the student's reading or comprehension.</p> <p>The audio that has been captured is then transcribed into text form using the speech-to-text conversion service.</p> <p>The transcribed text is then</p>	<p>The novelty of this pronunciation assessment system resides in its holistic methodology for evaluating students' oral language proficiency. By seamlessly integrating real-time speech recording and precise speech-to-text conversion, the system delivers prompt feedback on pronunciation accuracy. Leveraging advanced text comparison algorithms enhances the system's capability to pinpoint</p>

		<p>compared to the original paragraph by comparing the texts received by text comparison algorithms to reveal disparities.</p> <p>Giving feedback to the student in terms of his/her mistakes in the selected text and the corresponding corrections concerned with the sounds or words that the student has pronounced incorrectly.</p>	<p>specific pronunciation errors, facilitating personalized feedback that identifies and addresses mispronounced words or sounds. This approach not only supports students in refining their pronunciation skills but also enriches their language learning journey through targeted and actionable feedback based on their spoken performance.</p>
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9. 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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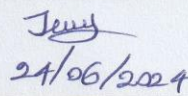
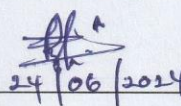
- d) Do the proposed sub-objectives reflect the students' areas of specialization?

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

Accepted with minor changes

10. Supervisor details

	Title	First Name	Last Name	Signature
Supervisor	Ms.	Jenny	Krishara	 24/06/2024
Co-Supervisor	Dr.	Dimuka	Wijendra.	 24/06/2024

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

The Review Panel Details

Member's Name	Signature

***Important:**

1. According to the comments given by the panel, make the necessary modifications and get the approval by the **Supervisor** or the **Same Panel**.
2. If the project topic is rejected, identify a new topic, and follow the same procedure until the topic is approved by the assessment panel.