



A Proposed Virtual Learning Model Based on Statistical Analysis of Educational Data of Egypt

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Abstract. Current political and research agendas all around the world place artificial intelligence (AI) high on the list. Although the foundations for AI have existed for a number of decades, recent advanced directions are accelerating what AI could do. One of these directions is education; those in charge of reforming education must consider the effects of an AI-driven future on education. However, various risks and issues are unavoidably brought on by these quick technological advancements; they have so far outrun policy discussions and regulatory structures. This paper seeks to identify the impact of AI on teaching, learning, and education, by analyzing educational data in Egypt. The data set was downloaded from the ministry of education website. It contained information such as the number of schools, the number of classes, and the number of students per class of the general education and al-Azhar education for primary, preparatory, and secondary stages. In addition, this data set contained information regarding the correlation between different factors. The finding of this research can inform the future design and implementation of the virtual learning model.

Keywords: Stages of Learning in Artificial Intelligence · Correlation · Virtual Learning Environment · Education Data Analysis

1 Introduction

Since the beginning of the 1980s, and until recently, educational applications of AI have mainly focused on the knowledge-based approach. The most prominent line of research has been concerned with intelligent tutoring systems.

(ITS). In formal education, AI can have both positive and negative impact on learning. As AI is now high on the policy agenda, it should appear that AI should be applied in as many educational settings as possible. When a replacement promising technology emerges, and when the restrictions of technology and also the challenges of applying it are often not perfectly understood, technology could appear to open radically new possibilities for solving old problems.

This is what happens in the first phases of the life-cycle of general-purpose technologies, and it ends up in technology push. Visionary entrepreneurs and policymakers realize the potential of latest technology and see all the chances of how it could make a difference.

1.1 Stages of Learning in Artificial Intelligence

Artificial Intelligence can be defined as the development of computer systems that are capable of performing tasks that require human intelligence, such as decision making, Learning and education, object detection, solving complex problems and so on. There are different stages of learning in Artificial Intelligence as described below, and shown in Fig. 1.

1.1.1 Artificial Narrow Intelligence

Artificial narrow intelligence (ANI) is a goal-oriented subset of artificial intelligence (AI) that is designed to be better at a single task, such as keeping track of weather updates, creating data science reports by analyzing raw data, or playing games like chess, poker, etc. By utilizing data from a single dataset, artificial narrow intelligence systems are trained to focus on one task at a time. In other words, such systems stop at the duties that have been allocated to them. [1].

1.1.2 Artificial General Intelligence

A machine with Artificial General Intelligence (AGI) would have the same capacity to learn how to perform a wide variety of tasks and be able to comprehend the world on par with any human. Any work that a human could complete, and probably many that a human couldn't, could be completed by an artificial general intelligence. At the very least, an AGI could combine flexible, human-like thinking and reasoning with computational benefits, such as almost instantaneous recollection and split-second number crunching [2].

1.1.3 Artificial Super Intelligence

The idea of artificial super intelligence is a futuristic one that explores how AI can surpass human intelligence. Computing software must outperform human intellect in all metrics and situations if artificial super intelligence is to develop and become reality. Artificial super intelligence will be a reality once AI surpasses human intelligence [3].

Machines with super intelligence are able to consider potential abstractions and interpretations that are just not conceivable for people to consider. This is due to the human brain's limited capacity for thought, which is restricted to a small number of billion neurons [4].

1.2 Types of Artificial Intelligence

Based on the functionality of AI-based systems, AI can be categorized into the following types:

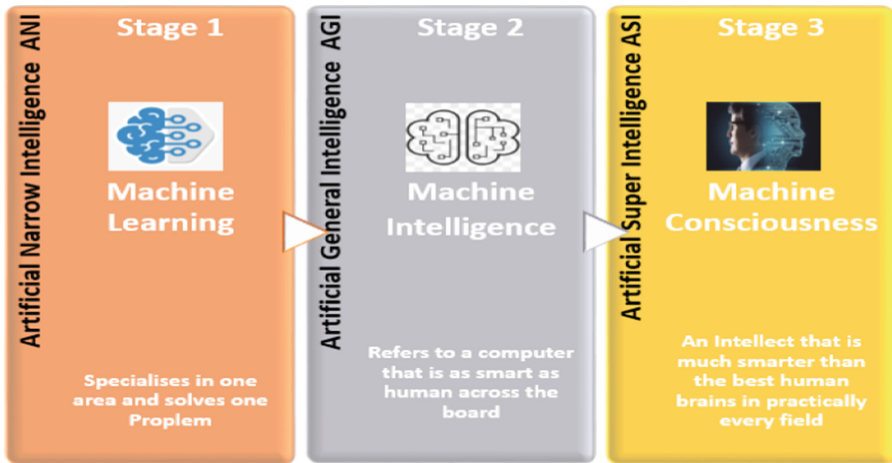


Fig. 1. Stages of learning in Artificial intelligence

1.2.1 Reactive Machines AI

The most fundamental forms of AI are entirely reactive; they lack the capacity to remember past events or draw conclusions about the present from them. This form of intelligence entails the computer directly observing the outside world and responding accordingly. It is independent of any personal worldview [5].

1.2.2 Limited Memory AI

Limited memory Similar to how the neurons in the human brain link, AI is distinguished by its capacity to assimilate new information and get better with practice. This type of AI is now in use and being improved. The AI environment is designed with low memory so that models are automatically trained and then updated based on the model behavior. AI with limited memory can solve challenging classification tasks and make predictions using past data [5].

1.2.3 Theory of Mind AI

All of the reactive AI systems in use today are categorized as narrow AI. According to theory of mind, machines are meant to represent the environment in which people think, feel, and make decisions. In the future, this is what needs to be accomplished [4].

An AI with a Theory of Mind would be aware that people have feelings, thoughts, and expectations regarding how they should be treated. It can then modify its reaction appropriately.

1.2.4 Self-Aware AI

The development of self-aware machines that can create representations of themselves is the last stage in AI research. It is a development and expansion of the Theory of Mind

AI. A self-aware machine possesses human-level consciousness, including the capacity for thought, desire, and emotional comprehension.

2 Literature Review

More research has been done on the effects of online learning since the SARS-CoV-2 virus pandemic led schools and colleges to close in a number of nations around the world. This has led to the crucial finding that the rising use of online learning is better categorized as an emergency reaction action than what online learning should ideally be [8]. Online learning should ideally be an alternative to traditional learning that is made available by digitalization in order to provide education to people who need access to distance learning [9].

Online education has become the standard method of instruction as a result of the pedagogical response to Covid-19-induced lockdowns, making education accessible to a sizable section of the population.

The difficulties encountered throughout the online learning stage are the elements that are anticipated. to make learning more difficult. As students, technology is a huge source of worry. Using out-of-date hardware may prevent you from downloading newer software that requires a higher computer specification, which hinders their ability to learn [8].

Research innovation is a big opportunity because online learning is a requirement for COVID-19. Research may focus on developing frameworks for approaches, adoptions, and improvements to online learning that permit individualizing instruction for students and reassessing the educational process [7]. An opportunity for educational institutions to further develop their IT infrastructure, which can then be used to guarantee business continuity [9].

A study by [10] looked at the digital disruptions in their research brought on by the Covid-19 shutdown and the difficulties UK educational institutions face while switching to online courses. This study, which involved 1148 participants, looked qualitatively at the main issues that experts from UK universities predicted would arise as a result of the move to online education.

3 Impact on Learning, Teaching, and Education

The knowledge-based approach has been the main focus of educational applications of AI since the early 1980s and up until recently. 61 The most well-known area of study has focused on intelligent tutoring systems, or ITS. The architecture of these systems is knowledge-based. A domain model that specifies the subject matter to be learnt is present in a typical ITS architecture, together with a student model that depicts the students' current level of understanding and learning. Through an adaptable and interactive user interface, an expert system or pedagogical model controls the introduction of learning materials to the learner [11].

These systems have historically employed the knowledge-based approach, and their success has mostly been shown in narrow and clear-cut fields like physics and mathematics. Intelligent tutoring settings have also been a significant source of data for learning

research since student behavior and learning can be closely tracked in ITS environments. The challenge of creating ITS for wide learning domains has shifted attention to the more specific issue of leveraging AI and machine learning to produce teacher interfaces for student and learner monitoring, as well as learning diagnostics. This is often referred to as educational data mining and learning analytics (EDM).

4 Data Analysis of the Educational Data (Case Study of Education in Egypt)

For investors looking to establish a presence in the Middle East's education market, Egypt ranks among the most alluring locations.

The first grade in the Egyptian educational system is called pre-primary education. However, basic education is only required to be completed for six years before moving on to three years of preparatory school and three years of secondary education. Primary school has the largest enrollment of all educational levels, with more than 12.8 million students. In 2019–2020, there were about 5.2 million pupils enrolled in preparatory classes. After finishing their required schooling, almost 3.3 million students choose to continue their studies in higher education, mostly at public colleges.

There is also Al-Azhar, a separate religious education program that runs independently of the Ministry of Education. Downloads of Egypt's educational data sets are available on the website of the Ministry of Education [12].

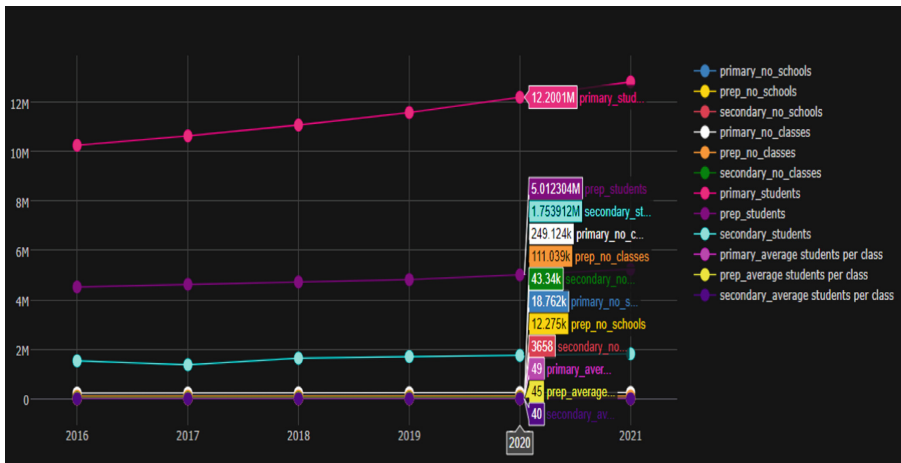


Fig. 2. General education analysis in Egypt

According to the general education analysis in Fig. 2, primary grade students make up the largest proportion of students, followed by prep students and secondary students, with the average number of students enrolled in classes, the number of schools, and the number of classes roughly equal across the three education phases.

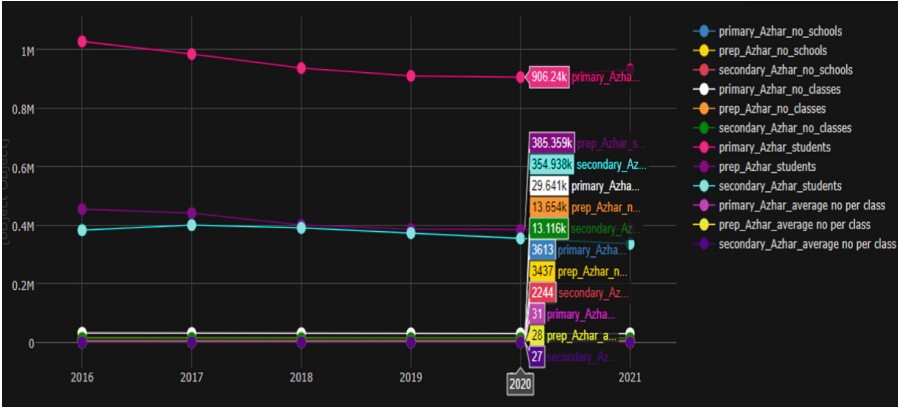


Fig. 3. Azhar education analysis in Egypt

Students in the primary grades make up a larger portion than prep students in the Azhar education study in Fig. 3. And secondary pupils who roughly equal the ratio of the number of schools, the number of students enrolled in classes, and the average number of students in each class. In recent years, fewer children across all stages have attended Azhar school.

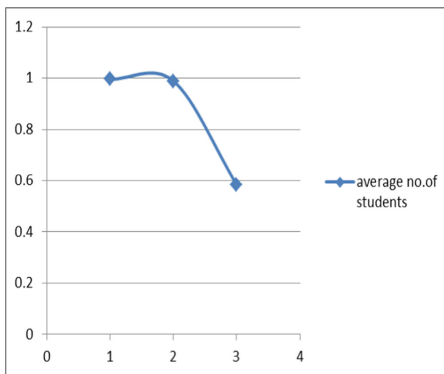
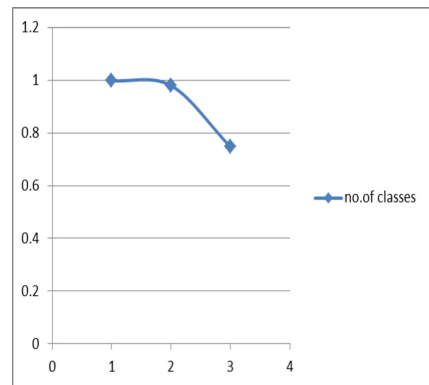
5 Results and Discussions

The researchers determine the relationship between the average number of students enrolled in classes, the number of classes, and the number of schools in this area, as represented in the below figures from [4–9], which represent the correlation results between different factors. The Table 1 represent the percentages of correlation for general education, and Azhar education for different factors.

The general education students in primary and prep stages are strong positively correlated to the average number of students in classes and number of classes. While in Azhar education students in primary and secondary stages are strong positively correlated to no of students in schools and no of classes but is negative correlated with number of schools (Figs. 4, 5, 6, 7, 8 and 9).

Table 1. Correlation between students and number of students in classes, number of classes and number of schools.

| | | Average number of students | Number of classes | Number of schools |
|-------------------|--------------------|----------------------------|-------------------|-------------------|
| general education | primary students | 0.9957 | 0.9981 | 0.9986 |
| | prep.students | 0.98865 | 0.9789 | 0.9918 |
| | secondary students | 0.5848 | 0.74689 | 0.6808 |
| Azhar education | primary students | 0.96412 | 0.97514 | -0.79449 |
| | prep.students | 0.2988 | 0.5577 | -0.80373 |
| | secondary students | 0.99125 | 0.90086 | -0.948299 |

**Fig. 4.** Correlation between general primary no of students and average no of students in schools, no of classes and no of schools**Fig. 5.** Correlation between general prep.no of students and average no of students in schools, no of classes and no of schools

6 A Proposed Virtual Learning Model

The researchers conclude from the previous data analysis that there is a need to build virtual model to apply virtual classrooms in schools to cope with the increasing numbers of students. This virtual learning system was built up from theories, principals and research in.

educational background. As described in Fig. 10.

The model begins with the phase I, which is a preparation of the learners to understand the virtual learning process, and then move to the second stage which is identifying goals of the teaching process and identify the ILO (institutional learning outcome), the next stage is searching facts that the learners need to know finding the ideas, and then move

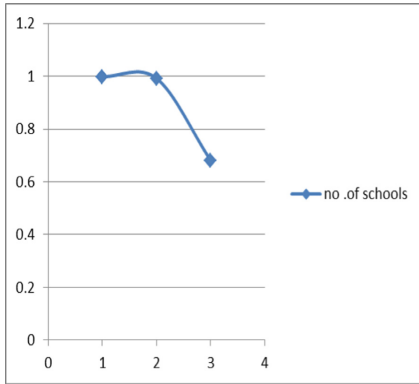


Fig. 6. Correlation between general secondary no of students and average no of students in schools, no of classes and no of schools

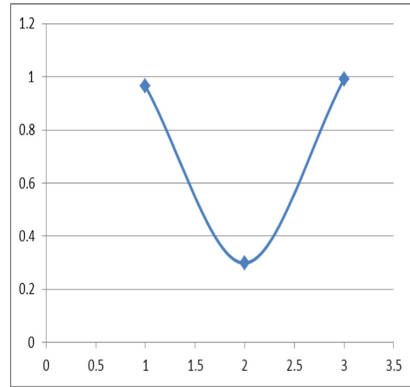


Fig. 7. Correlation between Azhar primary no of students and average no of students in schools, no of classes and no of schools

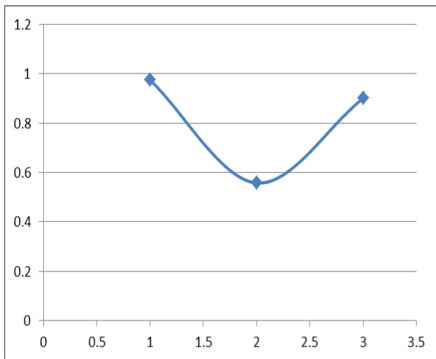


Fig. 8. Correlation between al-Azhar prep.no of students and average no of students in schools, no of classes and no of schools

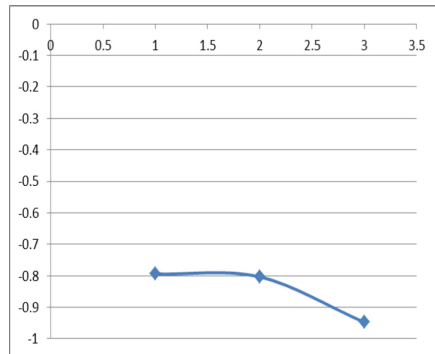


Fig. 9. Correlation between al-Azhar secondary no of students and average no of students in schools, no of classes and no of schools

to the next stage which is prepared students to find problem solutions, then stage 6 is creating productivity and evaluate the results, and the final stage is accepting productivity.

The paper suggests to apply this model on the general education (primary, preparatory and secondary) schools of Egypt to cope with the increasing number of students in school and to improve the learning system of Egypt.



Fig. 10. A Proposed Virtual Learning Model

7 Conclusion

In this paper, the researchers seek to identify the impact of AI on teaching, learning, and education by discussing the stages of learning in Artificial Intelligence and also, mentioned the types of AI system. And then highlight the impact of Ai on learning process, finally, the paper analyzing data set about educational data in Egypt and measure correlation between number of schools, number of classes, and number of students per class for primary, preparatory, and secondary stages for general education and al-Azhar education and found that there is a positive correlation in the general education, which means that the number of students is increasing when number of school increases. While there is a negative correlation in al-Azhar education Which lead to the importance and the need of build virtual model to apply virtual classrooms in schools to cope with the increasing numbers of students.

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