

Chapter 27

Artificial Intelligence and K–12: How to Explain?

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ABSTRACT

Artificial intelligence (AI) is a part of our everyday life. Having artificial intelligence will be vital for careers in science and engineering, which is the important part of the STEM curriculum. Most of us are aware of existence AI-powered services and devices, but hardly anybody knows about the technology behind them. Therefore, educational institutions should prepare the next generation in school with artificial intelligence literacy and the underlying concepts including algorithms, big data, and coding. Like classic literacy, which includes writing, reading, and mathematics, literacy in AI/computer science will become a major issue in the future. Furthermore, with AI literacy, pupils also receive a solid preparation for subsequent studies at university level and their future career. Currently, computer science education in school does not focus on teaching these fundamental topics in an adequate manner. This chapter will exploit understanding AI and how AI works in daily life and offer teaching methodologies to explain how AI works to K-12 learning environments.

INTRODUCTION

If anyone search for “inventions that changed the world”, a plethora of lists will arise. Can be imagined those any of those lists what our life would be like without any of the items listed. Let’s imagine living without electricity? How about a world without the wheel or antibiotics? We have grown used to inventions that make our life easier to the point that we take them for granted, and we are not fully aware of the big impact that they have on our society. We forget that many inventors, researchers and scientists had to step in to get us where we are now. STEM (Science, Technology, Engineering and Mathematics) is ubiquitous, and it’s been an amusement changer for the complete of humankind (Idin & Donmez, 2018). It has expanded dramatically in recent decades. STEM was present from very early on when human being invented the wheel using the laws of physics to make people’s everyday lives easier. The early form of STEM was manufacturing with human hands then replaced by machines during the first

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industrial revolution in the middle of 18th century leading to an increase in industrial products. One of the important STEM invention was the steam engine. As a result, new modes of transportation such as steam powered locomotives and ships developed (Catterall, 2017). In the middle of 19th century, with the discovery of petroleum and electricity, the source of power was shifted to those resources (Chesky & Wolfmeyer, 2015). Then the second industrial revolution came to stage. It was a period of great progress on science and discoveries. Inventions of these period were bulb, aircraft, telephone, radio, penicillin, antibiotic etc. Without these inventions, life of today would not be imagined. The third industrial revolution comes at the second half of the 20th century which brings digitalisation of machines leading to an increase in mass production (Catterall, 2017). The third industrial revolution had an enormous impact on the communication and media with the arrival of the Internet in addition to affecting manufacturing jobs. Most of the jobs that were previously done by human body force and employees on the factory are now done by engineers, designers, IT specialists. Hence, new technologies require different skills.

Thanks to STEM we see, touch and use thousands of products, software, apps, tools, devices in daily lives. For instance, the Internet helps us to connect to the people from all over the world thanks to STEM. According to Barr (2018) we are on the fourth industrial revolution or Industry 4.0 because of the way we manufacture products as a result of the digitization of production. The fourth industrial revolution is the adoption of computers and automation with agile and self-ruling systems powered by artificial intelligence and machine learning. Mankind is on the verge of gaining all the advantages of artificial intelligence (AI) as a commodity, but this also brings up some questions:

- Does having AI at our disposal mean that humans will be entirely displaced in factories, and if yes, how does one prepare for future skills?
- Will manual work become obsolete and will the skills of manual workers become unnecessary?
- Even more to the point, can education endorse all future students with the right skills before the fourth industrial revolution?

Utilizing hands-on-experiences and providing learners with tools to disclose their potential to change the future are the basic nature of STEM education (Nistor, et al, 2019). Therefore, there is need to revolutionize and update the STEM education by taking into account the digital competencies that students should have in the future. One of these crucial digital competencies is AI. The AI concept is a part of STEM subject which should be taught in the K-12 setting in order to prepare our generation to the future jobs that many of us has not even knew their names (Popovici & Mironov, 2019). AI has already emerged as daily part of our life such as smart household devices, smartphones application (Google Assistant, Siri), online shopping recommendation algorithms, Facebook friend suggestions, and YouTube video suggestions. Having deep AI competencies will be indispensable condition for careers in STEM industry. Hence teaching AI competencies will become increasingly important part of the STEM curriculum. Most of us know that there are intelligent devices, robots and services. However, few people know very little about the technology behind them. Therefore, it will be very important for the young generation studying in schools to know the basics of artificial intelligence, algorithms, data structures and coding (Southgate, et al, 2018). AI is becoming increasingly pervasive in applications that users interacting with technology however user understanding of these technologies is quite limited (Long & Magerko, 2020). Therefore, there is a need for what competencies students need to effectively understand, use, and critically evaluate AI based technologies. Furthermore, algorithms that works behind AI tools are obscure for the users who do not know them what they are interacting with. These lack of knowledge

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