Artificial Intelligence (AI) and the Educational Process: Using AI to Enhance Student Performance in Content Skills

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Author Information

Nouf Hamoud Aljohani is a physics teacher in the 34th high school, located in Jeddah, in the Kingdom of Saudi Arabia. She holds a master's degree in education technology and a bachelor's degree in physics. Her work has focused on employing technology in service of the physics curriculum to make the subject more enjoyable for learners. She has completed research in the field of technology, such as the use of virtual classroom technology with high school students. She has a curiosity to know the latest innovations in the field of technology and to share them with her colleagues.

Abstract

This paper examines the effectiveness of using audio artificial intelligence in Saudi classrooms. Currently, high school students in Saudi Arabia find physics difficult and they struggle to remain motivated to learn. By facilitating students' interaction with the activities that use Google Home Mini, it is anticipated that the degree of student achievement in physics can be increased. One participating class of students will be divided into two groups, the experimental group and the control group. The experimental group will engage with AI technology through Google Home Mini, under the supervision of the teacher. The control group will receive only traditional instruction from the teacher. The study will take place over a full semester. Student performance will be evaluated by using pre- and post- curriculum-based assessments of each group. The researcher then will compare the results using statistical tests via the SPSS program. The effectiveness of Google Home Mini will be measured using the Blake equation to determine the average gain (Blake, Sutton, Masson, & Phillips, 1986). The target indicator of success for the experimental group is a score of 90% on the post-assessment. AI is important in education because of its inherent strength in helping to address students' learning needs in the classroom. AI systems provide flexibility in presenting scientific material and in responding to students' interests and needs. AI systems benefit students through their ability to support information gathering and processing that enables greater diversity of response. There are many competing types of intelligence, including the capacity for logic, understanding, planning, emotional knowledge, self-awareness, creativity, problem solving, and learning. However, Tegmark (2018) asserts that intelligence is defined as "the ability to accomplish complex goals" (pp. 4-5). It is anticipated that using Google Home Mini in the classroom will support learners to develop this kind of intelligence and achieve the content-area goals.

Statement of Need

AI is one of the branches of computer science that deals with ways and means of creating and designing intelligent machines that can think and act like humans and perform multiple tasks requiring intelligence such as learning, planning, speech recognition, face recognition, problem solving, and logical thinking. Over the last two decades, AI technology has begun to spread widely in many industries, including the education sector; education mechanisms have developed rapidly, with developers exploiting advances in technology. As a result, student interaction has increased and has taken more creative forms (Lotfi, 2018). AI can be used to analyze many data points that the teacher cannot measure easily. For example, AI could be designed to identify the wrong answers that students chose compared to the answers they were able to select correctly and determine patterns in the kinds of corresponding questions. Through the application of AI technology that produces sound, students could review their lessons more easily and without need of a supervising teacher or parent. An AI system could be designed to help students practice each required skill. As the overall goal of the teacher's job is to contribute to building the character and abilities of the student in all aspects, AI technology can promote a teacher's ability to foster educational achievement by providing a stimulating learning environment. Such advances would help Saudi schools move from being more primitive, traditional schools to becoming 21st century schools of the future, or so-called smart schools.

Review of the Literature

Human–machine communication has emerged as a new relational context of education and should become a priority for instructional scholarship in the coming years. With artificial intelligence and robots offering personalized instruction, teachers' roles may shift toward overseers who design and select machine-led instruction, monitor student progress, and provide support. Edwards, Edwards, Spence, and Lin (2018) argue that bringing the sensibilities and knowledge of instructional researchers to bear on these issues involving machine agents, within and outside the traditional classroom walls, is vitally important.

Deep Learning of AI: Machine-learning technology powers many aspects of modern society, from web searches to content filtering on social networks, to recommendations on e-commerce websites, and it is increasingly present in consumer products such as cameras and smartphones. Machine-learning systems are used to identify objects in images, transcribe speech into text, match news items, posts, or products with users' interests, and select relevant results of a search. Increasingly, these applications make use of a class of techniques called deep learning (Lecun, Bengio, & Hinton, 2015).

What Is Intelligence? There are many competing types of intelligence, including the capacity for logic, understanding, planning, emotional knowledge, self-awareness, creativity, problem solving, and learning. Tegmark (2018) succinctly defines intelligence as "the ability to accomplish complex goals" (pp. 4-5).

Using AI to Support Student Learning: According to Lau, Zimmerman, and Schaub (2018), smart speakers offer users hands-free voice control, but to detect and respond to voice commands, the speakers' microphones have to continuously listen for their wake word "Google." Through those voice assistants, smart speakers can stream music, answer basic questions, communicate with other smart home devices, and complete many other functions. These advantages can be used to promote better approaches to achieving content skills and to help students realize better results (Lau, Zimmerman, & Schaub, 2018).

Implementation Plan

Implementation Activities: In this study, the experimental group will receive a set of questions that they will try to answer by using Google Home Mini, under the supervision of the teacher. The teacher in this process has the role of guide. The questions will relate to a unit of the physics curriculum. By testing attainment of these goals, the researcher can determine the effectiveness of using AI in the classroom as an assistive technique to increase student achievement.

Research Methodology: The semi-experimental approach will be used to demonstrate the effectiveness of the independent variable (use of Google Home Mini) on the dependent variable (content skills).

Goal: Measure the effectiveness of using AI audible interaction on students' performance in content skills, with the target indicator of success being 90% on the physics assessment, in 34 high schools in the city of Jeddah, Saudi Arabia.

Experimental Design: Table 1 Experimental Design of the Research

Group	Pre-assessment	Processing Method	Post-assessment
Experimental	pre-test	Use the traditional method and Google mini home	post-test
Control	pre-test	Use the traditional method only	post-test

Evaluation Plan

Collection of Quantitative Evaluation Data: The pre-test and the post-test are multiple-choice assessments consisting of 25 questions, with each question having four possible responses and only one correct answer. This type of question allows coverage of the largest amount of physics information from the curricular unit. Also, the question type allows for straightforward grading, with each question equal to one point. The test schedule will include assessment at the beginning and end of the semester, and the researcher will conduct the assessments.

Data Analysis: At this stage, I will use the IBM SPSS Statistics Subscription. Independent sample t-tests will be used to compare the pre and post averages of the assessment results after the use of the Google Home Mini AI technology for the experimental group and typical instruction only for the control group. I will measure the effectiveness of using Google Home Mini by employing the Blake equation (Blake, Sutton, Masson, & Phillips, 1986). In short, I will determine whether the experimental group statistically outperforms the control group after using the artificial intelligence technology.

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Arabic Translation

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