NAVIDAR

THE AI REVOLUTION: TRANSFORMING AMERICAN EDUCATION

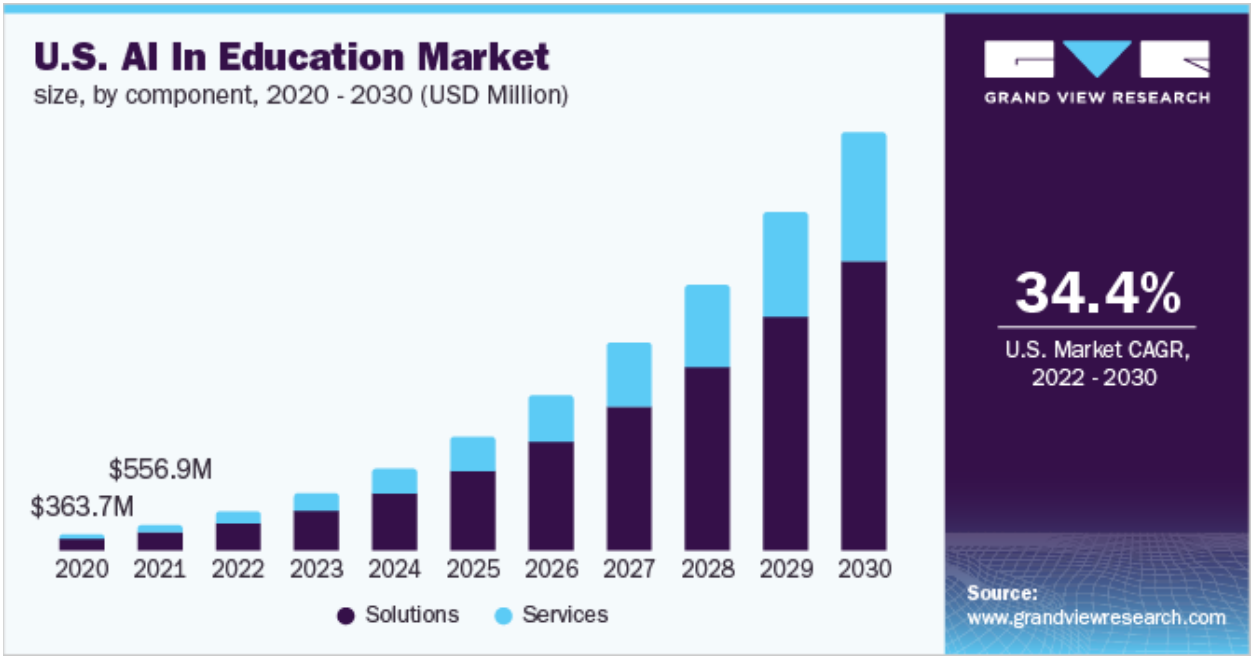
INTRODUCTION

Generative Artificial Intelligence (hereinafter, "AI") has captured the imagination of entrepreneurs, investors, and the public as few technologies ever have. We have referred to this remarkable phenomenon in past writings (The New Age Of Artificial Intelligence And The Path Forward) as **the "AI Revolution" and it is assuredly well underway.** The promise and challenges of AI dominate today's headlines and have propelled the valuations of many AI-focused companies and the overall stock market indexes to all-time heights.

AI is rapidly spreading through many industries and transforming markets, economies, and how we live our daily lives. **AI is similarly poised to revolutionize learning and teaching.** The education market is one of the most promising and fertile areas for the application of AI.

Sal Khan, CEO and Founder of Khan Academy, has said that AI may represent ***"the biggest positive transformation that education has ever seen."***

As a technology that itself focuses on learning (*as we discuss immediately below*), AI is poised to drive educational improvement, enhance educational outcomes, and level the playing field in what has been a highly variable and uneven market. At present, **we stand at a critical juncture** between traditional teaching methodologies and the implementation and impact of new AI-driven methodologies, ideas, and experiences that may transform education and open up new possibilities and opportunities for students and teachers alike.



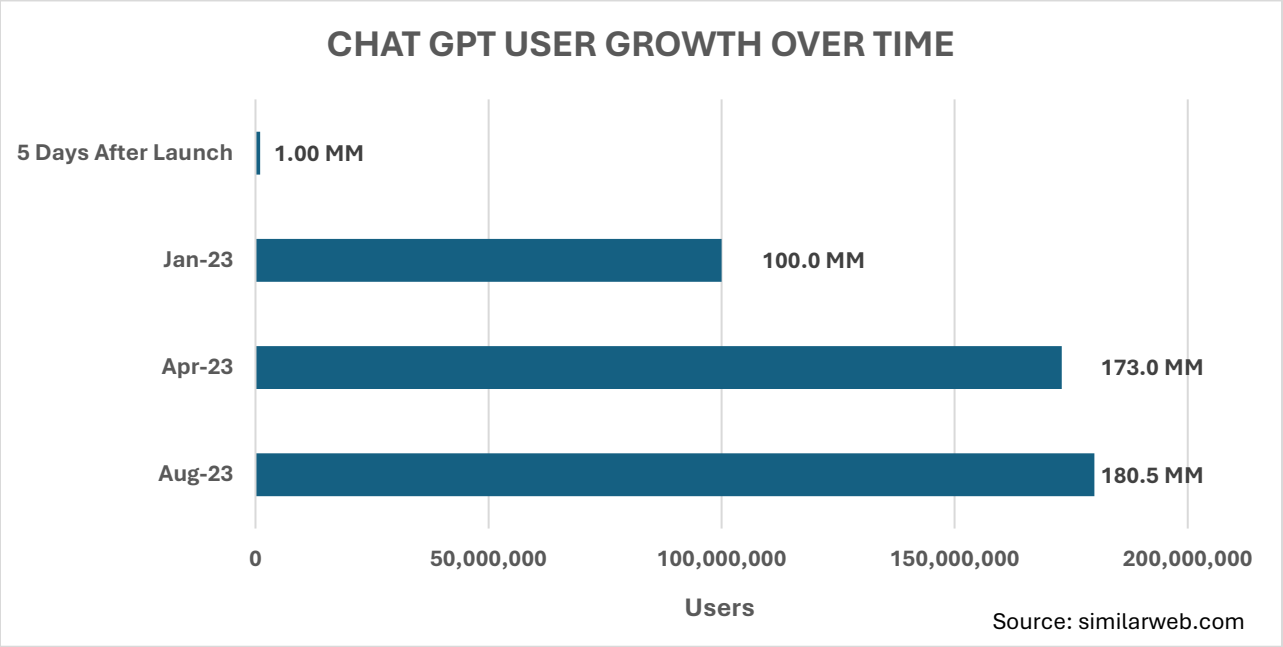
In this paper, we begin with a brief definition of AI, discuss the opportunities created by AI in education, and offer a glimpse into the future with a few predictions about what the future of AI in education may hold.

QUICK RECAP: WHAT IS ARTIFICIAL INTELLIGENCE?

As Navidar discussed in our thought piece, "*The New Age of Artificial Intelligence and The Path Forward*," AI is a technology (or a collection of technologies) that **utilizes computers and machines to essentially try to copy the outputs of the human mind, mimic human work, and perform tasks that normally require human intelligence, such as recognizing patterns, learning from experience, and making decisions.**

In essence, AI at its most essential level attempts to mimic human perception and decision making in order to accomplish tasks. Today, AI utilizes extraordinary amounts of data and massive computing power to make decisions. Computer algorithms, sets of instructions that are designed to accomplish a particular task, are critical to AI as they take one or a series of inputs, run them systematically through a set of steps, and in turn provide one or more outputs, including output like sentences, images, or instructions.

Such is the power of AI that programs like OpenAI's ChatGPT have exploded in popularity. Within just two months of its release, **ChatGPT4 amassed 100 million active user**s and by August 2023 had over 180 million people actively using the program. (See graphic below.)



THE BACKDROP OF AMERICAN EDUCATION: CRISIS CREATES OPPORTUNITY

Education experts, industry analysts, and commentators have long bemoaned the dire state of America's public education system. Despite spending a larger percentage of GDP on education than many other nations, **our educational outcomes**—as measured by international test scores in mathematics and writing and reading skills—**consistently fall below those of other nations,** including Poland, Finland, and South Korea.

It is quite evident that the United States education system faces many challenges, including **poor educational outcomes, sub-standard skills in critical areas like quantitative and qualitative reasoning,** dramatic achievement disparities, and high teacher turnover and career dissatisfaction.

Consider the following quantitative and qualitative data points:

- **Under 10% of Americans aged 16 to 65 are proficient in mathematics** (National Center for Education Statistics);
- U.S. students ranked **28th out of 37 OECD countries** in math literacy (OECD report);
- About **130 million adults in the U.S. have low literacy levels,** meaning that more than half of Americans in this age group read below a sixth-grade level (U.S. Department of Education);
- Two-thirds of U.S. children at both the 4th and 8th grade levels were **unable to read with proficiency at levels for reading** set by the National Assessment of Educational Progress (The National Assessment of Educational Progress);
- **COVID exacerbated what was already a dire situation,** with kindergarten through 12th-grade average math and reading scores registering the largest decline since record-keeping began more than 50 years ago in 1969 (Northwestern University report);
- **Fewer than half (47%) of Americans adults can correctly name the three branches** of government established by the U.S. Constitution, with about 25% unable to name a single branch (Constitutional Day Civics Survey by the Annenberg Public Policy Center); and
- **Only 3% of Americans surveyed could name all five of the First Amendment rights**, and, on average, could name one of the First Amendment rights (National Opinion Research Center FIRE survey).

Given these sub-optimal outcomes, there is undoubtedly an important role that AI-driven systems can play in driving better educational outcomes and improving math, reading, and writing skills so that American students can realize their full potential.

THE MULTI-FACETED PROMISE OF AI TO TRANSFORM EDUCATION

AI offers numerous compelling benefits to educators and students alike and truly has the potential to address some of the biggest challenges in education today. Below, we briefly describe various ways in which AI can—and likely will—transform the educational landscape for both educators and students.

Overcoming The Scalability Challenge: Scalability in AI generally refers to the ability of a system to adjust its complexity, speed, or size to handle different requirements efficiently as volumes expand and the number of system users increases.

One way to think about scalability is the ability of a system to expand seamlessly and without difficulty as the number of users increases. Because teachers—that is human beings who convey knowledge and skills in a classroom setting—are a scarce resource and have a limited amount of time, they cannot realistically be expected to meet the needs of all students simultaneously, not to mention that there are often dramatic differences in student ability within the same classroom.

AI-based systems are thus much more scalable than solely human-based systems in education. The typical class size in the U.S. is 15-26 students which makes it difficult for a single teacher to engage with and teach all of the students effectively, especially taking into account the significant variations in student ability within a single classroom.

Here, AI holds great promise by enabling educators to extend their reach and allowing students to learn both in and out of the classroom during and outside of school hours. As but one example, technology like chatbots--computer programs designed to simulate conversation with human users--can interact with students during non-class hours and help them continue to learn and improve their skills outside of the classroom when teachers are not present. Used this way, AI systems represent a "force multiplier" that extends the reach of educators and at the same time increases accessibility of education by opening additional learning opportunities for significantly more students.

Enabling Adaptive Learning Through Personalization and Customization: In education, a standardized, one-size-fits-all approach is often not an optimal means of improving student learning and achievement, particularly given the frequent and significant differences in ability within a single classroom, within a school, and across school systems.

Again, AI-driven systems present a potentially transformative learning opportunity as they can offer truly personalized and customized learning for students. The range of opportunities for AI-driven systems to offer personalization and customization is remarkably broad-based and include adapting to an individual student's knowledge level, preferred learning style, and learning speed to enable them to progress at their own pace and maximize their potential. For instance, AI systems will adjust the level of difficulty of questions based on the student's preparedness and current knowledge level.

These AI-driven adaptive learning systems will tailor and personalize additional questions in topic areas that an individual finds challenging and drive improvement and student success. This personalized approach combined with real-time, data-driven feedback will challenge students and enable them to improve consistently, especially during non-school hours and without necessarily requiring a teacher's presence. In addition, the unique ability of AI-driven systems to learn and be customizable will offer hope for students with language

barriers, physical or mental disabilities, and can level the playing field for all students to maximize their educational quality and progress.

Encouragingly, some of this AI-driven personalization of learning is already occurring today both within formal education environments as well as outside of school educational environments. For example, companies such as Khan Academy, Duolingo, and Varsity Tutoring use AI in their learning systems to better improve their users experiences and adjust questions and assistance based on the students answers. AI integration allows these online learning services to generate customized lesson plans, increase student engagement, and drive better educational outcomes.

Creating "Smart" Content & Reducing Administrative Burdens: AI holds significant promise in automating and reducing the considerable administrative tasks that consume many educator hours, lead to frustration and high turnover, and are not core to the essential mission of imparting knowledge and skills to students.

A UiPath survey, for example, found that on average, faculty spend 4.5 hours a week on mundane tasks that could be automated by AI. By leveraging AI-powered tools such as virtual assistants and automated data processing systems, educators can streamline these time-consuming routine tasks like taking attendance, scheduling meetings, and managing emails.

Perhaps even more interestingly and of potentially greater value, **educators will use AI-driven systems to keep teaching materials, lesson plans, and tests up to date with dramatically less time and effort.** AI may even grade papers and tests. These advancements will increase teaching efficiency, reduce errors, enhance productivity, and free educators to interact more directly and more frequently with students in the classroom.

LOOKING FORWARD: PREDICTIONS ABOUT WHAT THE FUTURE HOLDS

With the discussion above forming a hopefully interesting and informative backdrop, what do we see in the future? **How will AI transform the educational landscape in the United States and what will that future look like?**

Prediction #1: AI Will Drive Better Educational Outcomes

The prediction that AI-driven systems will improve educational outcomes might not at first seem particularly insightful or daring, but it is important to remember that the United States has historically invested and currently spends billions of dollars on education each year.

From 2022 to 2023 the US Department of education spent approximately $220 billion to fund public education. Despite this massive investment and expenditure, our public education system—from kindergarten through high school—is not delivering the desired

results in terms of skills, knowledge, and capabilities that our students need to compete in an increasingly competitive and global world.

We believe AI will enable educational content to be customized and personalized quickly, effectively, and—as Satya Nadella, CEO of Microsoft, recently noted— at *"zero marginal cost."*

By enabling teachers to create targeted content at the push of a button, AI-driven systems will drive the "mass customization" of educational materials. Chatbots will heighten student engagement with their subjects and provide a tutor that is available on a 24x7x365 basis to facilitate learning. By freeing teachers from time-consuming and unproductive administrative tasks, AI will enable them to spend more time engaged with student learners. It is important to remember that we are in the relatively early days of AI, and that AI-driven systems are learning systems that will become smarter, more accurate, and more useful over time as more students and educators continue to use them.

Ultimately, by helping to produce better educated, more skilled, and more knowledgeable students, AI will help to improve the American economy and international competitiveness.

Prediction #2: AI Will Never Replace Teachers; AI Will Help Them Do Their Jobs Better

Observers and analysts have noted the potential for AI both to eliminate jobs as well as transform existing jobs and create entirely new types of jobs. What will be the effect on the teaching profession of deploying AI-driven systems in the classroom?

The fear that AI will one day replace human educators is perhaps understandable, but let us state clearly our view that the far more likely effect of AI in education will be to make teachers even more meaningful facilitators of learning. Good teachers always have been and, in our view, will continue to be an irreplaceable cornerstone of effective learning in an AI-enabled world.

The importance of the personal connection, human interaction, and mentoring relationships fostered by educators with their students means that AI is likely to support teachers rather than replace them.

Rather, AI will be a tool used and guided by teachers—an incredibly intelligent teaching assistant—to help them in their mission to convey knowledge and develop critical thinking, reading, writing, and quantitative skills in their students. No matter what the advancements in AI, we believe that students will continue to need—and benefit greatly from—the assistance, guidance, support, and leadership of human educators.

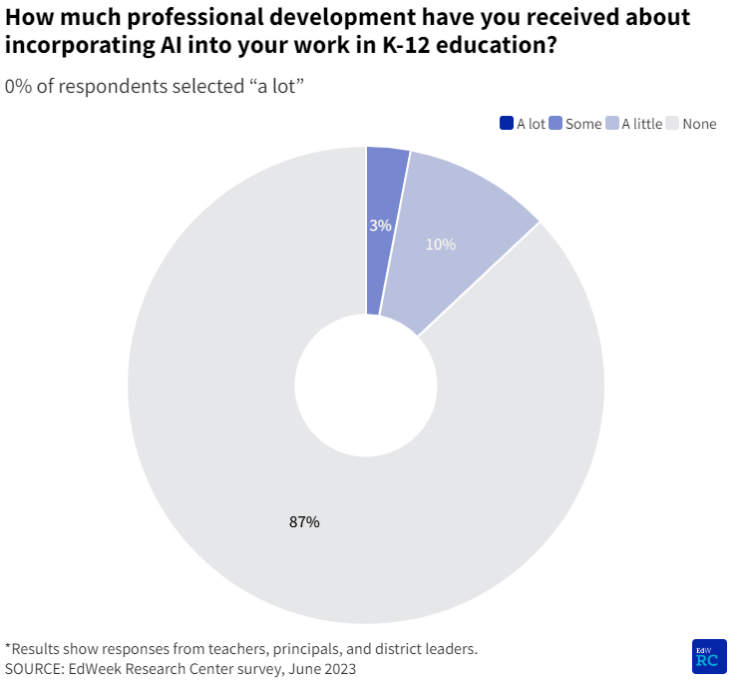
Prediction #3: AI Will Overcome The Numerous Challenges It Faces

The path to realizing the promise of AI in education is not without significant obstacles, but we believe that each of these challenges can and will be overcome, not only because of the continuous efforts of AI designers to improve their offerings but also because the stakes are so high. Below, we discuss several of the most oft-mentioned challenges facing AI adoption.

Potential Obstacle #1: The Training Gap

The "training gap" that is mentioned frequently in connection with AI adoption refers to the fact that many educators today are not well-versed in and have not been trained on how to use AI-driven systems. A recent survey noted that **more than 7 in 10 teachers have said they have not received any AI-related training or professional development on how to use AI in the classroom.** (See the chart below.)

We believe that this gap will be closed in several ways, including through teacher training (which can be encouraged and funded at both the state and federal level), online resources, and the ultimate development in each school of skilled AI practitioners who will help train their colleagues in the effective use of AI. We would note as well that we fully expect teachers to firmly embrace AI as it promises to make them more effective in their jobs, reduce their workload, and free time for them to focus on what they prefer to be doing, which is teaching and conveying knowledge and skills to their students.



Potential Obstacle #2: Privacy and Data Security

Privacy and data security are important issues in many facets of our wired and interconnected world and education is no exception. We expect that AI providers will prioritize privacy and data security in the educational arena, just as they have in virtually all other industries. In addition, the competitive pressure created by numerous vendors seeking to sell to the education market will likely ensure that these considerations will be given intense focus and appropriate safeguards established and improved over time.

Potential Obstacle #3: Potential Bias in AI Algorithms

Bias can be introduced in AI systems in a number of ways ranging from using biased data to train the algorithms to the incorporation of human bias in the formulation of algorithms. There are potential biases of many kinds, including racial, gender, and class bias and system designers and users must be vigilant about this possibility.

It would be wonderful if all bias could be eliminated and we would support that goal. And, yet, we would submit that this worthy goal is very likely not achievable, which does not mean that we should not continue our vigilant monitoring but more also means that we must closely monitor algorithms to make sure they do not disproportionately affect any students along racial, gender, or other lines.

Additionally, we would advocate for algorithmic transparency, which is to say to make it very clear what information the algorithm is considering and how it makes its decision. There will no doubt be ups and downs, but we are fundamentally sanguine about the power of human ingenuity to address these challenges directly and effectively.

CONCLUSION

The potential of AI to transform our educational system cannot be overstated. Just as AI is transforming other industries, so too will it transform our educational system by improving how students learn and enabling educators to do what they do best.

AI-driven systems will enable a major shift from a one-size-fits-all model to a highly adaptable system that provides personalized learning experiences that drive better student learning. The transformed educational system will provide truly personalized learning experiences to students, offer real-time, data-driven feedback to students and educators, improve accessibility of educational opportunities, automate non-core administrative tasks, and—most importantly—drive better educational outcomes for our students who represent the future of our country.

By harnessing the power of AI, we can create a future where our public education system is truly effective, provides truly personalized and empowering learning experiences, and enables teachers to fully unlock the full potential and talent of all students.