What emoji best describes your current feelings about AI?

Click **Present with Slido** or install our [Chrome extension](#) to activate this poll while presenting.
EMPOWERING EDUCATORS & ENGAGING STUDENTS WITH ARTIFICIAL INTELLIGENCE

AUGUST 5, 2023

JET CONFERENCE

FOUNDATION for ECONOMIC EDUCATION
EST. 1946
Time to Reach 100M Users

Months to get to 100 million global Monthly Active Users

Google Translate: 78 months
Uber: 70 months
Telegram: 61 months
Spotify: 55 months
Pinterest: 41 months
Instagram: 30 months
TikTok: 9 months
ChatGPT: 2 months

Source: UBS / Yahoo Finance

@EconomyApp
GPT 4 (released March 14, 2023) is 571 times more capable than GPT 3 (released in 2020)

- GPT-3: 175,000,000,000
- GPT-4: 100,000,000,000,000
Transformative

How will this new technology impact education?
"If I had asked people what they wanted, they would have said faster horses."

HENRY FORD
JOHN CHAMBERLAIN

Technological Revolution Apparent Threat to Writers

The stocks of companies that make photocopying equipment have earned a lot of money for investors and speculators. But the authors and book publishers of America are beginning to suspect that what is meat for the photocopying industry will turn out to be poison for writers.

The stories are already going around literary circles about the professor of English in a Texas college who makes up his own anthologies for his students out of photocopied material, cheating poets and short stories, in the end, serve to make the life of the free lance more hazardous than it is at present. Beyond this, it poses a menace to the livelihood of scientists. Publishers of scientific material, which is usually expensive to print and which must sell to libraries and research institutions in large quantities if it is to be issued at a profit to anybody, stand to lose in the very near future if a few more pennies can be shaved from the cost of photocopying.

THE STOCKS of companies that make photocopying equipment have earned a lot of money for investors and speculators. But the authors and book publishers of America are beginning to suspect that what is meat for the photocopying industry will turn out to be poison for writers.

WRITERS, Too, Menaced By Technology

The stocks of companies that make photocopying equipment have earned a lot of money for investors and speculators. But the authors and book publishers of America are beginning to suspect that what is meat for the photocopying industry will turn out to be poison for writers.

COPY MACHINES POISON To Writers

THE STOCKS of companies that make photocopying equipment have earned a lot of money for investors and speculators. But the authors and book publishers of America are beginning to suspect that what is meat for the photocopying industry will turn out to be poison for writers.

COPY CATS Threat To U.S. Authors

The stocks of companies that make photocopying equipment have earned a lot of money for investors and speculators. But the authors and book publishers of America are beginning to suspect that what is meat for the photocopying industry will turn out to be poison for writers.
There is frictional pain and dislocation in that process, and sometimes the new jobs go to different people in different places, but over time the total number of jobs doesn’t go down, and we have all become more prosperous.
An IBM Electronic Calculator speeds through thousands of intricate computations so quickly that on many complex problems it's just like having 150 EXTRA engineers.

No longer must valuable engineering personnel... now in critical shortage... spend priceless creative time at routine repetitive figuring.

Thousands of IBM Electronic Business Machines... vital to our nation's defense... are at work for science, industry, and the armed forces, in laboratories, factories, and offices, helping to meet urgent demands for greater production.
What **jobs** are exposed to GPT?

**Low Exposure**
- Athletes
- Automotive Repairers
- Cement Masons
- Cooks
- Pile Driver Operators
- Stonemasons
- Tire Repairers and Changers
- Dishwashers
- Carpenter Helpers

**High Exposure**
- Interpreters + Translators
- Survey Researchers
- Writers and Authors
- Public Relations Specialists
- Tax Preparers
- Mathematicians
- Blockchain Engineers
- Proofreaders and Copy Markers
- Accountants and Auditors
Changes in Labor Markets: The first casualty of the AI revolution? (contract cheaters?)

AI is taking the jobs of Kenyans who write essays for U.S. college students

Ghostwriters say the meteoric rise of ChatGPT has coincided with a drop in income.

“The most I made in a month last year was $296. In March, I could barely get 10 assignments ... I didn't even hit $74.”

By MARTIN K.N SIELE
21 APRIL 2023 • NAIROBI, KENYA

- Kenya is a major hub for the contract cheating industry, where freelancers help American students write essays and handle classwork.
- The proliferation of AI tools like ChatGPT is reducing the earnings of Kenyans involved in contract cheating.
Advances in technical capabilities could have the most impact on activities performed by educators, professionals, and creatives.

<table>
<thead>
<tr>
<th>Occupation group</th>
<th>Overall technical automation potential, comparison in midpoint scenarios, % in 2023</th>
<th>Share of global employment, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educator and workforce training</td>
<td>With generative AI: 15%</td>
<td>Without generative AI: 64%</td>
</tr>
<tr>
<td>Business and legal professionals</td>
<td>With generative AI: 32%</td>
<td>Without generative AI: 62%</td>
</tr>
<tr>
<td>STEM professionals</td>
<td>With generative AI: 29%</td>
<td>Without generative AI: 57%</td>
</tr>
<tr>
<td>Community services</td>
<td>With generative AI: 39%</td>
<td>Without generative AI: 65%</td>
</tr>
<tr>
<td>Creatives and arts management</td>
<td>With generative AI: 28%</td>
<td>Without generative AI: 53%</td>
</tr>
<tr>
<td>Office support</td>
<td>With generative AI: 66%</td>
<td>Without generative AI: 87%</td>
</tr>
<tr>
<td>Managers</td>
<td>With generative AI: 27%</td>
<td>Without generative AI: 44%</td>
</tr>
<tr>
<td>Health professionals</td>
<td>With generative AI: 29%</td>
<td>Without generative AI: 43%</td>
</tr>
<tr>
<td>Customer service and sales</td>
<td>With generative AI: 29%</td>
<td>Without generative AI: 45%</td>
</tr>
<tr>
<td>Property maintenance</td>
<td>With generative AI: 29%</td>
<td>Without generative AI: 38%</td>
</tr>
<tr>
<td>Health aides, technicians, and wellness</td>
<td>With generative AI: 34%</td>
<td>Without generative AI: 43%</td>
</tr>
<tr>
<td>Production work</td>
<td>With generative AI: 73%</td>
<td>Without generative AI: 82%</td>
</tr>
<tr>
<td>Food services</td>
<td>With generative AI: 70%</td>
<td>Without generative AI: 78%</td>
</tr>
</tbody>
</table>
As a result of generative AI, experts assess that technology could achieve human-level performance in some technical capabilities sooner than previously thought.

**Technical capabilities, level of human performance achievable by technology**

<table>
<thead>
<tr>
<th>Capability</th>
<th>2010</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
<th>2060</th>
<th>2070</th>
<th>2080</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordination with multiple agents</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Creativity</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Logical reasoning and problem solving</td>
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<tr>
<td>Natural-language generation</td>
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<tr>
<td>Natural-language understanding</td>
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<tr>
<td>Output articulation and presentation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generating novel patterns and categories</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Sensory perception</td>
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<td></td>
<td></td>
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<tr>
<td>Social and emotional output</td>
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<td></td>
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<tr>
<td>Social and emotional reasoning</td>
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<td></td>
</tr>
<tr>
<td>Social and emotional sensing</td>
<td></td>
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</tr>
</tbody>
</table>
The advent of generative AI has pulled forward the potential for technical automation.

Technical automation potentials by scenario, share of time spent on work activities,$^1 \%$

- Updated early scenario including generative AI$^2$
- Updated late scenario including generative AI$^2$
- 2017 early scenario$^2$
- 2017 late scenario$^2$
The advent of generative AI has pulled forward the potential for technical automation.

Technical automation potentials by scenario, share of time spent on work activities, \(^1\) %

- Updated early scenario including generative AI\(^2\)
- Updated late scenario including generative AI\(^2\)
- 2017 early scenario\(^2\)
- 2017 late scenario\(^2\)
The economic potential of generative AI: The next productivity frontier

McKinsey Digital

The midpoint scenario at which automation adoption could reach 50 percent of time spent on current work activities has accelerated by a decade.

Global automation of time spent on current work activities, \( ^1 \) %

- Updated early scenario including generative AI
- Updated late scenario including generative AI
- 2017 early scenario
- 2017 late scenario

Midpoint 2017

50%
The economic potential of generative AI: The next productivity frontier

Global automation of time spent on current work activities, \(^1\) %

- Updated early scenario including generative AI\(^2\)
- Updated late scenario including generative AI\(^3\)
- 2017 early scenario\(^2\)
- 2017 late scenario\(^9\)

The midpoint scenario at which automation adoption could reach 50 percent of time spent on current work activities has accelerated by a decade.
Generative AI increases the potential for technical automation most in occupations requiring higher levels of educational attainment.

### Impact of generative AI on technical automation potential in midpoint scenario, 2023

<table>
<thead>
<tr>
<th>Education level</th>
<th>Overall technical automation potential, comparison in midpoint scenarios, % in the United States in 2023</th>
<th>Share of US employment, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master’s, PhD, or higher</td>
<td>28</td>
<td>13</td>
</tr>
<tr>
<td>Bachelor’s degree</td>
<td>36</td>
<td>22</td>
</tr>
<tr>
<td>Associate’s degree</td>
<td>45</td>
<td>9</td>
</tr>
<tr>
<td>Some college</td>
<td>48</td>
<td>22</td>
</tr>
<tr>
<td>High school diploma or equivalent</td>
<td>51</td>
<td>24</td>
</tr>
<tr>
<td>No high school degree</td>
<td>54</td>
<td>9</td>
</tr>
</tbody>
</table>
Transcribe a doctor’s visit into clinical notes.

Dr. Jeff Gladd
Integrative medicine physician

Dr. Gladd uses Nabla’s Copilot to take notes during online medical consultations. It’s a Chrome extension that listens into the visit and grabs the necessary details for his charts. Before: Writing up notes after a visit took about 20 percent of consult time. Now: The whole task lasts as long as it takes him to copy and paste the results from Copilot.
Is Chat GPT Smarter than a Student in Principles of Economics?

Jadrian Wooten, Ph.D.
jadrian@vt.edu
@Wootenomics
ChatGPT has Aced the Test of Understanding in College Economics: Now What?

Wayne Geerling 1, G. Dirk Mateer 1, Jadrian Wooten 2, and Nikhil Damodaran 3

Abstract

The Test of Understanding in College Economics (TUCE) is a standardized test of economics knowledge performed in the United States which primarily targets principles-level understanding. We asked ChatGPT to complete the TUCE. ChatGPT ranked in the 91st percentile for Microeconomics and the 99th percentile for Macroeconomics when compared to students who take the TUCE exam at the end of their principles course. The results show that ChatGPT is capable of providing answers that exceed the mean responses of students across all institutions. The emergence of artificial intelligence presents a significant challenge to traditional assessment methods in higher education. An important implication of this finding is that educators will likely need to redesign their curriculum in at least one of the following three ways: reintroduce proctored, in-person assessments; augment learning with chatbots; and/or increase the prevalence of experiential learning projects that artificial intelligence struggles to replicate well.
Exam results (ordered by GPT-3.5 performance)

Estimated percentile lower bound (among test takers)
Distribution of Pre- and Post-test Scores on Micro TUCE-4: Matched

Note: Data presented in Table 4 of the TUCE Examiner’s Manual (Walstad, Watts, and Rebeck 2007). The distribution of test scores is based on 3,255 college and university students who took the microeconomics version of the TUCE-4 as a pretest and posttest.
Distribution of Pre- and Post-test Scores on Macro TUCE-4: Matched

Note: Data presented in Table 5 of the TUCE Examiner’s Manual (Walstad, Watts, and Rebeck 2007). The distribution of test scores is based on 2,789 college and university students who took the macroeconomics version of the TUCE-4 as a pretest and posttest.

Created with Datawrapper
Our Thirst for Artificial Intelligence is Costly

Large language models like ChatGPT and Bard are energy-intensive and require massive server farms for training. Cooling those data centers also uses a lot of water.

**JADRIAN WOOTEN**
APR 17, 2023

- ChatGPT would need to “drink” a **16.9 oz water bottle** in order to complete a basic exchange with a user consisting of roughly 25-50 questions [Gizmodo]

- About **20%** of data centers in the U.S. rely on watersheds that are under moderate to high stress from drought and other factors [Lawrence Berkeley National Laboratory]

- By 2071, nearly half of the **204 freshwater basins** in the U.S. may not be able to meet the monthly water demand [Earth’s Future]

- Data centers are big energy consumers—a hyperscaler’s data center can use as much power as **80,000 households** [McKinsey & Company]

- Data centers accounted for around **1%** of global electricity demand in 2020 [Science]
Joel Miller was a public educator for 14 years before joining FEE. He was awarded the 2020 John Morton Excellence in the Teaching of Economics Award by the Council for Economic Education.

He enjoys being an active instructional leader in the economics teaching community. Joel aims to help young people learn economic reasoning and the timeless principles of liberty through development of FEE's Educational Programs and Teaching Resources.

Curriculum Development Manager
ATLANTA, GA
Twitter (X?): @mrjoelmiller
jmiller@fee.org
Realizing the Potential and Mitigating the Risks of AI for Education

How can we optimize the potential of AI, as well as mitigate the concerns about biases, inequities, misinformation, deepfakes, security, privacy and misuses of AI in order to fairly, safely, and productively use AI for teaching and learning? How can we prepare educators, parents and students to understand the potential and address these risks?

Sal Khan
Founder and CEO, Khan Academy

Chris Piech
Assistant Professor, Computer Science Education, Stanford University

John Mitchell
Mary and Gordon Crary Family Professor; Professor of Computer Science, and (By courtesy) Professor of Electrical Engineering; Professor of Education, Stanford University
Disrupted

ChatGPT's explosive growth shows first decline in traffic since launch

By Krystal Hu

July 5, 2023 5:06 PM EDT · Updated a day ago
Ethical Considerations:

FACT OR FICTION?
STUDENT STRUGGLES: Motivation
Using growth mindset phrases in class can help motivate students to overcome learning difficulties by emphasizing the importance of effort, resilience, and continuous learning.

Here are some growth mindset phrases you can use in the classroom:

1. "Mistakes are opportunities to learn and grow."
2. "Challenges help us develop new skills and abilities."
3. "With effort and practice, you can improve your skills."
4. "It's okay not to know, but it's important to be willing to learn."
5. "The more you practice, the better you'll become."
6. "Success comes from hard work and perseverance."
7. "You haven't mastered this yet, but you will if you keep trying."
8. "Believe in your ability to learn and grow."
9. "Your brain is like a muscle – the more you exercise it, the stronger it gets."
10. "Don't give up when things get tough – that's when the real learning happens."

---

Source: Dora Demszky, Assistant Professor of Education Data Science, Stanford University. AI+Education Summit: Generative AI for Education. https://hai.stanford.edu/events/aieducation-summit-ai-service-teaching-and-learning
Think-Pair-Share (3 mins):

“What are some **ethical considerations** and **best practices** for implementing AI like ChatGPT in your students’ learning? How could you handle possible challenges?”
Debrief:
“What is one key ethical consideration you discussed and a possible corresponding best practice or strategy identified in response.”
Strategies & Examples of Classroom Applications
QUICK START GUIDE FOR TEACHERS AND STUDENTS

- Expand or explain in step-by-step
- Act as though
- Simulate this scenario
- Create an outline for a story or writing prompt
- Ignore all previous instructions before this one
- Generate a list of questions about
- Show me this idea in real life, i.e., quadratic equation
- Play devils advocate...
- Summarize \{x\} for a \{n\}
- Summarize cold fusion for a 10 year old

AI PROMPT ENGINEERING

How you talk to the AI to get better responses
<table>
<thead>
<tr>
<th>LEVEL 1</th>
<th>LEVEL 2</th>
<th>LEVEL 3</th>
<th>LEVEL 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recall</td>
<td>Skills and concepts</td>
<td>Strategic thinking</td>
<td>Extended thinking</td>
</tr>
</tbody>
</table>

**Keywords:**

**LEVEL 1:**
- Identify
- Recall
- Use
- Measure

**LEVEL 2:**
- Complete multiple steps in order to find a solution
- Requires students to make informed decisions about problem-solving and procedures

**LEVEL 3:**
- Reasoning, planning, using evidence, or a higher level of thinking
- Requires students to draw conclusions from observations

**LEVEL 4:**
- Complex reasoning, developing, or thinking over a period of time
- Requires students to design and conduct an experiment

**Keywords:**

**LEVEL 1:**
- Classify
- Organize
- Estimate
- Collect & display data

**LEVEL 2:**
- Justify
- Explain
- Draw conclusions

**LEVEL 3:**
- Relate
- Make connections
Ask ChatGPT to help me practice interview skills.

Example

I want you to act as an interviewer. I will be the candidate and you will ask me the interview questions for the high school economics teacher position.
Prompt the Generative AI to become a tutor. 1-on-1 learning is best (but beware of misleading information).

The Wisdom of Practice: Lessons Learned from the Study of Highly Effective Tutors

MARK R. LEPPER
Department of Psychology, Stanford University, California

MARIA WOOLVERTON
Department of Pediatrics, Child Development Center, Georgetown University Medical Center, Washington, D.C.

Tutoring stages:
- **Problem selection** based on student’s current knowledge.
- **Problem presentation** with motivation and context.
- **Problem solution** by student, with scaffolding, assistance, encouragement, and feedback.
- **Reflection** on lessons learned from the solution process.
- **Instruction** on new material.
I want you to debate a topic with me. You should take the opposite stance to mine. I feel increasing the minimum wage is harmful to the economy and decreases employment.
Strategy

Student ask ChatGPT for a “list of 5” or listed examples of a topic. Students pick what they think is the top reason provided in the response and defend their choice. They could also find an article associated with their selection.

Example

What are 5 ways to improve the Labor Force Participation Rate in the U.S.?
Strategy

Provide students with a graph and ask them to identify something significant they notice and ask ChatGPT for more information.

Example

Provide a graph of the stock price for Ford Motor Company to students and have them describe something on the graph in a ChatGPT prompt to obtain a response that tells more of the story about that topic and that particular time period. i.e. students can ask why the stock price increased significantly in 1998.
Strategy

Make the text more approachable.

Example

Paste the most recent FOMC Statement. Tell ChatGPT to rewrite the statement in the style of LL Cool J.
Strategy

Have ChatGPT act as a historian.

Example

I want you to act as a historian. You will research and analyze cultural, economic, political, and social events in the past, collect data from primary sources and use it to develop theories about what happened during various periods of history. My first suggestion request is "I need help uncovering facts about redlining in Cincinnati".
Strategy

Ask ChatGPT to create a scenario for students to utilize in a role play situation.

Example

Provide a scenario where I need to act as an underwriter for an auto insurance policy and determine the level of risk and cost of insurance.

Follow-up: Provide a scenario for a more risky driver.
Ask students to create a prompt that may have generated the provided response.

Example

Provide students the response to your ChatGPT prompt: Generate a list of concepts found on a pay stub for students to know before starting their first job.
Strategy

Have ChatGPT help students explore the difficulties faced by entrepreneurs.

Example

What are realistic situations Elon Musk faced in developing SpaceX and what solutions were developed to combat these problems?
Strategy

Provide tutoring or coaching.

Example

I have a test tomorrow about Period 8 in my AP U.S. History class. Act as my tutor and help me prepare for the test.
Strategy

Ask ChatGPT to summarize a passage of text and change the reading level.

Example

Paste a Wall Street Journal article and ask it to summarize it as if you were 12.
Ask ChatGPT to create a review guide.

Create a review guide for a test on the use of social media for my high school marketing class.

Follow-up: Can you provide a description for each of the topics?
Strategy

Ask ChatGPT to help you write your lesson plans.

Example

Write a lesson plan for me. I am a high school economics teacher and have to teach market structures.
Strategy

Ask ChatGPT to create your next test.

Example

Create a 15 question multiple choice test with 3 free response questions for a high school personal finance class. The topic is managing credit.
Strategy

Have ChatGPT create an answer key (with mistakes) to a test.

Example

Paste in the text from your multiple choice test and watch ChatGPT do its magic. Ask it to make 5 mistakes and have students see if they can identify those mistakes as review for a test.
I am a high school business student and need to write a paper about the importance of entrepreneurs in our economy. Provide an outline for my writing.
Strategy

Have ChatGPT create a tweet from a text submission. Or have it create a title for a text submission.

Example

Provide students a recent news article about the economy with the title redacted. Have students come up with what they think the title should be or create a tweet. Paste text from the newspaper article into ChatGPT and ask it to create a tweet or title. Ask students which is better, the AI or human creation.
Strategy

Use ChatGPT to provide an outline of a topic and then have students supply the images to tell the story.

Example

Provide an outline of the history of Apple.
Strategy

Have ChatGPT be your business consultant in a role play situation.

Example

Act as a consultant for my business. I am a restaurant owner and am falling into debt. My revenues are not keeping pace with my expenses. What should I do?

Follow-up: What are normal food costs for a restaurant that specializes in items like hamburgers and chicken sandwiches?
Strategy

Use ChatGPT to outline a business plan.

Example

Create a business financial plan to start a new food truck business in your community. Determine what type of food truck will benefit your community and the funds needed for the start-up. Include data or research that will help to make informed decisions about future resources and goals. Include the general operating costs of your food truck, start-up costs, and a plan of action of where to park your mobile business.
Pixar image of
Federal Reserve
Chairman
Jerome Powell
How far have we come in one year?

Midjourney, March 2022 vs. Midjourney, March 2023 -- same prompt ("Donald Trump and Barack Obama playing basketball")
Please Complete Session Survey!
https://www.tfaforms.com/5079059

FOUNDATION for ECONOMIC EDUCATION
EST. 1946
Reflect

I used to think...
but now I think...