The Future of the Education Sector: A Dive into the Possibility of Artificial Intelligence and Robotics Replacing Teachers and the Impact It could have on Learning.

Abstract - The future of education may not lie within the current norms in place but a different approach entirely. This essay explores the use of AI and robotics as a possible option for teaching and the implications it could have on learning.

1 Introduction

Artificial intelligence (AI) and robotics play a vital role in the world today, it is currently used across sectors such as manufacturing, medicine, security, transportation and agriculture. It is set to shape the next industrial generation in multiple ways and research shows it will improve the global economy GDP by at least 14% which is equivalent to an addition of $15.7 trillion by 2030 [1]. A report by PWC predicts 30% of all jobs could be at risk due to AI and robotics by the middle 2030s with the highest impacted sector within transportation (52%) and storage (52%) while the least being within the education sector (8%) [2].

In the education sector, AI and robotics have only been deployed on a small scale which is partially due to the limits of the current AI technology. There are two major ways AI and robotics are currently utilized, through AI computer algorithms as tutors and humanoid/android as teaching assistants.

This paper will explore the potential of adopting AI and robotics as teachers based on the current studies, highlight the potential advantages, disadvantages and discuss the possible future of AI and robotics in the education industry.

2 Current State of AI and Robotics

Today, the application of AI and robotics in the education industry is delivered using different techniques. AI computer programs are one of the techniques being used, alternatively physical humanoids and androids have been tested. Each method of delivery differ however, all methods may not require the presence of humans.

2.1 AI Computer Programs

AI computer programs are creating a wave in what is known as “adaptive learning”. Adaptive learning is the utilization of algorithms to develop a customised learning program for students based on their individual knowledge states [3].

The authors in [4] explore the effectiveness of an AI algorithm called “Yixue Squirrel AI” compared to expert human teachers in delivering lessons in Maths and English for a middle school. The evaluation was based on an average score in a pre-test and post-test for lessens delivered to a set of students between the ages of 13 to 15 years through AI (101 students) and another set of students taught by teachers (102 students).

2018-04-29	
13:00-13:05	Introduction
13:05-13:10	Questionnaire
13:10-14:00	Pre-test
14:10-15:00	Instruction by Yixue/human teachers
2018-04-30	
13:00-13:50	Instruction by Yixue/human teachers
14:00-14:50	Instruction by Yixue/human teachers
15:00-15:50	Instruction by Yixue/human teachers
2018-05-01	
13:00-13:50	Instruction by Yixue/human teachers
14:00-14:50	Instruction by Yixue/human teachers
15:00-15:50	Post-test
15:50-16:00	Questionnaire

Figure 1 Schedule for the experiment[4]

The results showed that both set of students improved in their post-test however, the students which utilized Yixue AI displayed 4.19 times better gains than the student taught by teachers. A post interview of the students who learnt through the algorithm revealed an 87% positive feedback for learning through Yixue.

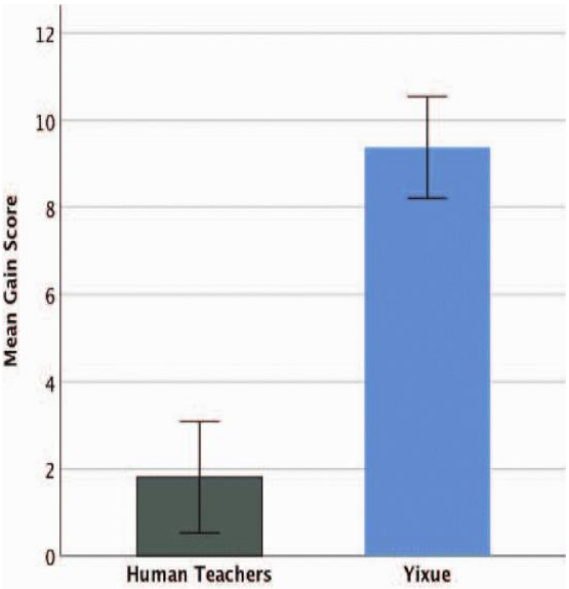

Figure 2: Graph of the pre-test to post-test scores of the students taught by human teachers and students taught by AI [4]

2.2 Humanoid and Android

Humanoids are robotics with two arms and legs that appear human like and androids are robotics which are specifically designed to look like real life humans.

Currently in the education industry humanoids/androids are being used as assistant teachers as shown in [5] and [6]. This helps to ease the work load on teachers and stimulate learning in students.

In [7] a trial experiment was carried out to evaluate the impact of a humanoid robot as a teaching assistant in a primary school. A questioner was completed by the students on completion of the experiment and this showed 90% of the students felt engaged and more relaxed with the humanoid robot assistant. However, it is important to note that this was executed in an elementary school and could have had an impact on how engaged the students were to the humanoid.


Figure 3: A humanoid on the left, an android on the right [8] [9]

3 The future of AI and Robotics

Due to the technological limits of humanoid AI today, it not feasible to replace teachers and can only be deployed in limited roles such as assistant teachers. These problems with the technology today include recognition of speech, proficiency in answering follow up questions and overall AI quality [8]. The experiments explained earlier indicates there is great potential in AI and robotics as teachers. It will become practical to deploy robotics as teachers when the technology develops to a stage in which humanoids/ androids are capable of recognizing speech irrespective of the speaker's accent, better quality in maintain conversations and utilizing adaptive learning to engage more students. The ideal scenario will be to create a humanoid/android with full capabilities of the current AI computer programs.

3.1 Advantages

AI and robotics possess key functions that could improve the learning in the classroom. Adaptive learning will help tailor students syllables and improve learning at a more efficient rate. Research in [9] shows robots have a better ability of teaching a second language than human teachers and there is more of a balanced dialogue between students and robots than human teachers because human teachers tend to control conversations more often [10]. This would help

students who have difficulties in grasping second languages and a more balanced dialogue will be advantageous for students who feel embarrassed when asking questions which gives them a greater chance of learning.

According to the world bank [11] 53% of students from third world countries lack the ability to read short stories on completion of primary school some of the factors that contribute to this include shortage of teachers and lack of quality teachers trained at high level. AI and robotics could offer an alternative to this in the future be providing access to quality education in countries that lack such means and assist in communities with teacher shortages.

3.2 Social Impact and Ethical Concerns

With opportunities for AI and robotics rising it is expected that more job opportunities for humans will be lost which also applies in the education industry as there could be less demand for human teachers. Another concern with the potential use of robots in teaching children is that children learn through imitation and studies in an Australian school [12] revealed the students began to imitate the robot after a session of teaching. This implies that the use of robotics to teach could affect children's socially abilities; however, there is a possibility the children were simply having fun in that specific case.

A major concern with AI and robotics in education raises the question of robots being able to embody emotions. It is argued in [13] that it will be a difficult task to teach students to fall in love with a topic or subject if the teacher is not emotionally devoted enough to it.

Privacy is another issue with the use of AI and robotics in the education industry. In order to maximize it features such as adaptive learning, it will have to store and maintain students records which could potentially be breached by a third party. Likewise, a malfunction could occur and student's records could be leaked which would be unsuitable [14].

4 Discussion and Conclusion

The future of AI and robotics in the education industry is promising, with further improvements to the technology, AI and robotics could be a valuable asset by enlarging the horizon of the education system and opening up possibilities not conceivable with human teachers. The technology will be able to perform repeatable tasks such as grading and activities human teachers find tiring [15].

The is a consensus that robots are incapable of developing real emotions which could hinder their teaching ability however, emotions which may be missing from the technology today could be compensated with the level of quality they could provide compared to human teachers through features such as adaptive learning and better memory capability. Furthermore, the emotional state of a human teacher could have an effect on how they teach and could impact students either in a positive or negative way [16]. For instance, a teacher in bad mood could translate such a mood towards students, while the lack of emotions within robots could imply there will always be consistency in teaching rhythm.

The sole use of AI and robotics as teachers in schools suggests children may lack the necessary social skills to build human to human relationships which may have an adverse effect on the children in future thereby making the sole use of AI and robotics as teachers unsuitable [17].

There are benefits of incorporating this technology in the education sector however, concerns of privacy, possible lack of emotions and effect on social skills of children should not be ignored. Therefore, there has to be a compromise in which AI and robotics can be used along human teachers in the education industry. As suggested in [18] a code of practice could be introduced within schools which ensures the use of AI and robotics are monitored. This code of practice could ensure a human teacher is always present when a robot is teaching, could impose a limit on how much children between the ages of 3 to 14 interact with the robots and data collected by robotics on students are stored for a limited time. Through this it may be possible to effectively utilize this technology without entirely compromising our present teaching traditions.

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