



# EDUCATION AND ARTIFICIAL INTELLIGENCE

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# AI has vast potential to improve educational outcomes worldwide through process optimization and personalization.

Artificial intelligence solutions (AI) for education have been gathering increasing attention. Led by companies in the United States and China, global investment in education technology (EdTech) neared \$20 billion in 2019. The coronavirus has, for now, ended the days of packed classrooms and lecture halls, and forced many parents to come to grips with homeschooling and online learning. While a true return to normal appears unlikely, the demand for digital education solutions on the household and institutional level can be expected to proliferate.

There are two leading schools of thought regarding the use of AI in education. One idea supports learning becoming AI-led, meaning students would primarily receive app-based lessons, often tailored to suit individual learning styles and strengths. Teachers might work to complement the technology, overseeing students engaged by tablets and laptops. The other idea, AI-assisted learning, is one with which society may be more comfortable. Teachers maintain a leading role, while programs designed to handle administrative tasks, grading, and lesson planning can free up time for teachers to offer students one-on-one assistance. Such equipment may also improve the work-life balance of educators, helping to reduce the profession's heavy turnover rate. We're likely to see a combination of these approaches employed going forwards.

People are used to computers used to grade multiple choice exams, particularly standardized tests like the SAT and ACT. However, there has been significant progress on natural language processing (NLP), a branch of AI focused on interpreting human speech. Such programs are already in place across the U.S. states to grade written work, including extensive essays. In some cases, the computer-graded work is also checked by people, but oftentimes only random samples of tests are selected for human verification. As algorithms improve, schools may develop genuine dependence on these programs. Already, companies like London-based Century Tech claim that their AI solutions can analyze student performance and offer feedback.

Many parents and teachers strongly believe human development to be one of society's remaining sacred areas, one that should never become algorithmically determined. A leading reservation about the use of AI in the classroom regards its inability to replace trained educators in reading and responding to human emotions. Still, researchers have been working to address this concern. Emotion-focused AI, or Affective Computing, is widely deployed by companies looking to understand the impact of their advertisements on consumers. One ongoing education-based example is the Affective Robot Tutor Integrated Environment (ARTIE) at Spain's National Distance Education University. ARTIE is designed to recognize significant cognitive states - concentrating, distracted and inactive - through keyboard strokes and mouse action. Once a state has been identified, ARTIE can offer individualized responses, such as words of encouragement or attempts to increase interest in a particular topic. Similarly, AI-based technology could be used to help students recognize emotions in others. In development are augmented reality glasses imbued with software that can read and label facial expressions, which could prove life-changing for children with autism.

The rationale behind many existing EdTech applications is that, given enough data, algorithms can identify the mechanisms that work best for individual students. Students respond differently to different styles (videos, reading, lecture), lesson structure, and feedback types. Squirrel AI, China's predominant provider in this space, breaks topics down into thousands of granular elements - much more concisely than a textbook - allowing for precise diagnosis of gaps in student knowledge. Other companies, like Content Technologies, can provide their own educational materials or repackage ready-made content from institutions seeking alternative means of delivery.



Higher education institutions are deploying AI-based solutions, inside the lecture hall as well as out. Colleges have already deployed systems capable of identifying early warning signs and flagging students at elevated risk of dropping out, information that administrators can use to ensure that they check up on struggling students. Mississippi Western State University trialed AI chatbot technology from EdSights to identify and engage such students, and reported increased retention of over 7% as a result of the project. Chatbots, already ubiquitous in other industries, could soon make their way onto more campuses. Georgia State University and the University of Murcia in Spain have had success using the technology to help answer student FAQs, saving time for faculty and administrative staff. Elsewhere, in the absence of on-demand human resources, students can access emotional wellbeing chatbots, which may even help relieve pressure on strained mental health services.

While there are privacy concerns associated with the vast amounts of data required for effective applications, the greatest hindrance to the deployment of AI in education is the existence of bias. Educational Testing Service (ETS), the non-profit responsible for administering assessments such as the GRE and TOEFL, has frequently reported that its automated essay scoring engine, E-rater, typically diverges from human graders, tending to give higher or lower average scores to particular ethnic groups. MIT researchers have also shown that E-rater can be tricked into giving high scores to meaningless gibberish essays, as long as they are littered with sophisticated words and sentences.

There is also great danger fostering reliance on systems that may systematically misread emotions, particularly along the axes of gender and race. There can be lifelong consequences for students incorrectly labelled as angry or unmotivated without any nuance provided by human interaction. Moreover, many EdTech solutions are presented as ways for schools to reduce labor costs. If indeed more cash-strapped municipalities are induced to employ these programs, it may exacerbate inequalities as wealthier students retain the benefits of personalized human teaching and feedback, while AI systems guide disadvantaged pupils through their formative years.

AI has vast potential to improve educational outcomes worldwide through process optimization and personalization. In a post-coronavirus world, the topic will undoubtedly be under heavy discussion. However, due to its sensitive nature, attitudes are likely to be polarized and politicized. As additional uses and complexities are revealed, nobody should be surprised when this hits the news cycles in the coming months and years.

## There is a significant risk in fostering reliance on systems that may systematically misread emotions.

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July, 2020

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