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A pedagogical Scenario of Introducing Artificial Intelligence in School Education

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Abstract: The field of artificial intelligence (AI) technology is undergoing rapid development with implications for many aspects of our daily lives. It is blurring the boundaries between humans and machines, creating exciting opportunities and posing new obstacles, signaling a period of continuous technological advancement. To educate today's students in AI concepts and prepare them for their future social and professional roles, there is an urgent need to integrate AI into educational curricula worldwide. A two-hour educational scenario has been designed for first-year lower secondary students to demonstrate how a computer learns using AI. Students use Scratch to develop a program that simulates chatbots. The learning objective is to increase students' understanding of how AI collects and retrieves data for computer learning using AI.

Keywords: Artificial intelligence, Machine Learning, Education K-12, Scratch

Introduction

Artificial intelligence (AI) has a long history dating back to the 1950s (Denning & Tedre, 2019), with major milestones occurring almost every decade. The effort to create machines that learn to think like humans is a contemporary achievement that has been developed and continues to develop rapidly due to recent advances in big data and deep learning (Ali et al., 2021; Vartiainen et al., 2020). Big data, cloud computing, and the Internet of Things (IoT) are key technologies of the 4th industrial revolution and have contributed to the development of IT, which in turn has had a deep impact on human's daily life and has brought about significant changes in politics, economy, society, and culture, as a whole (Zhang & Aslan, 2021). It is crucial that modern students, future citizens of the artificial intelligence society, are educated in the concepts and uses of AI, including ethical values, for human well-being and social development (Vartiainen et al., 2020).

From an early age, children are increasingly exposed to devices that employ artificial intelligence (AI) and machine learning, such as smart toys. However, the lack of instruction regarding the functioning of this technology gives rise to erroneous expectations concerning its capabilities and limitations (Druga et al., 2018). Integrating AI and machine learning into our daily lives necessitates the conclusion that teaching these subjects is essential for developing knowledge and skills in this field. The incorporation of AI-based learning tools and pedagogical approaches has also been demonstrated to enhance the overall educational experience for young learners (Arrieta et al., 2020). Furthermore, teaching TN concepts at the earliest stages of education enables students to develop computational thinking skills which, are vital for problem-solving and critical analysis in the modern era (Yim & Su, 2024). Furthermore, research (Cassar et al., 2019) indicates that as the nature of work evolves, the skills required by workers to meet the demands of modern society also change. It is incumbent upon the education system to prepare students for the future of work. In light of the ongoing evolution of technology and the growing demand for professionals in areas such as AI and machine learning, there is growing consensus that equipping students with the requisite technical skills is crucial for nurturing and developing future citizens who possess the 21st-century competencies necessary to thrive in an increasingly digital world, including the ability to problem-solve with the assistance of AI. In the national curricula of several countries, including the United States, the United Kingdom, China, and Australia, the teaching of IT is included from the preschool age, either as a standalone subject or as a subsection of computer science (Ali et al., 2021; Bardakci & Unver, 2020; So et al., 2020). In Greece today there are individual initiatives of educational scenarios that promote the education of students in IT, but they mainly concern higher education and the older secondary classes. The curriculum to be implemented in 2025 for computer science in K-12 education, has been designed to include activities that promote the teaching of IT at all educational levels.

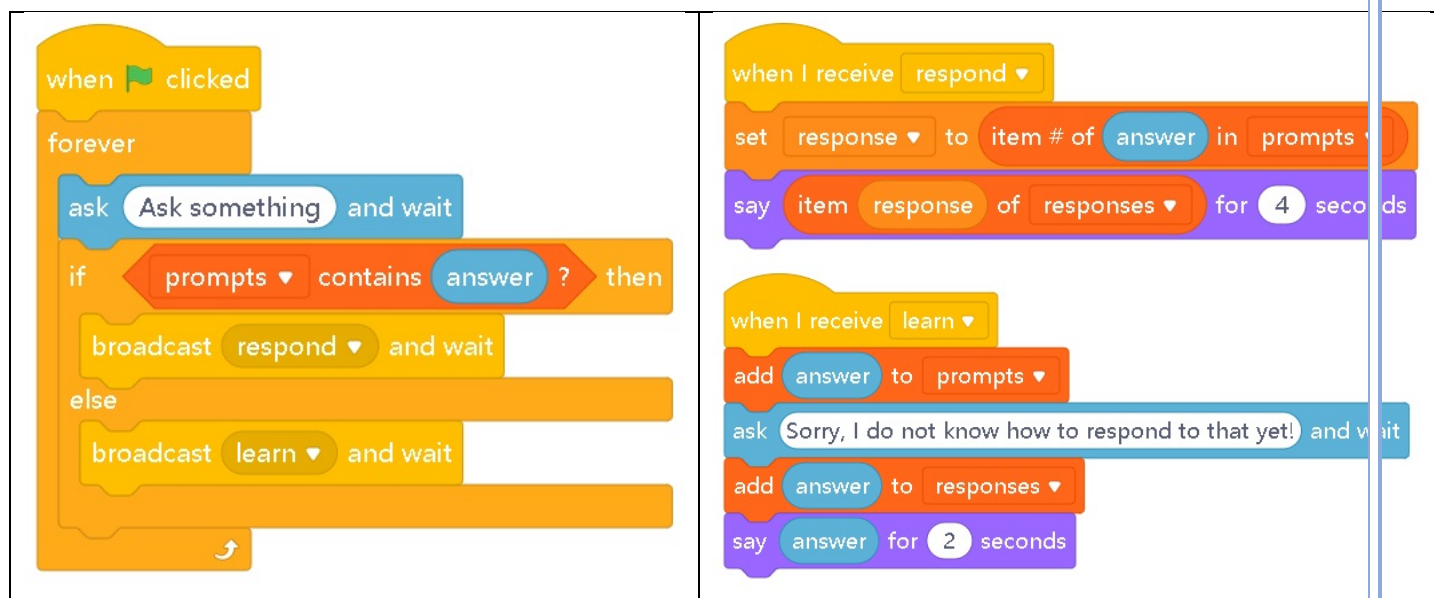
In our teaching proposal, a two-hour teaching scenario was designed to facilitate students' comprehension of how computers learn. The scenario has been designed for first-year lower school

students who have engaged already with visual programming, predominantly within the Scratch environment, since the final grades of primary school. The teacher will initially present ChatGPT to the class and invite students to pose questions and evaluate the responses that will be provided. The objective is to facilitate a constructive discussion in plenary about how the computer learns and where it gets all this information from. Subsequently, the students will be divided into pairs and tasked with creating a program (Figure 1) that simulates how the computer derives information from chatbots such as ChatGPT.

At this preliminary stage, it should be noted that AI and machine learning will not be used. Instead, students will create two lists, one to store the question and the other to record the expected answer. The lists are populated incrementally as the program is utilized thereby simulating how ChatGPT accumulates data.

Figure 1

Scratch program



Source: author's own development

Results

On completion of the course, we expect students to understand how the computer extracts information from the Internet and ultimately learns. We hope to guide educators who want to understand themselves and better prepare today's students for tomorrow's workplace. Specifically, the first discussion will explore students' thoughts on AI and machine learning. During the creation of the program questions about the new technology will be resolved. Upon completion of the instructional intervention, there will be a new discussion about the skills students need to develop and the necessity of education they believe must equip themselves to be competent citizens and workers in this new world. Questions such as, what kind of future do students envision in an increasingly automated work environment? How do students see themselves as future workers? How do students and educators

plan to prepare young people for increasing automation and the new challenges that IT brings to the workplace and society at large?

Conclusions

AI technology is developing rapidly and is likely to increase, even faster in the future. Therefore, today, it is important to adopt and understand the new technology (Vartiainen et al., 2020). In the 4th Industrial Revolution, computer science education must be included in the regular curriculum at all levels of education worldwide and be part of digital citizenship education (Frana & Klein, 2021). We advocate extending the script. Initially with a feedback rubric, to assess activity and understanding of how AI and machine learning work in K-12 education. Of course, the assessment could be done in other ways, such as observations or interviews.

We are also designing further educational interventions using AI and machine learning to deepen data collection, results analysis, and development and evaluation of trained machine learning models in primary and secondary education.

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