INNOVATIVE TEACHING METHODS IN HIGHER EDUCATION

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ABSTRACT

The purpose of this study was to assess the impact of Artificial Intelligence (AI) on education. Premised on a narrative and framework for assessing AI identified from a preliminary analysis, the scope of the study was limited to the application and effects of AI in administration, instruction, and learning. A qualitative research approach, leveraging the use of literature review as a research design and approach was used and effectively facilitated the realization of the study purpose. Artificial intelligence is a field of study and the resulting innovations and developments that have culminated in computers, machines, and other artifacts having human-like intelligence characterized by cognitive abilities, learning, adaptability, and decision-making capabilities. The study ascertained that AI has extensively been adopted and used in education, particularly by education institutions, in different forms. AI initially took the form of computer and computer related technologies, transitioning to web-based and online intelligent education systems, and ultimately with the use of embedded computer systems, together with other technologies, the use of humanoid robots and web-based chatbots to perform instructors' duties and functions independently or with instructors. Using these platforms, instructors have been able to perform different administrative functions, such as reviewing and grading students' assignments more effectively and efficiently, and achieve higher quality in their teaching activities.

INTRODUCTION

The U.S. Department of Education (Department) is committed to supporting the use of technology to improve teaching and learning and to support innovation throughout educational systems. This report addresses the clear need for sharing knowledge and developing policies for "Artificial Intelligence," a rapidly advancing class of foundational capabilities which are increasingly embedded in all types of educational technology systems and are also available to the public. We will consider "educational technology" (edtech) to include both (a) technologies specifically designed for educational use, as well as (b) general technologies that are widely used in educational settings. Recommendations in this report seek to engage teachers, educational leaders, policy makers, researchers, and educational technology innovators and providers as they work together on pressing policy issues that arise as Artificial Intelligence (AI) is used in education. AI can be defined as "automation based on associations." When computers automate reasoning based on associations in data (or associations deduced from expert knowledge), two shifts fundamental to AI occur and shift computing beyond conventional edtech: (1) from capturing data to detecting patterns in data and (2) from providing access to instructional resources to automating decisions about instruction and other educational processes. Detecting patterns and automating decisions are leaps in the level of responsibilities that can be delegated to a computer system. The process of developing an AI system may lead to bias in how patterns are detected and unfairness in how decisions are automated. Thus, educational systems must govern their use of AI systems. This report describes opportunities for using AI to improve education, recognizes challenges that will arise, and develops recommendations to guide further policy development.

GUIDING QUESTIONS

Understanding that AI increases automation and allows machines to do some tasks that only people did in the past leads us to a pair of bold, overarching questions: 1. What is our collective vision of a desirable and achievable educational system that leverages automation to advance learning while protecting and centering human agency? 2. How and on what timeline will we be ready with necessary guidelines and guardrails, as well as convincing evidence of positive impacts, so that constituents can ethically and equitably implement this vision widely? In the Learning, Teaching, and Assessment sections of this report, we elaborate on elements of an educational vision grounded in what today's learners, teachers, and educational systems need, and we describe key insights and next steps required. Below, we articulate four key foundations for framing these themes. These foundations arise from what we know about the effective use of educational technology to improve opportunity, equity, and outcomes for students and also relate to the new Blueprint.

Foundation 1: Center People (Parents, Educators, and Students)

Education-focused AI policies at the federal, state, and district levels will be needed to guide and empower local and individual decisions about which technologies to adopt and use in schools and classrooms. Consider what is happening in everyday lives. Many of us use AI-enabled products because they are often better and more convenient. For example, few people want to use paper maps anymore; people find that technology helps us plan the best route to a destination more efficiently and conveniently. And yet, people often do not realize how much privacy they are giving up when they accept AI-enabled systems into their lives. AI will bring privacy and other risks that are hard to address only via individual decision making; additional protections will be needed. As protections are developed, we recommend that policies center people, not machines. To this end, a first recommendation in this document (in the next section) is an emphasis on AI with humans in the loop. Teachers, learners, and others need to retain their agency to decide what patterns mean and to choose courses of action. The idea of humans in the loop builds on the concept of "Human Alternatives, Consideration, and Fallback" in the Blueprint and ethical concepts used more broadly in evaluating AI, such as preserving human dignity. A top policy priority must be establishing human in the loop as a requirement in educational applications, despite contrary pressures to use AI as an alternative to human decision making.

Foundation 2: Advance Equity

A recent Executive Order9 issued by President Biden sought to strengthen the connection among racial equity, education and AI, stating that "members of underserved communities—many of whom have endured generations of discrimination and disinvestment—still confront significant barriers to realizing the full promise of our great Nation, and the Federal Government has a responsibility to remove these barriers" and that the Federal Government shall both "pursue educational equity so that our Nation's schools put every student on a path to success" and also "root out bias in the design and use of new technologies, such as artificial intelligence." A specific vision of equity, such as described in the Department's recent report, Advancing Digital Equity for All10 is essential to policy discussion about AI in education. This report defines digital equity as the condition in which individuals and communities have the information technology capacity that is needed for full participation in the society and economy of the United States." Issues related to racial equity and unfair bias were at the heart of every listening session we held. In particular, we heard a conversation that was increasingly attuned to issues of data quality and the consequences of using poor or inappropriate data in AI systems for education.

WHY AI IN HIGHER EDUCATION

The purpose of higher education around the world is to educate and enlighten students in new ways of thinking and problem-solving as well as to equip them with the knowledge and skills needed as they transition to the workforce. The recent advancements in AI have the potential to revolutionize nearly all aspects of our world. This is especially true for students who are soon-to-be members of the workforce entering an AI-fueled digital economy.

In alignment with the global adoption of AI, AI is being integrated into all aspects of higher education—teaching, learning, researching, and administrative tasks—to help students better prepare for an evolving, tech-based future.

Intel is steadfastly committed to expanding access to AI curricula, programming, and resources for higher education institutions around the world. As AI evolves at your higher education institution, we are here to maximize your success with guidance, expert insights, and a technology portfolio designed for AI initiatives of all sizes.AI in Higher Education Use Cases.Steps to Supporting AI at Your University.

AI TECHNOLOGIES OF HIGHER EDUCATION

All types of artificial intelligence (AI), such as machine learning, generative AI, and computer vision are quickly becoming prevalent in all areas of higher education today. They are being used to help improve teaching and learning, create enhanced educational experiences, streamline processes, and accelerate academic research. Determining the right technology needed to support these new and exciting AI-based projects across campus can be challenging for IT teams. Let Intel assist in your AI-in-higher-education efforts so you can more easily find the exact combination of hardware, software, and security needed for success.

AI IN HIGHER EDUCATION TAKEAWAYS

AI has the potential to revolutionize teaching and learning, operations, and research at higher education institutions.

Types of AI used in higher ed include machine and deep learning, generative AI, and computer vision.

Students, faculty, administrators, staff, and researchers use AI for a variety of purposes, including data science.

AI is used to accelerate academic research, equip students with skills for the future, and improve operations.

Intel offers hardware and software technologies, course content, and student programs to advance AI in higher education.

AI in Higher Ed Use Cases

From students building advanced technical skills to faculty members educating tomorrow's innovators to researchers pursuing breakthrough scientific discoveries—AI is quickly becoming prevalent on higher education campuses and applied in new and evolving ways.

Accelerating AI-Powered Scientific Research

University research is vital to advancing scientific discoveries and innovation; strengthening local, regional, and national economies; and addressing the world's most perplexing challenges. This research is often costly, requires massive amounts of compute power, and is extremely time consuming—sometimes taking years or decades to reach a conclusion or achieve desired results. AI is emerging as a viable solution to drastically accelerate the research process, saving researchers time, lowering costs for universities, and ultimately bringing the impact of revolutionary research results to the real world sooner.

Teaching the Next-Generation of Innovators

The demand for graduates with AI skills is expected to rapidly grow over the next three years. A 2021 survey of higher education educators and IT decision-makers found that 69 percent of all respondents sensed increasing demand from employers for graduates with AI technical skills. That's why there has been an industry-wide shift to create new AI offerings, bolster existing curricula, and increase the overall accessibility of AI instruction to a wider variety of students.

To help community colleges in the US expand their AI programming, in 2020 Intel created the AI for Workforce program to provide colleges with over 500 hours of AI content and prepacked courses, professional development for instructors, and implementation guidance for faculty.

BUILDING STUDENT SKILL SETS FOR A DIGITAL ECONOMY

Today's students are looking for opportunities to translate their academic success into career success. In the current digital economy, that means students must be equipped with new AI technical skills that they can use to solve complex problems with innovative solutions in fast-moving industries such as healthcare and life sciences and financial services.

Intel is empowering students to expand their learning, elevate their skills, and get on the fast track to becoming an AI leader through three programs:

Intel® Student Ambassador Programs for oneAPI and IoT: Students build their deep learning and programming skills, expand their professional network, grow their industry leadership, and get recognition from Intel on their expertise.

See the Student Ambassador for oneAPI Program

See the Student Ambassador for IoT Program

Intel® Software Innovator Program: Students become innovators, learning directly from influential experts, networking with peers, and delivering demonstrations to refine their ideas.

Intel® DevMesh community: Students gain access to a community portal for developers and creators to share their work, best practices, and ideas while creating a professional portfolio of work.

USING AI TO IMPROVE DAILY LIFE

Nearly everyone is already connected to AI through their everyday go-to tools, websites, and products like social media, online shopping recommendations, online search engines, and smartphones. With new AI advancements being released almost daily, your students and staff are turning to more-complex and compute-intensive applications to help enhance their lives and augment their teaching and learning. Some

of the more advanced, compute-heavy tools you may need to support include AI-powered personal assistants; video- or voice-based content creator apps for digitizing lectures, conferences, and guides; curricula and resource planning programs; and personalized learning solutions.

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HOW YOU CAN BEST SUPPORT AI INITIATIVES AT YOUR UNIVERSITY

A key factor to the success of any AI-related project is having the right foundational technology in place that provides the ideal balance of performance, advanced security features, and costs. We know it can be challenging to select the exact solution needed to match the needs of every person on campus and their unique use-case technology specifications. To help you with planning, we've gathered advice from our experts on the steps you can take to better understand and support the needs of your diverse higher education community.

Determine the type of AI being used or taught

No matter the size or type of higher ed institution your IT team supports, determining which technologies will best support your user base begins with an understanding of the type of AI being used or taught.

AI is a broad term that is often used instead of describing the more complex types—or subsets—of AI. However, broadly labeling initiatives as an "AI project" can make selecting the right supporting technology even more difficult. Each AI subset requires a unique combination of hardware, software, and security based on the project's end goal. Let's explore the types of AI that are either being used at your institution already or will be soon

Classical machine learning (ML): *Uses models, or algorithms, to analyze data sets, identify patterns, and make predictions without human intervention. This type of AI is often the first type students learn about when beginning their college career. ML also powers many popular tools used by everyone on campus, such as Gradescope, Grammarly, Consensus, Elicit, and ResearchRabbit.*

Deep learning: *Teaches computers to process data in a way that is inspired by the human brain, using models that can recognize complex patterns in pictures, text, sounds, and other data to produce accurate insights and predictions. This type of AI is an advancement of classical ML and used when working with massive data sets that have numerous parameters or when a high level of accuracy is required.*

Computer vision: *Trains computers to make sense of the overwhelming amount of visual data collected to locate, identify, and track objects or specific actions. This type of AI combines cameras, edge computing, cloud-based computing, software, and AI to enable systems to "see" data collected from cameras and videos. In addition to researchers using computer vision to aid their pioneering work, it's often used by campus security and administration professionals to help ensure campus safety. Computer vision can also enhance student engagement in distance learning, enable automated proctoring for online exams, and help spot plagiarism in handwritten student exams.*

Generative AI: *Generates new content when provided with a prompt by an end user. Generative AI creates this content based on the massive sets of data and machine learning AI algorithms it was trained on. This type of AI is integrated with language AI, also known as natural language processing (NLP), which allows it to process and understand human language. When used together, generative AI and NLP can understand a prompt and generate an appropriate response via text, video, imagery, or audio. Generative AI is a relatively new tool that higher ed students and professionals are enthusiastically adopting and experimenting with to accelerate research, boost productivity, enhance curriculum development, and maximize learning outcomes.*

Pick Technologies Based on the Complexity and Scale of AI Projects

For students, faculty, administrators, and researchers to fully harness the power of AI, they need to be equipped with and supported by the hardware and software technologies that maximize performance, minimize costs, and provide enhanced security features to help keep sensitive information and data safe and secure.

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