Is Elementary AI Education Possible?

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ABSTRACT

As artificial intelligence (AI) technology becomes increasingly pervasive, it is critical that students recognize AI and how it can be used. There is little research exploring learning capabilities of elementary students and the pedagogical supports necessary to facilitate students' learning. PrimaryAI was created as a 3rd-5th grade AI curriculum that utilizes problem-based and immersive learning within an authentic life science context through four units that cover machine learning, computer vision, AI planning, and AI ethics. The curriculum was implemented by two upper elementary teachers during Spring 2022. Based on pre-test/post-test results, students were able to conceptualize AI concepts related to machine learning and computer vision. Results showed no significant differences based on gender. Teachers indicated the curriculum engaged students and provided teachers with sufficient scaffolding to teach the content in their classrooms. Recommendations for future implementations include greater alignment between the AI and life science concepts, alterations to the immersive problem-based learning environment, and enhanced connections to local animal populations.

1 HOW TO TEACH AI AT THE ELEMENTARY LEVEL: PRIMARYAI

As artificial intelligence (AI) technology becomes increasingly pervasive, it is critical that students recognize AI and how it can be used. There is little research exploring learning capabilities of elementary students and the pedagogical supports necessary to facilitate students' learning. PrimaryAI was created as a 3rd-5th grade AI curriculum that utilizes problem-based and immersive-based learning

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within an authentic life science context through four units: machine learning, computer vision, AI planning, and AI ethics. In the final unit, students engage in a game-based simulation investigating the decline of New Zealand's yellow-eyed penguin population.

The curriculum was co-designed with 3rd-5th grade teachers, computer scientists and educational researchers. Teachers also created the locally-based curriculum and wrote a children's book to accompany the students as they investigate a local ecosystem problem. Throughout the design and development process, teachers provided on-going feedback on ways to increase student understanding, contextualize the problem, engage more students, and connect it to other aspects of the curriculum in order to facilitate adoption by other future teachers.

PrimaryAI was implemented in two teachers' classrooms (one 4th grade and one 5th grade) from two different schools. Teachers reported that students were generally engaged in the content and provided specific suggestions to improve the curriculum. We also conducted pre- and post-tests for each unit and found that the results of the one-group pre-test/post-test study revealed statistically significant knowledge gains in student learning. Teachers also indicated that the curriculum was engaging to their students. Although they indicated that the materials provided adequate scaffolding for teachers to teach the materials, they still expressed being unsure of some content and suggested that additional professional development was necessary to feel confident in teaching.

Future iterations of teaching AI at the elementary level should strongly consider the level of professional development necessary to support elementary teachers. Studies have shown that modeling and coaching are typically the strongest methods of supporting teachers as it is contextualized, personalized, and situated within their classrooms for greater potential of adoption by other teachers.

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