Curriculum Model for Artificial Intelligence in Early Childhood Education in Sri Lankan Preschools

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I. INTRODUCTION

Early childhood education (ECE) receives significant advantages for learning experiences through Artificial Intelligence (AI) implementation from the first stages of education. Private preschool institutions in Sri Lanka require specialized AI curriculum because they control 71% of all preschool facilities. When preschoolers learn AI during this phase, they gain essential digital competencies that help them develop critical thinking abilities and problem-solving skills as well as creative thinking.

The research presents an AI curriculum structure specifically designed for Sri Lankan preschool educational institutions. The curriculum structure presents AI concepts to students using age-relevant content and educational strategies which connect to their learning requirements.

Table 1: Key Competencies in the Curriculum

Competency	Description
AI Knowledge	Understanding basic AI concepts and how AI functions.
AI Skills	Developing practical skills related to AI technologies.
AI Attitudes	Fostering a positive mindset towards AI and its applications.
AI-Based Contextual Reasoning	Enhancing the ability to reason and make decisions in AI-driven environments.

The research aims to identify suitable AI subjects along with educational methods for young students while evaluating AI education outcomes and investigating children's development of contextual reasoning competencies through AI-based education. The research findings will support development of AI curriculum which prepares Sri Lankan future students for an AI-powered world.

II. LITERATURE REVIEW

Using artificial intelligence in early childhood education leads to substantial academic advantages which help students develop their critical thinking skills and computational competencies and creative aptitudes. Limited studies have been conducted about AI applications in Sri Lankan preschool education.

1. AI Curriculum for Preschool Education

Research from across the world acknowledges that AI technology should be implemented within preschool educational programs. Intelligent tutoring systems alongside robotic technology help teachers improve their teaching practices while helping them develop required skills and capabilities [1]. STEM education with AI technology develops computational abilities and provides practical learning opportunities to teach students about AI systems [2].

2. AI-Based Teaching Materials in Early Childhood Education

Teaching tools like Bee-Bot robotic kits and LEGO WeDo allow preschoolers to engage in computational programming and problem-solving [3]. AI-powered learning platforms can transform through knowing different educational stages of young students to develop thinking abilities and creative skills. By offering virtual storytelling and tutoring programs, these tools enhance engagement and provide a dynamic learning experience that builds foundational AI literacy [1].

3. Competencies Developed Through AI-Based Learning

AI education fosters essential skills such as computational thinking, problem-solving, and AI literacy [2]. The developed competencies enable students to utilize AI with responsibility as they develop digital skills which will benefit their future learning activities in technology-dependent environments [1].

4. Challenges and Research Gaps

Sri Lanka together with developing nations encounters two major difficulties regarding their limited AI technology availability and their need for culturally adapted AI educational programs. Studies exploring how children's development changes after being exposed to AI have insufficient evidence base [4]. Researchers need to continue exploring how AI educational experiences influence children's cognitive growth and their emotional well-being while conducting worldwide examinations about AI teaching methods to validate global applicability and results.

III. MATERIALS AND METHODS

Stage 01: Curriculum Development

The AI curriculum was developed through a comprehensive process, starting with a literature review to identify key AI concepts appropriate for preschool learners. Educational standards guided the curriculum development

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through expert consultation to make the content suitable for students of this age. Basic AI education included essential subjects Introduction to AI, Patterns, Classification, Clustering, and Decision Trees which provided essential knowledge to young learners.

Stage 02: Curriculum Experimentation in Early Childhood Education

An AI education program underwent evaluation by ten preschool students aged 5-6 years from three schools located in Matara district. The study selected participants randomly from both genders and the curriculum delivery occurred in Sinhala. The educational program started by using a pre-quiz to measure students' starting AI understanding then continued with interactive video lessons that taught AI fundamentals. Students used ProProfs Quiz Maker to answer quizzes designed for measuring their learning outcomes. ProProfs Quizzes received student input from all participants. The interviewer assessed student progress during the session by using Google Forms to provide evaluation ratings from 1 to 5. Teachers analyzed AI learning effectiveness through the Teacher's Feedback Form on Google Forms.

Stage 03: Implementation and Evaluation

Student outcomes were analyzed using SPSS software, which evaluated quiz performance, feedback, and time spent on tasks. The evaluation process supported curriculum development through proof of objective attainment and a better learning space for children attending preschool. The successful implementation of AI curriculum in future endeavors requires complete education and ongoing support for educators who will handle this curriculum.

IV. Results and Discussion

1. Pre-Quiz and Post-Quiz Results

Table 2: Measuring AI Knowledge

		Pre-Quiz	Post-Quiz
N	Valid	10	10
	Missing	0	0
Mean		52.00	94.3750
Median		50.00	96.8750
Std. Deviation		19.322	8.04177
Minimum		20	75.00
Maximum		80	100.00

Student performance significantly improved from pre-quiz to post-quiz. The average pre-quiz score was 52.00, with a median of 50.00 and a standard deviation of 19.32. After completing the curriculum, the average post-quiz score increased to 94.38, with a median of 96.88 and a reduced standard deviation of 8.04, indicating more consistent results. The improvement of 42.38 points in the mean highlights the curriculum's effectiveness in enhancing students' understanding of AI concepts.

2. Engagement, Confidence, and Curiosity

Students showed strong engagement (mean = 4.60), confidence (mean = 4.40), and curiosity (mean = 4.20). The most common scores for each were 5, reflecting high participation and positive attitudes towards the curriculum. Low standard deviations suggest consistent experiences across students, demonstrating that the curriculum effectively fostered positive learning behaviors.

Table 3: Assessing Engagement, Confidence and Curiosity

		Engagement Level	Confident Level	Curiosity Level
N	Valid	10	10	10
	Missing	0	0	0
Mean		4.60	4.40	4.20
Median		5.00	4.50	4.50
Mode		5	5	5
Std. Deviation		.699	.699	.919

3. Real-World Application Understanding

Table 4: Measuring the Ability of Real-World Application

	Frequency	Percent	Valid Percent	Cumulative Percent
Somewhat, but needed help	3	30.0	30.0	30.0
Yes, with clear examples	7	70.0	70.0	100.0
Total	10	100.0	100.0	

Most students (70%) understood real-world AI applications clearly, while 30% needed some help. These results show that the curriculum effectively connected AI concepts with practical examples.

V. Conclusion

The research showed significant improvements in preschoolers' understanding of AI principles, boosting their engagement and confidence. While progress in AI concepts and applications was notable, challenges remain in implementing real-world applications. Future studies should include a more diverse sample and adapt the curriculum to different languages in Sri Lanka for wider applicability. The AI curriculum faced challenges such as limited technological resources, resistance from some educators, and the need for culturally relevant content. Educators emphasized the importance of professional development and ongoing support for successful AI integration. Further research should analyze the cognitive effects of AI educational programs while studying social changes caused by these programs and measuring them against educational curriculum used in countries worldwide.

VI. References

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