

Review Article

Which is More Acceptable to Students for Classroom Engagement: “Virtual Avatars” or “Facial Analytics”? Competencies and Design Issues for AI-Powered Online Education’s Student-Teacher Interaction

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A B S T R A C T

As online education increasingly integrates Artificial Intelligence (AI) to enhance learning experiences, this study delves into the intricate dynamics between students and teachers in AI-powered virtual classrooms. Recognizing the potential of AI in personalized learning, automated assessments, and instructional support, the research explores the nuanced perspectives of both educators and students. The multifaceted impact of AI on learner-teacher interactions is investigated, encompassing concerns about privacy, algorithmic bias, and the potential erosion of critical thinking skills. To comprehend the immediate emotions evoked by AI scenarios, storyboards were employed, providing insights into perceptions of intrusiveness. This study contributes significantly to the field by outlining potential scenarios for future investigations, summarizing the benefits and drawbacks of AI in online learning, and emphasizing the importance of inclusive design and implementation considerations. By addressing the concerns of both students and professors, the research strives to pave the way for a comprehensive understanding of AI’s role in shaping the future of online education. The study underscores the need for further research to bridge gaps and overcome impediments, ensuring AI systems realize their full potential in transforming virtual classrooms.

Keywords: Classroom Engagement, Virtual Avatars, AI Systems, Online Education, Teaching.

Artificial intelligence (AI) has several potential uses in online learning and teaching, including automated tasks for instructors, personalized student learning, and assessments powered by AI.¹ For example, AI-driven tutoring systems may be able to meet the demands of each student by customizing lessons to suit their unique learning styles and

aptitudes.² automatically answering questions from students in online discussion forums and carrying out tedious tasks that AI teaching assistants can do, giving teachers more time to concentrate on other important duties.³ AI algorithms decode clickstream data to help teachers evaluate the potential, growth, and accomplishments of their students.⁴

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Even though artificial intelligence (AI) has many potential uses, some educators and students might not find AI to be very enjoyable.⁵ The Facebook-Cambridge Analytica data scandal shows how AI systems might collect and analyze student data without the consent or awareness of the students, potentially violating their privacy. Students using an AI robot may believe that it is biased if the robot does not take algorithmic or data bias into account.⁶ Teachers fear that if their students become overly dependent on AI systems, they will lose their capacity for independent thought and the development of critical thinking skills.⁷

Understanding how AI technology impacts teachers and students in virtual learning environments is critical. Researchers focusing on AI in Education (AIED) applications are currently examining the potential impacts that AI systems could have on distance education.⁸ For instance, there hasn't been much discussion of the risks and moral ramifications of AI systems in the context of student-teacher relationships.⁹ Conflicts between instructors and students can arise from a variety of issues, such as oppressive control, changing power balances, and privacy concerns.¹⁰ To find any gaps, difficulties, or barriers keeping AI systems from realizing their full potential, more study on how these systems affect learner-instructor interactions is required.¹¹

It is critical for students and teachers to be able to connect and collaborate online. When teacher-student interactions incorporate characteristics such as communication, support, and physical presence, students are more engaged and succeed in class.¹² The ties students create with their professors influence their sense of self-worth, drive to study, and fearlessness in trying new things.¹³ It is less obvious how AI technology will affect student-teacher interactions in online learning. It is commonly anticipated that AI systems will have far-reaching implications for the future of education, particularly the dynamic between professors and students.¹⁴ More research is needed to understand how and why various types of AI systems effect learner-teacher interactions in online education.¹⁵

To get insight into participants' immediate feelings, we presented them with a range of hypothetical scenarios using storyboards.¹⁶ Through conducting these interviews, we were able to obtain a thorough picture of how educators and students evaluate the impact of AI systems on learner-instructor interactions, as well as the thresholds at which educators and students start to view AI as "invasive".¹⁷

This work contributes a great deal of new information to the body of knowledge already available in AIED research. We started the current study by creating a variety of scenarios that may be applied in later research projects examining AI's effects on online and distance learning (ODE). Second, the research presents the key benefits and drawbacks of artificial intelligence in online education

from the viewpoints of instructors and students in higher education. Lastly, we looked at how AI-based systems could affect the planning and implementation of online learning. The focus is on including instructors and students in the process, making sure their queries and worries are answered, and thoroughly gathering and presenting data.

Background

This study looks into the effects of artificial intelligence on the dynamics between online teachers and their pupils. To begin, we presented a theoretical framework based on studies of the dynamics of teacher-student relationships in virtual classrooms. Then we looked at the artificial intelligence software that is now being used in virtual classrooms.

Conceptual Foundation

Effective online learning requires heart-to-heart and soul-to-soul communication between instructors and students.¹⁸ Students develop new viewpoints and learn from one another through discourse. Three kind of interactions can be distinguished in online learning: interactions between students and the course contents, student-to-student interactions, and student-teacher interactions.¹⁹ These kinds of interactions create a sense of community and motivate students to engage in online learning.²⁰ In particular, participation and belongingness are essential to the long-term sustainability of online learning environments.²¹

It is essential for students and teachers to interact. By offering several points of contact, direction, inspiration, and prompt feedback, teachers can assist students in improving their motivation and performance.²² Students may feel more connected to one another when instructors participate in and facilitate online debates.²³ In general, whether or not students succeed as distant learners depends on the volume of interaction between them and their teachers.²⁴

Online student-teacher interactions can be examined using the five-factor model of learner-instructor interaction.²⁵ When creating an online collaborative learning environment, teachers and students must collaborate effectively and provide support to each other. In online courses, students' engagement, enjoyment, learning, and retention are all enhanced when they perceive their teachers to be present during their interactions with them.²⁶ Physical presence, positive reinforcement, and open lines of communication are necessary to raise student achievement and happiness.²⁷ The interactions between students and teachers are the main subject of this study. in terms of communication and assistance as well as physically.²⁸ Future online classroom dynamics are expected to be impacted by the use of artificial intelligence (AI).²⁹ If educators and students were worried

about how AI technology will change their interactions, they would not use such systems, even with their clear advantages.³⁰ The current study was necessary because there haven't been many empirical studies on how AI systems affect student-teacher relationships.

Ai-Powered Online Learning

It is anticipated that different AI systems will have varying effects on online student-teacher collaboration.¹⁶ AI can be used as a teaching assistant in a number of ways, such as automatic answers to weekly announcements, student introductions, and commonly asked questions, to help teachers feel more involved in their classes.²⁴ Artificial intelligence (AI) solutions for educational settings could become available in the near future, offering teachers and students ongoing feedback on their progress and learning as they pursue their objectives.⁸ By customizing the learning process for each individual student, adaptive assessments are being made available online in an effort to boost student motivation and engagement.¹² Because they provide the idea that they are in the same room, virtual avatars make it easier for individuals in distant locations to collaborate. AI-powered face analytics are being employed in today's tech-enhanced classrooms to better facilitate instructors' duties as mentors and guides.²¹ Understanding the influence of AI as experienced by students and educators is critical when examining various AI systems.¹⁹

Factor of learner-instructor interaction	Definition
Communication	Instructional communication (Q & A) between learners and the instructor about topics directly related to learning contents
Support	Instructional management by the instructor, including supporting learning materials and providing feedbacks directly related to learning contents
Presence	Perceived connectivity between students and instructors during the online learning process
Guidance	Guidance by the instructor through providing encouragement and positive reactions that are not directly related to learning contents
Social intimacy	Social interaction by the instructor, such as introduction, greetings, and exchange of personal information that are not directly related to learning contents

Table I. The Five-Factor Model of Student-Teacher Interaction (Adapted From [3-7], [16], [19], [23], and [26-29])

The challenges of AI's effect on learner-instructor interaction have been obvious with the recent arrival of commercial AI systems for online learning.²⁴ For example, a 'Proctorio' is a device that monitors students' screens during tests in order to detect any instances of cheating.² Although it appears to be a perfect method of monitoring online pupils, some students have claimed that it increases their anxiety before exams.¹³ Students who are aware that Proctorio would be recording their tests are more likely to be preoccupied and nervous.²⁴ Similarly, 'Squirrel AI', which aims to provide adaptable learning, automatically adapts teaching methods to best suit each student's needs, which may inhibit kids' creative and imaginative growth.²⁸ In such environments, AIs are developing autonomy in data evaluation, inferring

learning, and even making certain pedagogical decisions on their own.¹⁴

Methods and Methodology

This project aims to gain further insight into the ways in which AI systems impact the presence, support, and communication between students and teachers in the context of online learning. Due to their recent experiences taking online courses during the COVID-19 outbreak, both professors and students have a renewed respect for the advantages of online education. Rather than conducting a thorough assessment of AI technology, our goal was to identify areas that still need investigation and ways that AI systems may enhance interactions between students and teachers.

Through the use of "storyboards" and "speed dating," we pushed participants to evaluate the implications of every facet of AIED. In our study, participants in the exploratory research method known as "speed dating" were given the opportunity to view "storyboards" representing various potential AI systems. Following an introduction to prospective AI areas anticipated to become available in the future, participants were better equipped to assess AI systems comprehensively and formulate their own conclusions. We conducted "Speed Dating" with professors and students using storyboards, spanning a broad range of fictitious uses of AI systems in online education. Our main focus is on answering the following research question.:

'What effect do AI systems have on communication, assistance, and physical presence between students and teachers in online classrooms?'

Creation of a Storyboard

Our team of designers engaged in an online brainwriting exercise to generate storyboards for AI systems in the online learning ecosystem, which is both technically feasible and favourably boosts learner-instructor engagement. A Bangalore-based AI lab employed eight designers with a mean experience of 9.7 years (SD = 2.8 years) in human-computer interface (HCI) design. Each team member distributed a Google Slides file with an incident log to the rest of the group. This cycle was repeated four times until the designers agreed that the AI system scenarios were technically feasible and would improve learner-instructor interaction in online learning.

We conducted follow-up interviews with eight AI experts with an average of 13.6 years (SD = 9.1 years) of research experience and 6 years (SD = 4.7 years) of teaching experience to validate their technical viability and positive impact on learner-instructor interaction. The researchers conducted semi-structured interviews with AI professionals via video conference. We inquired about ways to improve its technological viability. Given their experience with

online education, we asked AI specialists if they thought they could make adjustments to this situation that would have a net positive effect on the relationship between students and teachers. We then asked if they could conceive of any instances in which such research ideas could be implemented. The scenario was revised to include AIEd-related information, as proposed by AI experts. Each interview lasted 39 minutes on average (standard deviation = 9.1 minutes). Each AI professional who participated to the study was compensated with 11,000 Indian Rupees.

Finally, we created nine situations that encourage conversation, presence, and facilitation between students and instructors while they are learning online. To categorise specific situations, researchers used characteristics affecting student-teacher relationships. However, while the AI's 'Teaching and Grading Support' may be viewed as technologies that aid the instructor, the term 'support' in the context of student-teacher interaction refers to learner assistance. The AI's 'Teaching and Grading Support' scenarios are better understood as communication systems rather than direct student aid because they demonstrate increased or faster communication between students and instructors.

The following four scenarios were created using research proposals from AI specialists:

(1) AI as a companion, (2) AI as a peer reviewer, (3) AI as a group project organiser, and (4) AI as a breakout room matching tool.

The purpose of these scenarios was not to study all possible AI systems in online learning exhaustively or to address every issue in great detail, but rather to demonstrate the variety of circumstances that can happen when utilising AI systems in online learning. To eliminate race and gender indications and encourage participants to place themselves in the positions of the characters, we designed four-cut storyboards with all the characters having a similar visual style.

Participants

We then played 'Speed Dating' with storyboards. We invited five professors and eight students to our 'Speed Dating' event. We selected professors from three different fields and students from five different academic paths to boost diversity. Because of the COVID-19 pandemic, all students and teachers are required to have at least three months of experience with online learning or teaching. Teachers had an average tenure of three years, while students spent an average of one year in college. In order to handle the expected levels of student-instructor participation in online university courses, both students and faculty members needed prior experience with online learning and teaching. The participants' experience with AI systems was secondary

to their thoughts on the anticipated human-AI interactions and their potential repercussions. Given that recent research have shown that Speed Dating can be successful even for persons with no prior knowledge or competence with AI systems, participation in this study required no specialised knowledge or experience. Professors and students were each paid 3,000 Indian Rupees for their involvement.

Procedure

Semi-structured interviews were conducted with participants using the 'Zoom' video conferencing application software. The interview questions were designed with the respondents' perceptions of the AI systems in mind, while keeping the storyboards shown in mind. Participants discussed how they imagined AI applied to digital teaching after reading each storyboard aloud. To start participants thinking critically about the potential ramifications of this technology on the learner-instructor interaction, we asked them, "Would you want to experience the implications of adding an AI system to an online course?" We also had students select AI systems that they believed would and would not be effective in order to have a more complete understanding of the merits and cons of AI. For an average of 39.6 minutes (SD = 8.2 minutes) of interview time, each participant was given a storyboard and asked many questions about its significance, with 'student-professor interaction' at the forefront.

Data Analysis

Each interview was recorded and transcribed in order for the data to be analysed. We employed Reflexive Thematic Analysis as an approach. We established a set of semantic codes for important words or remarks after spending some time getting to know the interview data. We then proceeded to the inductive coding phase. After carefully evaluating the data, we coded each transcript separately in Google Docs by highlighting and annotating it. We were able to resolve our disagreements on these issues through productive and diligent discussions. Using a deductive strategy backed by variables impacting learner-instructor interaction, the data were categorised and organised into themes in a separate MS Word document. We were able to organise the material into meaningful thematic units after three rounds of dialogue, establishing recurring difficulties and themes.

Findings

According to the responses to our poll, the application of AI systems in online learning may enable scalable learner-instructor customisation, but with the risk of violating society norms. Participants were concerned that if AI systems violated social norms in any area of learner-instructor interaction (i.e., communication, support, and presence), problems with accountability, agency, and supervision in online learning would arise.

Communication

Students in virtual classrooms ask and answer questions about course materials such as readings, debates, and quizzes. There is hope that AI systems would improve communication between students and teachers, but there is also concern that it may lead to misunderstandings and problems with accountability.

Quantity and Quality

The students believe that the anonymity given by AI will make them less hesitant to express queries. Online students may avoid asking questions during lectures because they are concerned that the teacher has already addressed the subject or because they do not want to appear uninformed in front of their classmates. They believe that having an AI Teaching Assistant would make them feel more at ease asking questions, less guilty about taking up too much of the professor's time, and less disruptive in class. One student even joked, "I've got an AI to handle it for me if it's a foolish question." Questions given to an AI remove the discomfort that can occur during educational conversations. Another student stated, "Asking questions is no longer a burden." We can flood AI with questions since it does not become frustrated." All of the students polled agreed that incorporating AI into online education will inspire more student curiosity.

Professors anticipate that AI will offer brief, repetitive responses, freeing up their time to engage more in-depth talks with students. Responding to students' constant questioning takes a significant amount of time and effort. Teachers thought that by devoting less time to routine tasks like responding to administrative inquiries, they would have more time to address students' concerns regarding course material. If an AI Teaching Assistant addresses students' easy, routine, and repetitive questions, teachers can better communicate with students by focusing on new questions or giving more time for in-depth or unconventional queries. AI Grading Assist and AI Peer Review provide quick feedback loops.

Responsibility

Despite their belief that AI systems will boost the quantity and quality of instructional communication, students are concerned that AI systems will provide incorrect answers, which will harm their grades. Students raised a number of issues. Because if the AI is responding questions from learners and improving itself as a result, pupils may use that response in future work and it may be deemed incorrect. Students want to ensure that the source from which AI systems learn is reliable. This may provide difficulties for teachers as well, because teachers may mark an answer incorrectly, but students may argue that the answer was provided by the AI system. Although AI may have some

responsibility in specific situations, such as when answering questions whose answers should be accepted as true, the majority of students believe that holding AI accountable would be difficult owing to its incomprehensibility. As one student put it, grasping the reasoning behind an answer provided by an AI whose inner workings are unknown makes it more difficult to comprehend. Students are concerned about how teachers will respond in an emergency due to their reliance on AI. "Many of my engineering classmates will have more leeway to justify their grades, I can see," a student observes. Under such a system, I can see people becoming less tolerant of their fates."

Teachers expected problems with students stemming from misconceptions or dishonesty based on artificial intelligence. A conflict might occur, for instance, if the TAs, the AI, and the professor all offer conflicting answers. If a student does poorly on an exam, a lot of them might claim that AI is wrong. This could be challenging for powerful teachers and teaching helpers. According to a another expert, "there would be lots of difficulties if an AI gives students a brilliant thought and the teacher and TA decide to regrade." This suggests that there may be problems on the other side of the equation. One professor said, "I worry that the algorithm will react in some roundabout way." "This problem stems from the poor quality of the answer." "Misunderstandings and other problems can usually be solved with a face-to-face conversation," said a second scholar, expressing concern about the possibility of AI-based misinterpretation. I don't believe a machine could ever accomplish it. There is a chance that the students will be misled and confused."

Support

Aiding in an online classroom means that the teacher is in charge of the students' learning and ensuring that they are getting what they need. AI systems will give just-in-time, individualised support for students on a large scale in the future, but both students and teachers are concerned that too much support may undermine students' agency and control over their education. Many students believe that AI will make it easier to receive personalised education, particularly in group situations. All of the students interviewed agreed that AI has the potential to assist them in focusing on what they do, particularly in student-led activities such as group projects and individual study. Some students believed that adaptive technology could increase learning efficiency by allowing them to focus on weaker areas of knowledge. When questioned about the Adaptive Quiz system's potential as a source of advise, one student stated, "I feel, being able to give the quiz, encourages me, leads me, and I think it would be good to me."

A second student appreciated having an AI's 'Group Project Organiser' by his side as a mentor. Students expected to

have more time to dedicate to important project-related duties such as researching, writing, and delivering their work on time.

Many instructors believe that AI could be used to provide students with timely, individualised assistance. According to one professor, “one of the most effective learning tactics is to be presented immediately with the proper answer or the suitable means to discover the correct answer,” which is especially useful when taking quizzes and completing assignments. Several educators have praised an AI-based system for adaptive exams and intelligent suggestions. All of the professors were excited to hear that AI could assist students stay on track with their studies and immediately discover any gaps in their knowledge, especially if they were absent. Two educators identified AI’s potential to assist pupils who want to learn at their own pace. In an online synchronous learning scenario, for example, where students may be in different time zones, the availability of fast responses from AI systems may boost student engagement.

Agency

Despite their enthusiasm for the assistance that AI may provide, students are concerned that standardised assistance may impair their ability to learn independently. For example, one student expressed concern that “over-standardizing the educational process would result in the use of only the standardised tools.” Data collection on student involvement would gradually determine students’ attitude, and an involved student would begin to exhibit a standardised demeanour over time.” While learning should comprise “discovering yourself and proceeding at your own pace,” he believes that AI training may arbitrarily accelerate a student’s learning speed. Other students expressed concern about the possible impact of a system like the AI’s Group Project Organiser, saying they were concerned that if AI was in charge, they would be less invested in their group projects. Another student expressed fear that AI might diminish the value of hands-on learning. It lulls people into complacency since they become accustomed to working with an AI helper and are thus unprepared to deal with obstacles when they enter the real world. Simply simply, they will be unprepared.

Instructors share students’ fears that relying too heavily on AI may stifle their curiosity and prevent them from studying on their own. Educators were concerned that children would not have the opportunity to develop their abilities and learn from their mistakes. A professor stated that she would prefer not to have all of her students working on the same type of project, and that the AI Group Project Organiser would make this impossible. Others in the teaching community, particularly those in the humanities, have expressed similar concerns, pointing out that students’

final projects can vary widely while remaining of high quality, and that giving students advice based on historical data could steer them in a specific direction, potentially stifling their creativity. A professor stated that he does not enjoy showing pupils outdated homework because he believes it destroys their ability to think outside the box. After witnessing the AI-powered storyboards, a professor had a key question: “At what point is it students’ work and at what point is it the AI’s algorithm?”

Connection

‘The term “presence” refers to an online classroom feature that allows professors and students to be aware of one another and collaborate successfully. AI technologies are expected to boost students’ sense of closeness while minimising the possibility of privacy issues.

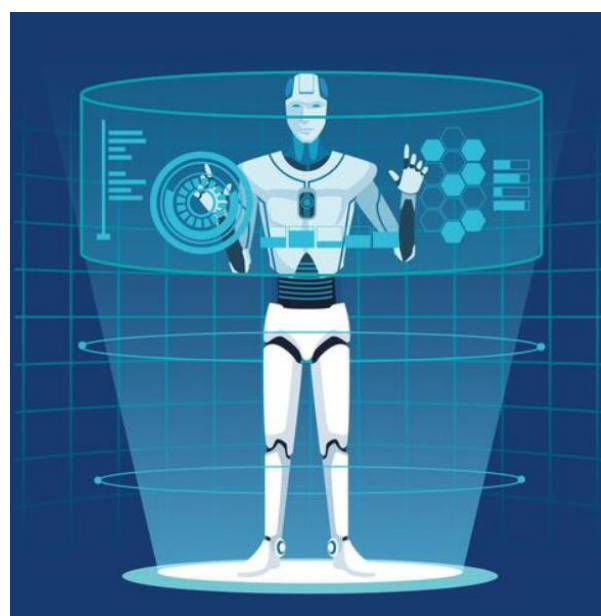


Figure 1. Depiction of Virtual Avatar

Students hypothesise that AI could improve learner-instructor interactions by transmitting social interaction signals without using camera data, hence respecting students’ privacy. Many students indicate that they are hesitant to utilise cameras in online lectures because they are worried about “looking like a mess,” “being in my pyjamas,” or “feeling too invasive.” Filming, according to one student, “makes you more anxious and conscious of what you’re doing, which hinders you from engaging with the course content.” The most popular choice among students in this regard was AI, which uses a virtual avatar to communicate facial expressions and body language to the teacher. The aim is for pupils to “show significantly more of their expressiveness, confusion, or understanding” when they are in class and “find at-home studying less intrusive.” “Virtual Avatars addresses the problem of not having to expose your actual face, but you can still

transmit your sentiments to the instructor,” one student explained, explaining why they were optimistic about the future of AI systems. AI will enable teachers to better fulfil the requirements of their kids, according to proponents. Many educators, particularly those who have taught at the university level, argue that in online learning scenarios, students routinely switch off their webcams, making it difficult for professors to detect their body language. One professor commended the ability of AI Facial Analytics to automatically scan students’ faces to determine whether they understand the information being taught. A second professor concurred, stating that it was difficult to tell if students were paying attention, especially when she was cracking a joke, and that an avatar may assist. A professor also stated that turning on the camera may be useful for both the teacher and the students because students may do anything else if the camera is not switched on. Educators have consistently complimented AI’s ability to give important data on students’ performance and opinions in online classes.

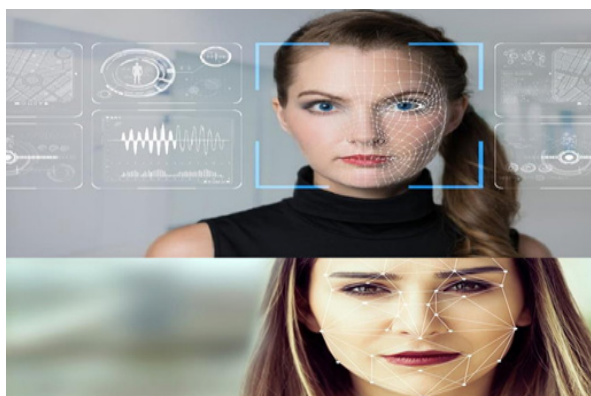


Figure 2. Depiction of Facial Recognition

Surveillance

While technologies such as AI have the potential to increase communication between lecturers and their students, the examination of non-conscious behaviours such as eye tracking and facial expression analysis has the opposite effect, giving students the impression that they are being watched. Students who took part in this study all expressed concern about having their unapproved eye movements recorded. “I get nervous when I have to take and pass tests or other similar quizzes and assignments.” “I’m concerned that I unintentionally cheated,” one student said. Another student mentioned feeling anxious while speaking with professors via email or in person because he was afraid they would assess him based on his unconscious behaviour before offering replies. Most pupils are uneasy with AI-powered facial analytics. One student is concerned that because a person’s facial expression is “something that occurs that may be beyond your control,” AI may neglect the complexity of true human emotion in favour of

simplifications that may lead to further misunderstanding. Despite the benefits, students have expressed reservations about employing AI to analyse unconscious behaviour.

Many teachers have criticised the use of AI interpretation to analyse students’ social markers. All instructors were sceptical about utilising AI to detect students’ eye movements and facial expressions since not all students are comfortable sharing personal information to teachers. One educator was concerned that if students realised that smiling would raise their engagement scores given by AI Facial Analytics, they would start smiling more in online classrooms. Several educators have spoken out strongly against the use of AI-based systems that track online students’ eye movements and analyse their facial expressions. One professor stated that he prefers to avoid dependency on AI by engaging in face-to-face conversations with his students. A number of instructors questioned whether the data adequately reflected students’ responses to course material rather than extraneous ambient stimuli, citing a lack of time and/or technical resources.

Similar to how a comfortable air-conditioned environment improves the productivity of occupants such as students in a classroom,^{32,36} the use of AI systems in online learning is expected to improve learner-instructor interaction by increasing the volume and quality of communication, enabling just-in-time individualised support for learners at scale, and increasing students’ feelings of connectedness. Despite these potential benefits, both students and teachers voiced concern that AI systems in online education could break social boundaries, causing challenges with accountability, agency, and monitoring.^{37,40}

Analysis and Conclusion

We wanted to find out how AI technologies have changed students’ and teachers’ face-to-face and virtual classroom experiences in terms of communication, help, and instructor presence. Despite the fact that there is an increasing number of AIED research examining the advantageous qualities of AI systems, little has been done to understand the concerns of students and teachers. Recent breakthroughs in the field of artificial intelligence in online education have demonstrated how haphazard application can have troubling privacy and surveillance consequences for students. The findings of this study revealed that both educators and their students regard AI systems as having both good and negative consequences. Despite the fact that AI systems were praised for boosting the amount and quality of communication, providing just-in-time, personalised help to large numbers of students, and strengthening the sense of connection, there were concerns about accountability, autonomy, and monitoring. Many of the desirable traits that students and teachers find unpleasant have resulted from the advent of AI systems. Teachers and students

have complimented AI for its effective communication, but they have also expressed concerns about the possibility of dishonesty and misinterpretation while working with AI. Both professors and students welcomed AI's targeted, on-demand assistance, but many were afraid that it might limit their ability to study autonomously. They are concerned, however, about the AI's intrusive data collection, which they believe will jeopardise their privacy. AI's social cues for student and instructor participation were favourably accepted. This study has created numerous opportunities to establish the levels at which AI systems are considered "invasive."

While AI systems facilitate student-teacher communication by allowing users to remain anonymous, some students are concerned about accountability issues that may occur if AI's erroneous and inexplicable reactions have harmful implications. Due to the opaque nature of the AI system, students, for example, have no means of knowing whether or not the responses they receive from an AI Teaching Assistant are correct. Students get the idea that understanding the mental process behind an AI's response will be difficult. If students use AI-generated answers on examinations and their instructors incorrectly mark them as incorrect, it could have major assessment and evaluation ramifications. Students would have more liberty to question their grades because AI is fundamentally untrustworthy. Given that AI systems do not always get it right, it may be possible to circumvent this by making the system more explicable. The ability of an AI to provide human-comprehensible explanations for its outcomes or operations is referred to as 'explainability.' The ability to explain the reasons behind an AI's answer allows students to assess the system's accuracy on their own, potentially increasing the system's credibility and transparency. AI systems must be explainable in order for students to have faith in and embrace them. It would be fascinating to investigate ways to ensure that AI systems can be explained within the context of online education. AI systems should not give pupils inaccurate answers that may confuse or mislead them, but rather point them to reputable, independently accessible sources of information.

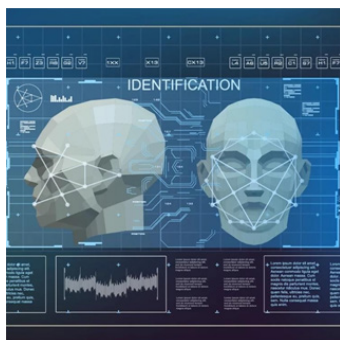


Figure 3. Working of Facial Recognition Software

Second, while AI systems can be adjusted to each individual student's needs, they run the risk of overly standardising the learning process by mandating what a motivated student must or must not do. Although students welcome whatever help they may obtain from AI systems, many are wary of the pre-packaged, standardized support it provides for fear that it would diminish their control over their own education. Teachers share students' fears that permitting AI systems to provide too much assistance may limit students' prospects for independent study. Educators were concerned that students would not have the opportunity to develop their talents and learn from their failures.

Instead of restricting learning to a set of pre-packaged and standardised procedures that reduce student autonomy, AI technology should be used to supplement human thought and accelerate the learning process in online education. AI systems and human facilitators, such as teachers or peers, must collaborate to create an efficient learning ecosystem. It is feasible to achieve harmony between the two types by combining human and AI tutoring systems. While AI systems excel at rapidly assessing large datasets, they frequently fail when faced with fresh or complicated situations. Humans are adaptable and intelligent, but AI systems can handle data rapidly and precisely. When humans are involved in decision-making, they learn more effectively and efficiently. We need to maintain a human-teacher in the loop if we want our online learners to feel safe and in control. It is critical to research ways to blend human intellect and AI to promote student independence.

AI systems may be perceived as 'intrusive' if they begin to make judgements about social interaction based on unconscious conduct. Students were concerned about their appearance because they had no notion what their faces and gazes were like. Facial recognition regulation and monitoring are both problematic and racist. Several students expressed dissatisfaction with the AI system's portrayal of their presence. The instructors felt similarly about the AI system's involvement in determining the significance of the students' acts.

Data regulations and agreements governing the nature of student data collecting and the types of data that may be made available to instructors should be clear, straightforward, and transparent, and should be the subject of future research. More study on diverse AI systems is both possible and necessary. Following that, educators' and students' perspectives on AI systems may be obtained across multiple academic areas. Participants came from a wide range of majors and fields of study. While this allowed us to generalise our findings from people from various backgrounds, more research into how students and professors from other disciplines perceive AI systems could be beneficial. Anecdotal evidence suggests that

humanities-based teachers cared more about their students' connections with them and inventiveness in class than engineering and pure science educators.

Another issue in the research was that it was conducted via reading storyboards rather of having participants engage with genuine AI systems. As a result, it is probable that the participants' viewpoints on AI systems were narrowed as a result. Participants' opinions may vary if they are exposed to AI systems on a frequent basis in the real world. Future research into the effects of AI on student behaviour should be conducted. Longitudinal studies would assist determine whether and how student attitudes change over time.

This study's conclusions may be valuable in the classroom and in the real world. The majority of negative experiences with AI systems can be attributed to student misunderstandings and excessive expectations. Despite the fact that the AI system is only an algorithm trained on acquired data, students frequently presume that its outcome is absolutely and entirely genuine. These misunderstandings may inhibit both students and teachers from fully utilising AI. To overcome this difficulty, it is critical to increase AI literacy among non-technical students and teachers. Researchers are looking exploring ways to engage young children interested in creative programming activities that use AI, and studies have recently issued how-to guides on introducing AI into K-12 curriculum.

Resolving disagreements when AI systems cross the line between students and instructors is also critical for limiting the negative effects of these technologies on learner-instructor interaction. Our recommendation is that in the future, AI systems be constructed to ensure that their activities can be explained to people, that human feedback can be solicited, and that data be rigorously collected and presented. This will allow AI technologies to be more seamlessly integrated into future iterations of online learning. Because AI systems and humans will surely collaborate in the future of online learning, it is critical to build such systems while keeping in mind their clear benefits and limitations.

References

- Ouyang, F., Zheng, L., & Jiao, P. (2022). Artificial intelligence in online higher education: A systematic review of empirical research from 2011 to 2020. *Education and Information Technologies*, 1-33.
- Alam, A. (2020). Challenges and possibilities in teaching and learning of calculus: A case study of India. *Journal for the Education of Gifted Young Scientists*, 8(1), 407-433.
- Franzoni, V., Milani, A., Mengoni, P., & Piccinato, F. (2020). Artificial intelligence visual metaphors in e-learning interfaces for learning analytics. *Applied Sciences*, 10(20), 7195.
- Alam, A. (2020). Pedagogy of Calculus in India: An Empirical Investigation. *Periódico Tchê Química*, 17(34), 164-180.
- Raj, N. S., & VG, R. (2022). Early prediction of student engagement in virtual learning environments using machine learning techniques. *E- Learning and Digital Media*, 20427530221108027.
- Alam, A. (2020). Possibilities and challenges of compounding artificial intelligence in India's educational landscape. *International Journal of Advanced Science and Technology*, 29(5), 5077-5094.
- Bagunaid, W., Chilamkurti, N., & Veeraraghavan, P. (2022). AISAR: Artificial Intelligence-Based Student Assessment and Recommendation System for E-Learning in Big Data. *Sustainability*, 14(17), 10551.
- Alam, A. (2020). Test of Knowledge of Elementary Vectors Concepts (TKEVC) among First-Semester Bachelor of Engineering and Technology Students. *Periódico Tchê Química*, 17(35), 477-494.
- Wang, S., Wang, H., Jiang, Y., Li, P., & Yang, W. (2021). Understanding students' participation of intelligent teaching: an empirical study considering artificial intelligence usefulness, interactive reward, satisfaction, university support and enjoyment. *Interactive Learning Environments*, 1-17.
- Alam, A. (2021). Should Robots Replace Teachers? Mobilisation of AI and Learning Analytics in Education. In *2021 International Conference on Advances in Computing, Communication, and Control (ICAC3)* (pp. 1-12). IEEE.
- Kairu, C. (2020, June). Students' Attitude Towards the Use of Artificial Intelligence and Machine Learning to Measure Classroom Engagement Activities. In *EdMedia+ Innovate Learning* (pp. 793-802). Association for the Advancement of Computing in Education (AACE).
- Alam, A. (2021). Designing XR into Higher Education using Immersive Learning Environments (ILEs) and Hybrid Education for Innovation in HEIs to attract UN's Education for Sustainable Development (ESD) Initiative. In *2021 International Conference on Advances in Computing, Communication, and Control (ICAC3)* (pp. 1- 9). IEEE.
- Ayouni, S., Hajjej, F., Maddeh, M., & Al-Otaibi, S. (2021). A new ML- based approach to enhance student engagement in online environment. *Plos one*, 16(11), e0258788.
- Alam, A. (2021). Possibilities and Apprehensions in the Landscape of Artificial Intelligence in Education. In *2021 International Conference on Computational Intelligence and Computing Applications (ICCICA)* (pp. 1-8). IEEE.

15. El Gourari, A., Skouri, M., Raoufi, M., & Ouatik, F. (2020, December). The future of the transition to E-learning and distance learning using artificial intelligence. In 2020 Sixth International Conference on e- Learning (econf) (pp. 279-284). IEEE.
16. Alam, A. (2022). Educational Robotics and Computer Programming in Early Childhood Education: A Conceptual Framework for Assessing
17. Elementary School Students' Computational Thinking for Designing Powerful Educational Scenarios. In 2022 International Conference on Smart Technologies and Systems for Next Generation Computing (ICSTSN) (pp. 1-7). IEEE.
18. Yin, W. (2022). An artificial intelligent virtual reality interactive model for distance education. *Journal of Mathematics*, 2022.
19. Alam, A. (2022). A Digital Game based Learning Approach for Effective Curriculum Transaction for Teaching-Learning of Artificial Intelligence and Machine Learning. In 2022 International Conference on Sustainable Computing and Data Communication Systems (ICSCDS) (pp. 69-74). IEEE.
20. Rakhimov, M., Yuldashev, A., & Solidjonov, D. (2021). The role of artificial intelligence in the management of e-learning platforms and monitoring knowledge of students. *Oriental renaissance: Innovative, educational, natural and social sciences*, 1(9), 308-314.
21. Alam, A. (2022). Investigating Sustainable Education and Positive Psychology Interventions in Schools Towards Achievement of Sustainable Happiness and Wellbeing for 21st Century Pedagogy and Curriculum. *ECS Transactions*, 107(1), 19481.
22. Schiff, D. (2021). Out of the laboratory and into the classroom: the future of artificial intelligence in education. *AI & society*, 36(1), 331- 348.
23. Alam, A. (2022). Social Robots in Education for Long-Term Human- Robot Interaction: Socially Supportive Behaviour of Robotic Tutor for Creating Robo-Tangible Learning Environment in a Guided Discovery Learning Interaction. *ECS Transactions*, 107(1), 12389.
24. Greenhow, C., Graham, C. R., & Koehler, M. J. (2022). Foundations of online learning: Challenges and opportunities. *Educational Psychologist*, 57(3), 131-147.
25. Alam, A. (2022). Positive Psychology Goes to School: Conceptualizing Students' Happiness in 21st Century Schools While 'Minding the Mind!' Are We There Yet? Evidence-Backed, School- Based Positive Psychology Interventions. *ECS Transactions*, 107(1), 11199.
26. Yildirim, Y., & Celepcikay, A. (2021). Artificial Intelligence and Machine Learning Applications in Education. *Eurasian Journal of Higher Education*, 2(4), 1-11.
27. Alam, A. (2022). Mapping a Sustainable Future Through Conceptualization of Transformative Learning Framework, Education for Sustainable Development, Critical Reflection, and Responsible Citizenship: An Exploration of Pedagogies for Twenty-First Century Learning. *ECS Transactions*, 107(1), 9827.
28. Chung, Y., & Kim, J. R. (2020). Is artificial intelligence (AI) lecturer acceptable for adult learners in distance education?: an exploratory study on a cyber university, South Korea.
29. Alam, A. (2022). Employing Adaptive Learning and Intelligent Tutoring Robots for Virtual Classrooms and Smart Campuses: Reforming Education in the Age of Artificial Intelligence. In: Shaw, R.N., Das, S., Piuri, V., Bianchini, M. (eds) *Advanced Computing and Intelligent Technologies. Lecture Notes in Electrical Engineering*, vol 914. Springer, Singapore.
30. August, S. E., & Tsaima, A. (2021). Artificial intelligence and machine learning: an instructor's exoskeleton in the future of education. In *Innovative learning environments in STEM higher education* (pp. 79-105). Springer, Cham.
31. Greener, S. (2022). The tensions of student engagement with technology. *Interactive Learning Environments*, 30(3), 397-399.
32. Akhai, S., Singh, V. P., & John, S. (2016). Investigating Indoor Air Quality for the Split-Type Air Conditioners in an Office Environment and Its Effect on Human Performance. *Journal of Mechanical Civil Engineering*, 13(6), 113-118.
33. Tanwar, N., & Akhai, S. (2017). Modeling Effectiveness of Quality in Education through Internship Training. *Journal of Advanced Research in Quality Control and Management*, 2(1), 17-22.
34. Akhai, S., Singh, V. P., & John, S. (2016). Human performance in industrial design centers with small unit air conditioning systems. *Journal of Advanced Research in Production Industrial Engineering*, 3(2), 5-11.
35. Tanwar, N., & Akhai, S. (2017). Survey Analysis for Quality Control Comfort Management in Air Conditioned Classroom. *Journal of Advanced Research in Civil and Environmental Engineering*, 4(1&2), 20-23.
36. Akhai, S., Thareja, P., & Singh, V. P. (2017). Assessment of Indoor Environment Health Sustenance in Air Conditioned Class Rooms. *Advanced Research in Civil and Environmental Engineering*, 4(1&2), 1-9.
37. Sidana, A., & Sidana, N. (2024). The Empirical Investigation of Artificial Intelligence for Enhancing the Learner-Instructor Interaction towards Online Learning Using Multiple Regression Analysis. In *The Role of Sustainability and Artificial Intelligence in Education Improvement* (pp. 185-202). Chapman and Hall/CRC.

38. Rangel-de Lázaro, G., & Duarte, J. M. (2023). You Can Handle, You Can Teach It: Systematic Review on the Use of Extended Reality and Artificial Intelligence Technologies for Online Higher Education. *Sustainability*, 15(4), 3507.
39. Jaiwant, S. V., Vazirani, K., & Kalra, R. (2023). Envisioning the Future of Education with AI. *ISTES BOOKS*, 31-43.
40. Sibanda, M., Khumalo, N. Z., & Fon, F. N. (2023, November). A review of the implications of artificial intelligence tools in higher education. Should we panic?. In *The 10th Focus Conference (TFC 2023)* (pp. 128-145). Atlantis Press.