

# AFF

**We affirm the resolution resolved: In the United States, the benefits of the use of generative AI in education outweigh the harms.**

## Contention 1: Jobs

### **More jobs want generative AI skills** Wells 24

Wells, Rachel. "71% of Employers Prefer AI Skills above Experience in 2024." Forbes, 5 Nov. 2024, [www.forbes.com/sites/rachelwells/2024/11/05/71-of-employers-prefer-ai-skills-above-experience-in-2024/](https://www.forbes.com/sites/rachelwells/2024/11/05/71-of-employers-prefer-ai-skills-above-experience-in-2024/). Accessed 21 Feb. 2025.

[Rachel Wells: Forbes contributor and freelance writer who covers remote and flexible working, freelancing, side hustles, skill development, and AI, for Gen Z and Millennials; has been featured on Scripps News, MSN, and Business Insider; serial entrepreneur, LinkedIn Top Voice, silver winner of the London Chamber of Commerce's Young Business Person of The Year 2024 award, and is launching a tech start-up]

The next statistic states that **71% of business leaders** would give **preference to a candidate with less experience, as long as they had AI skills**. This signals good news for entry-level professionals. If you're seeking to break into a new industry, either as a career pivot or simply because you are just starting out in your professional life, **having AI skills will certainly give you a competitive edge when it comes to being considered for an entry-level role. The final highlight from Microsoft's study is that 77% of leaders state that with AI skills, entry-level professionals will be given greater responsibilities**. This clearly evidences that AI can give you the upper hand in your career, and actually propels you forward and enables faster professional development and growth than would be the case otherwise. AI skills are **indispensable in today's job market**. While **employers** are actively **seeking** professionals who can bring their **AI expertise** to enable greater ROI, **streamline processes, and remain competitive**, this is your opportunity to future-proof your career and be part of the innovation.

### **Torres 24**

Torres, Roberto. "Generative AI Jobs, Though Rare, Are on the Rise: Indeed." CIO Dive, 18 Mar. 2024, [www.ciodive.com/news/indeed-generative-AI-jobs-tech/710475/](https://www.ciodive.com/news/indeed-generative-AI-jobs-tech/710475/). Accessed 21 Feb. 2025.  
[Roberto Torres: editor for CIO Dive, covering the software industry, data analytics and the future of technology]

The company said **job postings directly related to generative AI skills spiked, going from 3 in every 100,000 job postings to 11 in 10,000 between January 2023 and February 2024**. "Growth in broader AI jobs is **far more muted than growth in GenAI-specific jobs**, even as the total level of broad AI jobs remains much higher," **said Nick Bunker, economic research director for North America at the Indeed Hiring Lab**, in a blog post. Dive Insight: Deploying enterprise-grade generative AI requires talent. Far from a plug-and-play capability, the outcomes of technology use hinge on having the right skill set on board. The talent market is reflecting this trend. **A previous Indeed report found jobseekers with generative AI skills could expect a nearly 50% salary bump compared to competitors who lack them**. On average, generative AI-savvy workers **command salaries of average salaries of up to \$174,727**. The speed at which the comparatively nascent subset of AI is developing is another factor making enterprise adoption challenging. **Nearly 3 in 4 executives said the accelerated technology change is surpassing their company's capacity to deploy advanced technologies like generative AI, according to an Infosys report published last week**. **Tech employers are shifting toward AI in their approach to the talent market, according to Bunker**. "For job seekers, this trend means tilting their interests and skills toward artificial intelligence if they want to land a tech role," Bunker said. "More broadly, increased hiring for AI-related jobs points toward deeper corporate investments in these technologies." **Employers had more than 436,000 open tech job postings in February, according to a CompTIA**

analysis of U.S. Bureau of Labor Statistics. **About 1 in 10** roles in that category are **related to AI or require** associated **skills**, according to the IT trade group.

## Students need to learn to use generative AI **Capgemini 23**

"Half of Secondary School Teachers Believe That Benefits of Generative AI in Education Outweigh the Risks." Capgemini, 30 May 2023, [www.capgemini.com/news/press-releases/half-of-secondary-school-teachers-globally-believe-that-benefits-of-generative-ai-as-an-educational-tool-outweigh-the-risks/](https://www.capgemini.com/news/press-releases/half-of-secondary-school-teachers-globally-believe-that-benefits-of-generative-ai-as-an-educational-tool-outweigh-the-risks/). Accessed 21 Feb. 2025.

[**Capgemini**: French multinational information technology (IT) services and consulting company, headquartered in Paris, France]

**Almost two thirds (64%) of secondary school teachers are convinced of the importance to develop students' digital skills to make them job-ready and the vast majority (82%) agree that compulsory education in digital skills would be beneficial to students.** However, the report highlighted a gap in confidence between adults and teenagers: **70% of teachers and 64% of parents believe that students have the necessary skills to be successful in today's workforce, while 55% of students aged 16-18 agree.** The research also finds that there is a significant gap in confidence between teachers in large cities (83%) and in rural areas (40%), and that urban 16-18 years old girls feel nearly twice more confident than in rural areas. Finally, teachers in rural areas are less likely to believe that digital literacy is a priority for their school than their peers in suburban and urban areas[1]. As per the research, **while 72% of students aged 16–18 feel confident about their basic digital literacy[2], less than half (47%) feel the same way about digital communication and data literacy[3] – attributes which are considered crucial for success in the modern workplace.** The report highlights that instilling confidence is key to empowering students to correctly identify fact from misinformation online. While the majority (80%) of students say they are confident in finding information online, fewer know which online sources to trust (66%) and even less are able to decipher fact versus opinion online (61%).

## There is already more demand for AI education **Gonzalez 24**

"Prepare Your Students to Meet the Demand for Generative AI-Related Jobs | EAB." EAB, 5 Sept. 2024, [eab.com/resources/blog/adult-education-blog/prepare-your-students-to-meet-the-demand-for-generative-ai-related-jobs/](https://eab.com/resources/blog/adult-education-blog/prepare-your-students-to-meet-the-demand-for-generative-ai-related-jobs/). Accessed 21 Feb. 2025.

[**Andrew Gonzalez**: Could not find]

We are not only seeing an increase in employer demand for AI skills, but also student demand for AI programs. **Between 2020 and 2023, reported master's-level completions for Artificial Intelligence programs increased from 297 to 935, a 215% increase. Based on this data, demand for learning AI skills appears to be growing.**

Offer Flexible, Generative AI-Related Programming

Professional, continuing, and online leaders should partner with their Computer Science and Engineering departments to offer flexible, generative AI-related program options (e.g., part-time, online, evening courses) to accommodate adult learners' personal and professional responsibilities, as some leaders in the space have already begun doing. **Carnegie Mellon University: CMU offers a graduate certificate in generative AI designed to accommodate working professionals' schedules with a 100% online modality and weekly evening courses. Purdue University: Purdue offers a generative AI bootcamp designed specifically for in-seat technology leaders and executives via online and self-paced courses.**

## IMPACT: Employment **Ellingrud 23**

Kweilin Ellingrud, et al. "Generative AI and the Future of Work in America." McKinsey & Company, 26 July 2023, [www.mckinsey.com/mgi/our-research/generative-ai-and-the-future-of-work-in-america](https://www.mckinsey.com/mgi/our-research/generative-ai-and-the-future-of-work-in-america). Accessed 21 Feb. 2025.

[**Kweilin Ellingrud**: attended Wellesley and Harvard, and majored in Economics and Political Science; attended Harvard Business School where she was co-president of the Women's Student Association]

The US labor market is going through a rapid evolution in the way people work and the work people do. Months after MGI released its last report on the future of work in America, the world found itself battling a global pandemic.<sup>1</sup> Since then, the US job market has come roaring back from its sudden drop. The nature of work has changed as many workers have stuck with remote or hybrid models and employers have sped up their adoption of automation technologies. **More recently, the accelerated development of generative AI, with its advanced natural language capabilities, has extended the possibilities for automation to a much wider set of occupations.** Amid this disruption, workers changed jobs at a remarkable pace—and a subset made bigger leaps and moved into entirely different occupations (Exhibit 1). **Some 8.6 million occupational shifts took place from 2019 through 2022. Now even more change is in store. We expect an additional 12 million occupational shifts by 2030. The total number of transitions through 2030 could be 25 percent higher than we projected a little over two years ago.**<sup>2</sup>

## Morgan Stanley 23

"Generative AI Is Set to Shake up Education | Morgan Stanley." Morgan Stanley, 2023, [www.morganstanley.com/ideas/generative-ai-education-outlook](https://www.morganstanley.com/ideas/generative-ai-education-outlook). Accessed 5 Mar. 2025.

[Morgan Stanley: an American multinational investment bank and financial services company headquartered at 1585 Broadway in Midtown Manhattan, New York City; offices in 41 countries and more than 90,000 employees; clients include corporations, governments, institutions, and individuals; ranked No. 61 in the 2023 Fortune 500 list of the largest United States corporations by total revenue and in the same year ranked #30 in Forbes Global 2000]

**Current generative AI technologies will likely affect a quarter of the occupations that exist today, rising to 44% within three years, according to Morgan Stanley Research estimates.** But fears that substantial job losses and permanent displacement of workers will ensue may prove unfounded in the long term. **Education providers could find themselves in a unique position to meet the growing need for retraining workers displaced by the technology—including by helping them learn skills needed to use or develop generative AI. Analysts estimate a \$16 billion market opportunity within the next three years from reskilling workers displaced by generative AI, assuming that around 6% of affected workers will need reskilling.** "History tells us major changes in technological paradigms are often followed by periods of disruption, typified by economic growth and net job creation—an idea at odds with current concerns about job destruction in the wake of generative AI," says Duvence.

## • Employment saves lives Brenner 21

Brenner, M. Harvey. "Unemployment, Bankruptcies, and Deaths from Multiple Causes in the COVID-19 Recession Compared with the 2000–2018 Great Recession Impact." American Journal of Public Health, vol. 111, no. 11, American Public Health Association, Oct. 2021, pp. 1950–59, <https://doi.org/10.2105/ajph.2021.306490>. Accessed 21 Feb. 2025.

[M. Harvey Brenner: Professor University of N. Texas Health Science Center, Department of Behavioral and Community Health & Bloomberg School of Public Health Johns Hopkins University]

**In the COVID-19 period of February to November 2020, unemployment was a significant predictor of excess deaths** controlling for the number of COVID-19 cases, age, and Black and Hispanic racial/ethnic groups (Table 1). **Using the same model, with identical controls, the combination of both recessional factors of unemployment and bankruptcies yielded an impact of further increased excess deaths** (Table 2). In the analysis presented in Table 2, which combines unemployment and bankruptcies, the numerical effect on excess deaths related to unemployment slightly decreased because of the relationship between unemployment and bankruptcies that typically would occur in a recession. **In the model that presents 10% unemployment (as currently estimated by the Federal Reserve and Department of the Treasury<sup>30</sup>) as the only recessional variable, an additional 48 149 deaths were estimated** (Table 1). **In the recessional model that included both unemployment and bankruptcies, the estimates of 10% additional unemployment led to 35 700 excess deaths, and a 120-unit increase per 100 000 in bankruptcies led to approximately 144 483 deaths.** Is this finding a unique, natural consequence of a recession related to a world pandemic or a partial reinstatement of the effects of recessions during the 21st century, specifically 2000 to 2018? Like total mortality, all major chronic disease causes of death showed significant beneficial effects of log GDP per capita with a 5-year lag and mortality increases related to unemployment without lag (Table 3). **The principal recessional variable, unemployment, showed evidence of elevated**

**mortality** during 2000 to 2018 (total mortality) **and major chronic causes of death and suicide** and continued to do so in the period February to November 2020 for total excess death. This indicates a continuous relationship of recession (especially indicated by unemployment rates) through the 2 research sample periods elevating mortality. The principal control variables showed **strong positive relations to total mortality and mortality by major cause**. However, the health care workforce with inverse relations to mortality featured as the strongest coefficient among predictive variables except GDP per capita with a 5-year lag (Table 3).

## Contention 2: Healthcare

### U.S. medical education is bad **Schenke 22**

Schenke, Maximilian. "The U.S. Medical Education System Is Not Producing Enough Doctors, and We Are Increasingly Unhealthy for It." The Michigan Daily, 31 Oct. 2022.  
[www.michigandaily.com/opinion/the-u-s-medical-education-system-is-not-producing-enough-doctors-and-we-are-increasingly-unhealthy-for-it/](http://www.michigandaily.com/opinion/the-u-s-medical-education-system-is-not-producing-enough-doctors-and-we-are-increasingly-unhealthy-for-it/). Accessed 21 Feb. 2025.

**Maximilian Schenke**: student at University of Michigan; Opinion Columnist at The Michigan Daily]

This has done nothing to improve the already existing shortage of healthcare workers, with **an AAMC report projecting a drastic shortage of as many as 122,000 physicians by 2032**. This same report coupled this prediction with the declaration that the entirety of the Baby Boomer generation, **a population comprising 21.16% of the U.S. population and many of our physicians, will become over 65. This entails a 48% increase in the amount of individuals over 65 in our country**. The issues with the U.S. healthcare system range far beyond just physician and patient numbers, and the effects of our deeply flawed system are showing in harrowing ways. **The U.S. is lagging far behind its equally-developed counterparts. A 2021 Commonwealth Fund study found that among some of the world's leading healthcare providers, seven of them European nations, the U.S. consistently ranked last in all but one of the five categories** assessed. An additional study compiling data from 2015 found that **among the world's most developed nations, eight of them European, the U.S. had a significantly higher mortality rate per 100,000, especially in regard to circulatory disease, which accounts for about a third of all deaths in the United States. The United States also ranked second worst in respiratory disease mortality rates, by far the worst in nervous system mortality rate and external causes of mortality (overdose, suicide and assaults), second worst in Endocrine disease mortality rate and had five times the maternal mortality rate per 100,000 live births. Among equally-developed nations, the U.S. also sports the highest percentage of obesity prevalence, a staggering 41.9% in 2017. As a result of all of these disastrous deficiencies, the U.S. had twice the average of years lost to premature death. Even more worrisome, these issues show no signs of improving**, as the index for healthcare quality and access has plateaued completely over the last decade. While a solution to all of these issues will require years of activism and significant legislative action, one aspect in which the U.S. is lagging behind most seems relatively straightforward. **Physician numbers per 10,000 in the United States average at some of the lowest in the developed world, 26.1, while most European nations average around 40. We are in dire need of more physicians.**

### Generative AI improves medical education **Reddy 24**

Reddy, S. Generative AI in healthcare: an implementation science informed translational path on application, integration and governance. Implementation Sci 19, 27 (2024). <https://doi.org/10.1186/s13012-024-01357-9>

[Sandeep Reddy: an Artificial Intelligence (AI) in healthcare researcher based at the Deakin School of Medicine besides being the founder/chairman of Healea]

In the context of medical education and training, this technology can be used to generate a wide variety of virtual patient cases. These cases can be based on a diverse range of medical conditions, patient demographics and clinical scenarios, providing a comprehensive learning platform for medical students and healthcare professionals [51, 52]. **One of the primary benefits of using generative AI in medical education is the ability to create a safe and controlled learning environment.** Medical students can interact with these virtual patients, make diagnoses and propose treatment plans without any risk to real patients. This allows students to make mistakes and learn from them in a low stake setting. **Generative AI can also create patient cases that are rare or complex, giving students the opportunity to gain experience and knowledge in areas they might not encounter frequently in their clinical practice.** This can be particularly beneficial in preparing students for unexpected situations and enhancing their problem-solving skills. Furthermore, the use of AI in medical education can provide a more personalized learning experience. **The AI can adapt to the learning pace and style of each individual, presenting cases that are more relevant to their learning needs.** For example, if a student is struggling with a particular medical condition, the AI can generate more cases related to that condition for additional practice. **In addition to creating virtual patient cases, generative AI can also be used to simulate conversations between healthcare professionals and patients** [51, 52]. This can help students improve their communication skills and learn how to deliver difficult news in a sensitive and empathetic manner. Moreover, **the integration of AI in medical education can provide valuable data for educators.** The AI can track the performance of students, identify areas of improvement and provide feedback, helping educators to refine their teaching strategies and curricula.

## Tkachenko 24

Tkachenko, Natalie. "Generative AI in Healthcare: Key Use Cases and Benefits – NIX United." NIX United – Custom Software Development Company in US, 25 Oct. 2024, [nix-united.com/blog/generative-ai-in-healthcare-use-cases-revolutionizing-patient-care/](https://nix-united.com/blog/generative-ai-in-healthcare-use-cases-revolutionizing-patient-care/). Accessed 21 Feb. 2025.

[Natalie Tkachenko: a HIPAA-certified expert with high-grade knowledge in the healthcare and pharmaceutical industries with 5+ years of experience]

Among other pivotal generative AI in healthcare use cases is medical training. **Studying medicine is notoriously expensive, both in terms of finances and time. Supplementing medical education with AI systems will reduce the overall bill and produce better-trained clinicians.** In combination with virtual reality and augmented reality (VR/AR), AI models can walk doctors through numerous scenarios to practice their skills in a simulation. **Aside from saving time and money, AI-powered medical training can also generate a wider spectrum of scenarios that cannot be done in a traditional setting.** Additionally, VR/AR simulations **feel a lot more real and urgent, which can help trainees feel fully immersed.**

## Generative AI is also being adopted in medicine Ghezzi 23

"How AI in Healthcare Could Save over 250,000 Lives Each Year and Become a \$188 Billion Market by 2030 -." Thejournalofmhealth.com, 6 Nov. 2023, [thejournalofmhealth.com/how-ai-in-healthcare-could-save-over-250000-lives-each-year-and-become-a-188-billion-market-by-2030/#:~:text=It%20has%20been%20estimated%20that,then%20250%2C000%20lives%20each%20year.](https://thejournalofmhealth.com/how-ai-in-healthcare-could-save-over-250000-lives-each-year-and-become-a-188-billion-market-by-2030/#:~:text=It%20has%20been%20estimated%20that,then%20250%2C000%20lives%20each%20year.) Accessed 21 Feb. 2025.

[Marzio Ghezzi: holds a Master Degree in Engineering and an Executive MBA]

And machines are capable of performing tasks at a faster and more accurate rate than humans. **It has been estimated that AI can reduce 86% of errors made by healthcare workers, which could save more than 250,000 lives each year.** A study involving 80,000 women in Sweden, recently published in The Lancet Oncology and reported by CNN, found that **AI helped healthcare workers detect 20% more cases of breast cancer, for example, whilst also avoiding an increase in false positives and reducing doctor workloads by 44%.**

## ODSC 24

Data, Open. "How Generative AI Is Revolutionizing Medical Education at Harvard." Medium, 22 Oct. 2024, [odsc.medium.com/how-generative-ai-is-revolutionizing-medical-education-at-harvard-13c0cd1a696a#:~:text=Harvard%20Medical%20School%20is%20embracing,environment%20increasingly%20influenced%20by%20AI](https://odsc.medium.com/how-generative-ai-is-revolutionizing-medical-education-at-harvard-13c0cd1a696a#:~:text=Harvard%20Medical%20School%20is%20embracing,environment%20increasingly%20influenced%20by%20AI). Accessed 26 Feb. 2025.

[ODSC: Open Data Science Conference; bring together AI practitioners, presenters, and companies that are shaping the present and future of AI and data science; hosting some of the largest gatherings globally; major conferences in the US, Europe, and Asia; mission is to foster the global AI community by providing a platform for AI engineers, data scientists, researchers, and professionals to exchange ideas, gain hands-on experience, and advance their careers through comprehensive conferences and training sessions]

**In addition to the curriculum overhaul, HMS launched a PhD program called AI in Medicine. The program saw an overwhelming response, with over 400 applicants for just seven spots.** "For a few years, there will be a huge gap in the workforce, so we want to train researchers who understand real healthcare challenges that AI can address," says Isaac Kohane, Professor of Biomedical Informatics at HMS. The demand for expertise in AI in medicine underscores the importance of preparing the next generation of medical researchers for AI-driven healthcare. Practical Applications in Hospitals

**AI is already making its way into HMS-affiliated hospitals. For example, Brigham and Women's Hospital is piloting an ambient documentation tool that automates clinical note-taking, freeing up physicians' time to focus on patient interaction.** "AI can reincorporate a human dimension to clinical practice by reducing administrative burdens," adds Taralyn Tan, Assistant Dean for Educational Scholarship and Innovation at HMS.

## IMPACT: Lives saved **Pearl 24**

Pearl, Robert. "Medical Education Needs Radical Reform: AI, Alone, Isn't the Answer." Forbes, 15 July 2024, [www.forbes.com/sites/robertpearl/2024/07/15/medical-education-needs-radical-reform-ai-alone-isnt-the-answer/](https://www.forbes.com/sites/robertpearl/2024/07/15/medical-education-needs-radical-reform-ai-alone-isnt-the-answer/). Accessed 21 Feb. 2025.

[Robert Pearl, M.D.: healthcare leader, author, educator, podcaster and Forbes contributor; for 18 years, he led The Permanente Medical Group (Kaiser Permanente); clinical professor of plastic surgery at the Stanford University School of Medicine and on the faculty at the Stanford Graduate School of Business; Pearl is board certified in plastic and reconstructive surgery]

Today, chronic diseases like diabetes and hypertension afflict 6 in 10 Americans, and are responsible for 1.7 million American deaths each year from heart attacks, strokes, cancer and other complications. These deaths are directly tied to a lack of prevention and effective disease management. Today, hypertension is the leading cause of stroke and is adequately controlled only 55% of the time. Diabetes, the leading cause of kidney failure and major contributor to cardiovascular disease, is controlled even less often. We know that control rates of 90% or more are possible with best practices, but not with today's approach. According to the CDC, 30% to 50% of the life-threatening complications from chronic disease could be avoided with effective management. **Teaching medical students how to use generative AI for continuous—not episodic—monitoring would radically improve the health of patients and our nation as a whole. Today's doctors have access to wearable monitors capable of measuring blood pressure and blood sugar. When linked with GenAI, these tools can reliably analyze patient health data and provide medical advice based on the expectations set by a clinician. With this combination, patients don't have to guess whether they need a physician's medical attention.** They know. And that expertise allows physicians to intervene sooner when there's a problem while reducing unnecessary office visits when chronic diseases are well-controlled. **Based on CDC data, successfully training the next generation of doctors to effectively monitor and manage chronic illnesses will save an estimated 510,000 to 850,000 lives each year with an annual reduction in healthcare spending of \$163 billion to \$272 billion.**



## Rebuttal Blocks:

### AI only makes up a fraction of global emissions **Kemene 24**

Kemene, Eleni, et al. "AI and Energy: Will AI Reduce Emissions or Increase Demand?" World Economic Forum, 22 July 2024, [www.weforum.org/stories/2024/07/generative-ai-energy-emissions/](https://www.weforum.org/stories/2024/07/generative-ai-energy-emissions/). Accessed 6 Mar. 2025.

[Eleni Kemene: Lead, Industry Decarbonization, Chemicals Sectors, World Economic Forum]

**AI's energy use currently only represents a fraction of the technology sector's power consumption, which is estimated to be around 2-3% of total global emissions.** This is likely to change as more companies, governments and organizations use AI to drive efficiency and productivity. Data centres are already significant drivers of electricity demand growth in many regions, as this chart shows.

### Only a fraction of data centers operate AI **The Week UK 24**

UK, The Week. "The Data Centres That Power the Internet." Theweek, The Week, 8 Sept. 2024, [theweek.com/tech/the-data-centres-that-power-the-internet](https://theweek.com/tech/the-data-centres-that-power-the-internet). Accessed 3 Mar. 2025.

[The Week UK: A weekly British news magazine founded in 1995 by Jolyon Connell, formerly of the right-of center Sunday Telegraph. Its main focus is news and commentary pertaining to important world events, as well as science, business and the arts]

**Data centres are the backbone of the internet and of much modern IT. They store, process, send and receive the data we produce and use. Each new development in IT** – such as the growth of social media, TV and music streaming, online gaming, online banking and cloud computing – **has led to the need for more data centres.**

### Answer: A new generative AI called Deep Seek uses a lot less energy.

**Marshall**, Christa. "'Game changer'? What 'DeepSeek' AI means for electricity." E&ENews by POLITICO, January 29, 20**25**, <https://www.eenews.net/articles/game-changer-what-deepseek-ai-means-for-electricity/>. Accessed February 14, 2025. [A graduate of Columbia University's Graduate School of Journalism, she formerly worked for The Denver Post and NPR.]

DeepSeek, which is owned by the Chinese stock trading firm High-Flyer, upended the tech world after releasing an app that rose to the top of the download charts of the Apple store. **It appeared to have similar functionality as OpenAI's ChatGPT chatbot,** which can do things like write poetry when queried. **DeepSeek** says its **model uses roughly 10 to 40 times less energy than similar U.S. AI technology** — **a reduction that** seemingly **would** sharply **cut the need for energy-gobbling data centers.** A Nature paper this month also reported that DeepSeek required about 11 times less computing resources than a similar one from Meta. That indicates "it may be an order of magnitude more efficient," said Jenkins.

### Answer: AI can optimize green energy sourcing.

**Johnson**, Alex. "AI and Energy Sustainability: Creating a Greener, Smarter World." Techresearches, February 12, 20**25**, <https://techresearchs.com/tie-tech/ai-and-energy-sustainability-creating-a-greener-smarter-world/>. Accessed February 14, 2025. [Founder, Author, and Chief Question Asker @FintechTakes]

AI-Powered Smart Grids **The integration of AI and energy management systems is enhancing smart grids by predicting demand, optimizing distribution, and minimizing waste.** Traditional power grids struggle with inefficiencies due to outdated infrastructure and unpredictable consumption patterns. AI-driven smart grids use machine learning algorithms to analyze real-time data, enabling grid operators to make informed decisions that improve reliability and reduce energy loss. AI in Renewable Energy Integration **AI is playing a crucial role in optimizing the integration of renewable energy sources like solar and wind into the power grid. Since renewable energy sources are often intermittent, AI helps forecast weather conditions, predict energy generation, and balance energy supply and demand effectively.** AI-powered storage solutions ensure that excess energy generated from renewables is efficiently stored and distributed when needed, reducing dependency on fossil fuels. AI in Energy Consumption Optimization **For industrial and commercial sectors, AI-driven energy optimization solutions analyze usage patterns and suggest measures to reduce waste.** AI-powered automation adjusts energy-intensive processes, such as heating, cooling, and lighting, based on real-time demand. These AI-driven systems not only cut costs but also lower carbon footprints, making energy consumption more sustainable.

## Answer: Generative AI increases student performance **Sun 24**

Sun, L., & Zhou, L. (2024). Does Generative Artificial Intelligence Improve the Academic Achievement of College Students? A Meta-Analysis. *Journal of Educational Computing Research*, 62(7), 1896-1933. <https://doi.org/10.1177/07356331241277937>

**Lihui Sun**: an associate professor in the Department of Educational Technology, School of Education, Minzu University of China. His research interests include computational thinking and programming education for children]

Using a meta-analytic approach, **this study analyses 65 independent studies on Gen-AI to enhance college students' academic achievement since 2022** to provide evidence on the effectiveness of Gen-AI to enhance college students' academic achievement. In addition, this study also explored the effects of different moderating variables on college students' academic achievement. These moderating variables provide more specific guidance for advancing the research and practice of Gen-AI-based teaching and learning activities in the future.

### Gen-AI Can Effectively Improve College Students' Academic Achievement

The **combined effect size** of Gen-AI **on college students' academic achievement is 0.533**, indicating that **Gen-AI has a moderate contribution to college students' academic achievement.** This is consistent with existing research, where Baidoo-Anu and Owusu Ansah (2023) reported a strong impact of Gen-AI on teaching and learning, where **Gen-AI significantly improved not only the cognitive level, but also the critical thinking, creative thinking, and problem-solving skills of college students** (Vázquez-Cano et al., 2021; Chang et al., 2022). At the same time, Gen-AI also contributes to the development of non-cognitive aspects of college students, such as boosting confidence (Essel et al., 2022; Sánchez-Ruiz et al., 2023), motivation and self-efficacy (Kim & Lee, 2023). **Overall, Gen-AI is effective in improving college students' academic achievement, and this effect varies significantly depending on the moderating variables.** If the moderating variables are properly combined, Gen-AI may be highly effective in improving the academic achievement of college students. In addition, the combined effect size of the medium may be because the use of Gen-AI in teaching and learning is not yet mature and widespread. This is explained by Rudolph et al. (2023), who argued that Gen-AI has the potential to enhance the teaching and learning experience through personalized learning materials, simulated conversation partners, and automated grading, but that at present, there may be technological limitations, cost issues, and teacher and student acceptance, leading to the fact that its application in the education field is not yet widely spread. **Therefore, in the face of this situation, the education field needs more investment and efforts to promote the application of Gen-AI in teaching.**

## Turn: Generative AI increases critical thinking **Sardi 25**



Sardi, Juli, et al. "How Generative AI Influences Students' Self-Regulated Learning and Critical Thinking Skills? A Systematic Review." *International Journal of Engineering Pedagogy (IJEP)*, vol. 15, no. 1, International Society for Engineering Education (IGIP), Kassel University Press, Jan. 2025, pp. 94–108, <https://doi.org/10.3991/ijep.v15i1.53379>. Accessed 23 Mar. 2025.

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**Generative artificial intelligence (AI), particularly tools such as ChatGPT, is transforming education by enhancing self-regulated learning (SRL) and critical thinking skills**, two essential competencies in the digital era. This study systematically analyzes the impact of generative AI on these skills using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework to identify, evaluate, and synthesize relevant studies. **Document searches were conducted in Scopus, Web of Science, and ScienceDirect, focusing on publications from 2022 to 2024, when ChatGPT was first widely adopted. Of the 3,214 documents identified, 557 met the initial screening criteria, and 38 studies were selected for detailed analysis. The findings reveal that 71.4% of studies reported AI's positive role in SRL, mainly through personalized learning, metacognitive support, and adaptive feedback. Likewise, 62.5% of studies reported its significant role in critical thinking, supporting the process of analysis, evaluation, and reflection.** However, researchers cautioned against an overreliance on technology, which one said could take away some students' ability to think for themselves. Such findings indicate that educational institutions need to change their ways and include generative AI in a model that focuses on areas that foster learner independence. This approach will assist teachers and decision-makers in harnessing the distinctive kitsch of AI technology by creating new learning spaces that are creative and future-oriented.

## Shumeiko 24

Shumeiko, N. V., and K. P. Osadcha. "Application of Artificial Intelligence in Higher Education Institutions for Developing Soft Skills of Future Specialists in the Sphere of Information Technology." *Journal of Physics Conference Series*, vol. 2871, no. 1, IOP Publishing, Oct. 2024, pp. 012027–27, <https://doi.org/10.1088/1742-6596/2871/1/012027>.

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As technological advancements continue to shape the landscape of education, **there is growing recognition of AI tools' role in developing vital soft skills for IT students.** As achieving the objectives set in this study allows us to equip pedagogues of higher education institutions with actionable tactics to direct students' efforts toward harnessing appropriate skills, we delved into the transformative potential of AI tools in developing the soft skills essential for the success of future IT professionals. For this, we stated three research questions, the answers to which we obtained in the process of the research in the following scope: (RQ 1). **Artificial intelligence tools or tools with elements of artificial intelligence are used to develop communication skills in training future IT professionals. In particular, AI tools are used for developing critical thinking, problem-solving, communication skills, creativity, flexibility, and independent learning.** (RQ 2). The survey results (appendix B) confirm that **AI tools have a noteworthy function in learning English as a foreign language by IT professionals. People acknowledge AI tools as resources that assist in generating ideas and enhancing writing styles.** At the same time, students are not confident in the use of AI tools in the learning process. They do not have the appropriate knowledge on how to apply AI to develop soft skills. (RQ 3). **AI technologies contribute to the development of soft skills in English language learning. To do this, teachers can use the capabilities of chats using generative artificial intelligence technologies.** Using the example of Microsoft Copilot, **particular prompts were proposed that allow future IT specialists to develop such skills as communication, negotiation, problem-solving, finding a common language with colleagues and clients and intercultural.** We also recommend developing public speaking skills using AI tools to improve the ability to communicate in business related themes (Yoodle, Verble, Gabble, Virtual Orator, Orai).

## AI still requires critical thinking skills

"11 Essential Skills for a Job in Artificial Intelligence." **Johns Hopkins Engineering** Online, 4 Dec. 20**24**,  
[ep.jhu.edu/news/11-essential-skills-for-a-job-in-artificial-intelligence/](https://ep.jhu.edu/news/11-essential-skills-for-a-job-in-artificial-intelligence/) //Ivy league department//  
**John Hopkins Engineering**:

#### Data Management and Processing

**AI professionals must handle large volumes of data with efficiency and expertise. They, therefore, must possess exceptional data management and processing skills.** These skills are used for cleaning, organizing, and preparing datasets before those sets train AI models.

Techniques like data wrangling, preprocessing, and understanding big data tools (e.g., Hadoop, Apache Spark) guarantee that AI models are built using accurate, high-quality data.

#### Analytical and Mathematical Skills

Mathematics forms the backbone of both artificial intelligence (AI) and machine learning (ML), as they allow for the development of sophisticated models and algorithms. **Professionals working in AI must be proficient in specific mathematical fields to** build accurate models, optimize performance, and **derive meaningful insights from data.**

#### Statistics and Probability

Statistics and probability form the foundations of AI, especially for tasks such as evaluating models, analyzing predictions, and making decisions. These fields help quantify uncertainty and allow AI systems to make predictions even with incomplete data.

For example, in supervised learning, statistical measures like mean squared error (MSE) are used to assess model performance. Bayesian probability is used in many AI models to update predictions as new data becomes available. Additionally, probabilistic models such as hidden Markov models rely on these principles to handle sequential data, like speech or time-series analysis.

#### Linear Algebra and Calculus

Both linear algebra and calculus are necessary for understanding the mechanics of machine learning models. Linear algebra provides the foundation for DL models by handling multi-dimensional datasets and operations like matrix multiplication. For example, techniques like singular value decomposition (SVD) are widely used in dimensionality reduction and recommender systems.

Calculus, particularly multivariable calculus, is foundational for optimization tasks in AI, such as gradient descent, where derivatives are calculated to minimize error functions and improve model accuracy.

#### Problem-Solving and Critical Thinking

**While machines can process large amounts of data, AI still requires the human capacity for creative problem-solving and logical reasoning to evolve and improve. These abilities drive the development of sophisticated algorithms and optimize AI systems for accuracy and efficiency.**

#### Creativity in Algorithm Design

Developers often need to think outside the box when crafting innovative algorithms or enhancing existing ones to solve problems. This creative process necessarily involves balancing multiple variables and constraints, envisioning new ways for AI systems to learn from data, and incorporating innovative techniques to improve outcomes. For example, AI systems that generate original art or music rely heavily on creatively designed algorithms that allow machines to mimic human creativity.

#### Logical Thinking and Deductive Reasoning

**Logical thinking and deductive reasoning come into play when troubleshooting AI models,**

debugging code, and optimizing algorithms. Developers must carefully analyze an AI system's behavior and identify issues to enhance performance as it grows.