

# $\hat{\Sigma}$

# What emoji best describes your current feelings about AI?

Click Present with Slido or install our <u>Chrome extension</u> to activate this poll while presenting.

# EMPOWERING EDUCATORS & ENGAGING STUDENTS WITH ARTIFICIAL INTELLIGENCE

AUGUST 5, 2023

JET CONFERENCE



FOUNDATION for ECONOMIC EDUCATION

EST. 1946





Session Resources



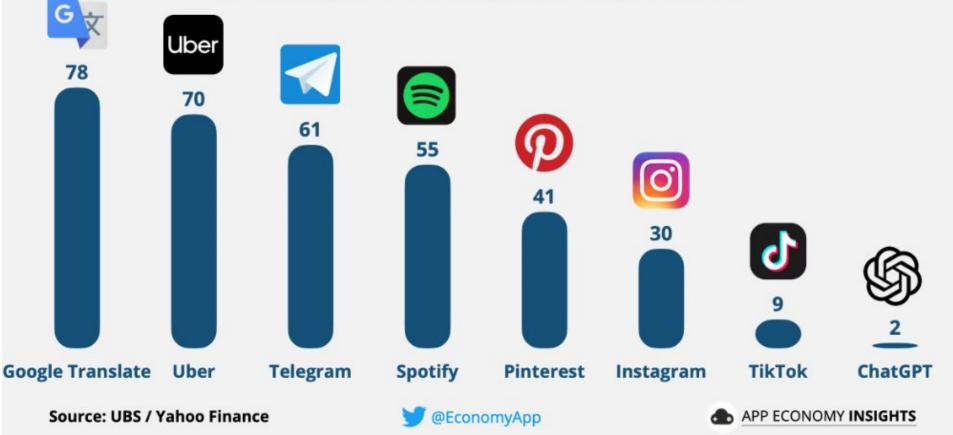


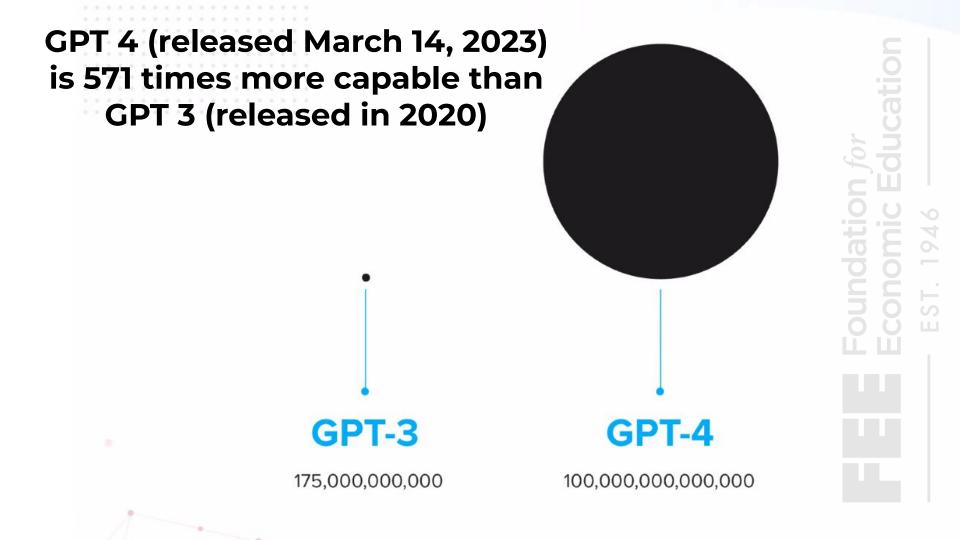
### **Derek D'Angelo**

ddangelo@fee.org

# **Time to Reach 100M Users**

### Months to get to 100 million global Monthly Active Users







# Transformative How will this new technology impact education?



Foundation *for* Economic Education ST. ш П

"IFIHADASKED **PEOPLE WHAT** THEY WANTED, THEY WOULD **HAVE SAID** FASTER HORSES."

HENRY FORD



Elementary school teachers picket against use of calculators in grade school The teachers feel if students use calculators too early, they won't learn math concepts

# Math teachers protest against calculator use

### JOHN CHAMBERLAIN **Technological Revolution Apparent Threat to Writers**

The stocks of companies that members of the authors league. make photocopying equipment

The stories are already going have earned a lot of money for the rounds of literary parties investors and speculators. But about the professor of English the authors and book publishers in a Texas college who makes up of America are beginning to sus- his own anthologies for his stupect that what is meat for the dents out of photocopied matephotocopying industry will turn rial, cheating poets and short

must, in the end, serve to make the life of the free lancer 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 li-Hentione maniog and res

THESE DAYS - By John Chamberlain

### Writers, Too, Menaced By Technology

The stocks of companies that There is a possibility, of course casualties would be the very books make photocopying equipment that he is just as fictional as the needed for scientific progress. have earned a lot money for in-short stories he is supposed to So, by a parlay, the continued vestors and speculators. But the filch by photocopying. But as a improvement of photocopying techavidors and book publishers of legend he stands as a premoniton needs with rob a potentially a merica and the stands and the stands as a premoniton needs we have a potentially that what is meril for a suspect of the future, when photocopying created to keep the U.S. abreast of conving industry will thum out to will have become even cheaper have the stands as a premonitor of the stands as a stand as a sta copying industry will turn out to than it is now.

# 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. The reason is that no royalties and

no wholesale or retail purchase prices are paid on book pages that are photographed, or reproduced by heat transference, or even microfilmed for a researcher's convenience. Nobody knows, of course, just how many sales of a book are lost because libraries are willing to, provide coyping services for their patrons for a small fee. To date, the cost of photocopying a whole book would amount to more than the bookstore price. But crucial pages and chapters suffice some potential book buyers, and it is this fact that has alerted the book publishers and the complaining members of the Authors league.

THE STORIES ARE already going the rounds of literary parties about the professor of English in a Texas college who makes up his own anthologies for his makes up ins own anticologies for ma

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. . . . .

SPEAKING RECENTLY at the American University in Washington, D. C., Curtis Benjamin of the McGraw-Hill Publishing Co., said: "The publisher of advanced treatises and monographs must depend upon . . . specialized libraries for basic support. I would estimate that if this basic supporting market should be diminished by as much as 40 per cent or 50 per cent, at least one-third of McGraw-Hill's current of America are beginning to susat least one-third of alcorawining to sus-lists of scientific and technical books peet that what is meat for the could not be published. And these casual photocopying industry will turn ties would be the very books needed for out to be poison for writers. scientific progress."

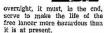
So, by a parlay, the continued im-tics and no wholesale or retail provement of photocopying technology purchase prices are paid on book might rob a potentially creative scientist pages that are photographed, or of a key book needed to keep the U. S. reproduced by heat transference, abreast of the Soviet Union in, say, rocket- ir even microfilmed for a rery, or underground miniaturization of nu-icarcher's convenience, clear testing. The advance of technology in one field could result in a scientific lag in many others.

### **Copy Cats Threat** To U.S. Authors

#### By John Chamberlain

The stocks of companies that make photocopying equipment have earned a lot of money for investors and speculators. But the authors and book publishers

The reason is that no royal-



By John Chamberlain: Publishers See

Piracy Threat In Photocopies

THE STOCKS of companies that

make photocopying equipment have

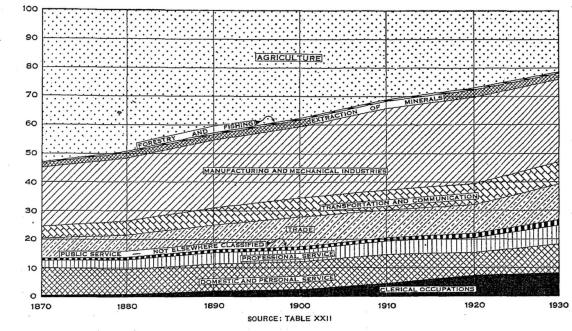
Beyond this, it poses a menace to the livelihood of scientists. Publishers of scientific material, which is usually expensive to print and which must sell to librarles and research institutions in big quantities if it is to be issued at a profit to anybody, stand to lose in the very near future if a few more pennics can be shaved from the cost of photocopying.

### **Lump of Labor Fallacy**

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.

#### DIAGRAM 4.—PERCENT DISTRIBUTION OF GAINFUL WORKERS BY GENERAL DIVISIONS OF OCCUPATIONS, FOR THE UNITED STATES: 1870 TO 1930

#### PERCENT



### 150 Extra Engineers

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.

IBM

INTERNATIONAL BUSINESS MACHINES

### 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



- 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 Al revolution? (contract cheaters?)

LABOR

# Al 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.

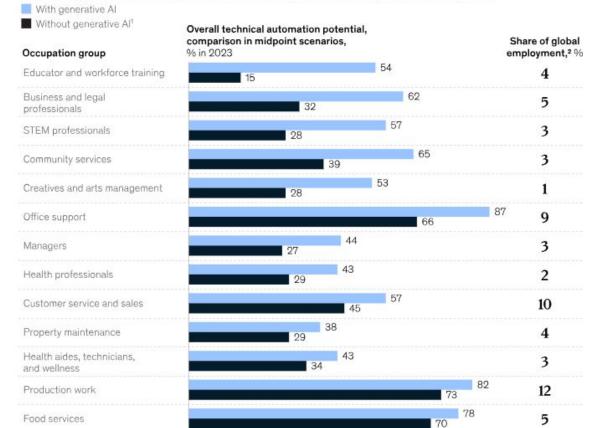
"The most I made in a month last



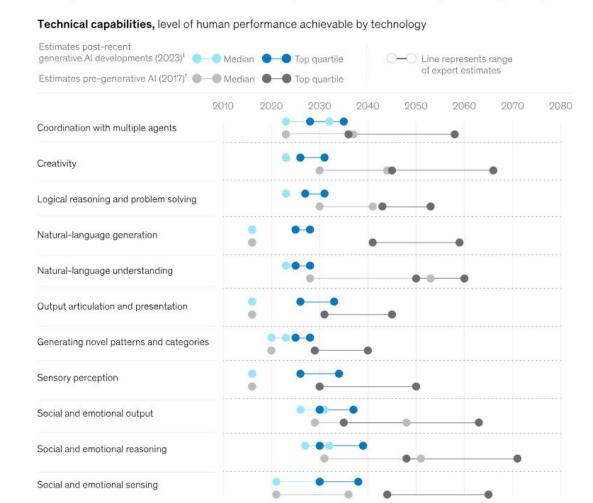
- Kenya is a major hub for the contract cheating industry, where freelancers help American students write essays and handle classwork.
- The proliferation of AI tools like ChatGPT is reducing the earnings of Kenyans involved in contract cheating.

Advances in technical capabilities could have the most impact on activities performed by educators, professionals, and creatives.

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

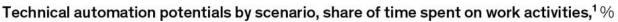


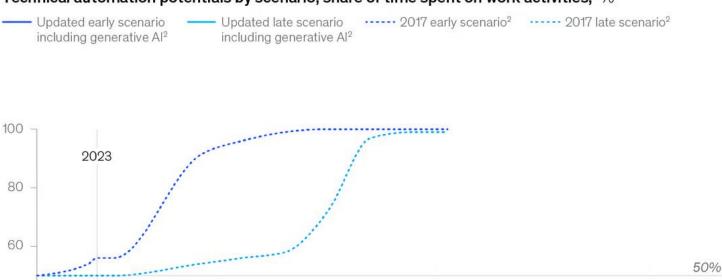
### As a result of generative AI, experts assess that technology could achieve humanlevel performance in some technical capabilities sooner than previously thought.





# The advent of generative AI has pulled forward the potential for technical automation.





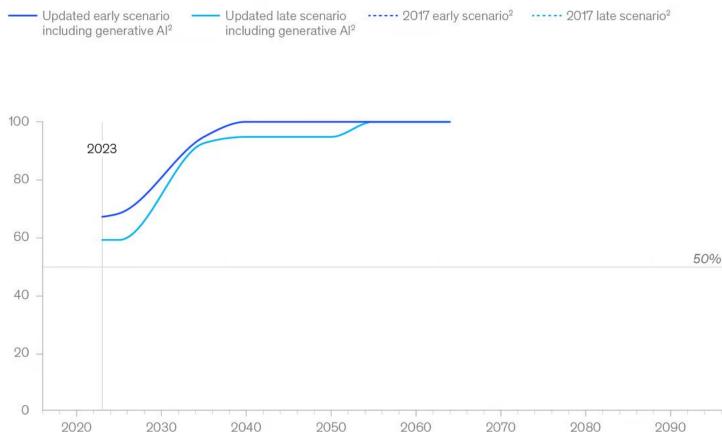
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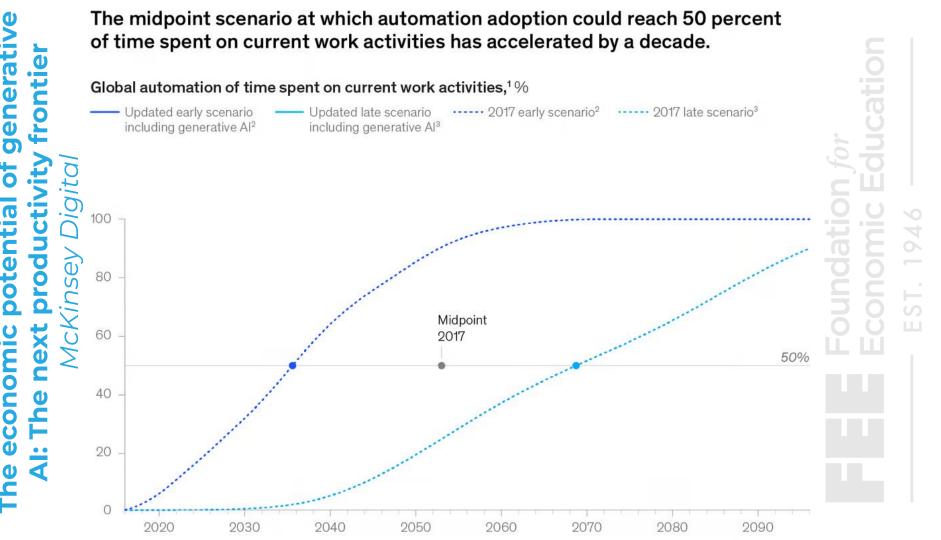
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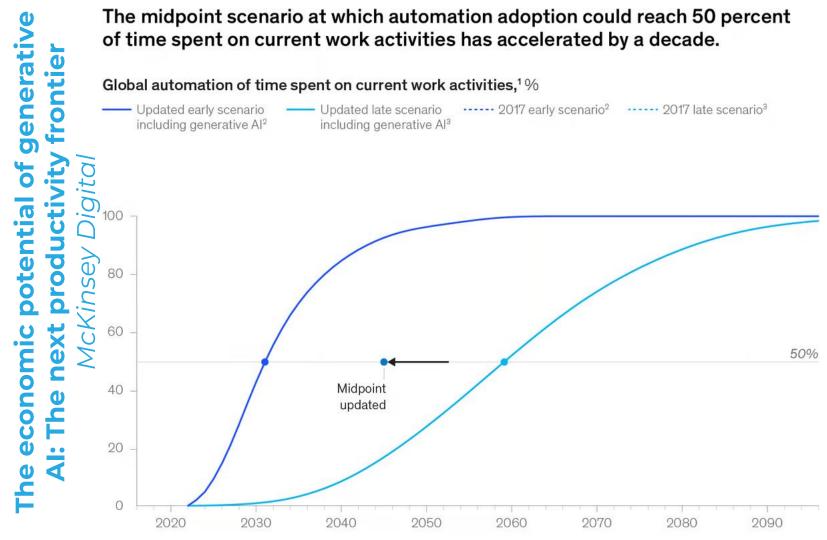
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# The advent of generative AI has pulled forward the potential for technical automation.

### Technical automation potentials by scenario, share of time spent on work activities,<sup>1</sup>%







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# 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

- With generative Al
- Without generative Al<sup>1</sup>

### Education level

Master's, PhD, or higher

Bachelor's degree

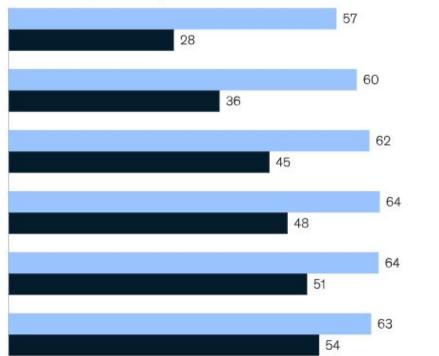
Associate's degree

Some college

High school diploma or equivalent

No high school degree

Overall technical automation potential, comparison in midpoint scenarios, % in the United States in 2023



Share of US employment, %

13

22

9

22

24

9



# Transcribe a doctor's visit into clinical notes.

Dr. Jeff Gladd Integrative medicine physician

Dr. Gladd uses Nabla's <u>Copilot</u> 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

Original Research Article

# **ChatGPT has Aced the Test of Understanding in College Economics: Now What?**

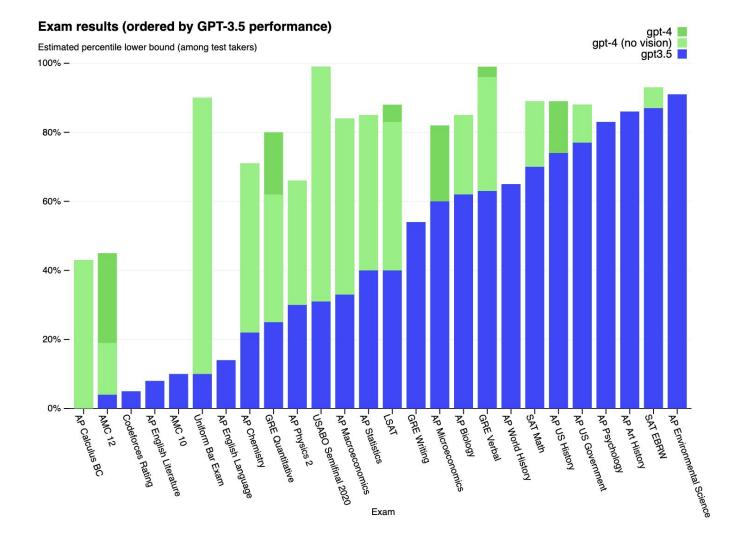
### <sup>the</sup> american economist

The International Honor Society in Economics

Wayne Geerling (D)<sup>1</sup>, G. Dirk Mateer<sup>1</sup>, Jadrian Wooten<sup>2</sup>, and Nikhil Damodaran<sup>3</sup>

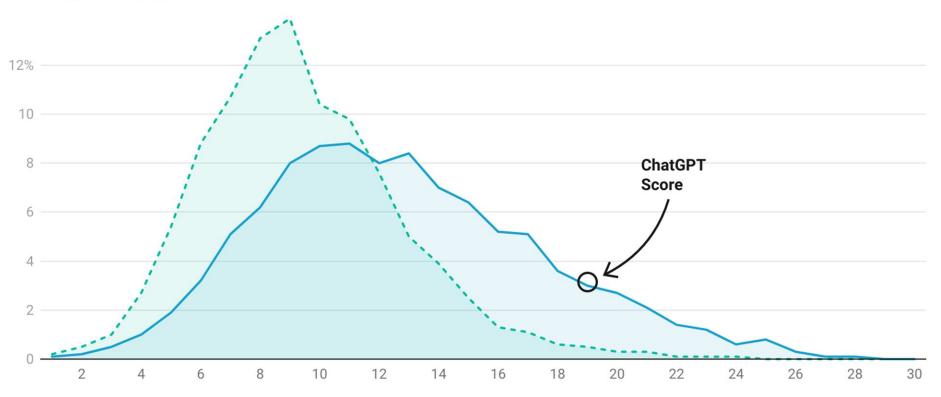
### Abstract

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.



### Distribution of Pre- and Post-test Scores on Micro TUCE-4: Matched

- - Pre Test — Post Test

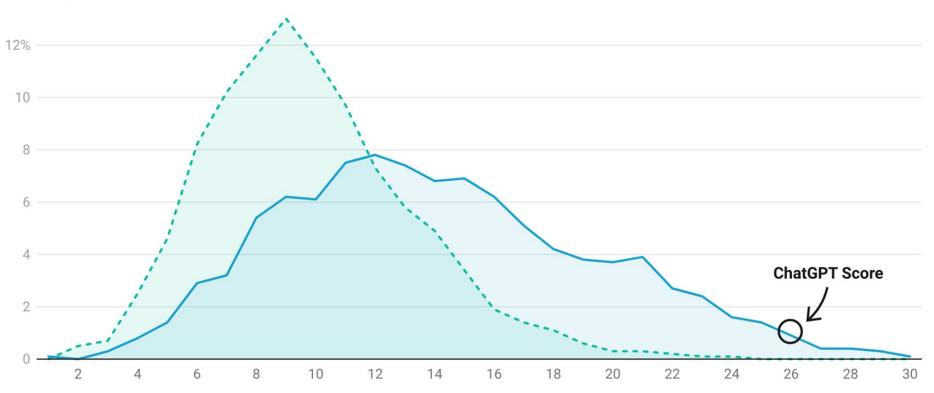


Note: Data presented in Table 4 of the TUCE Examiner's Manual (Walstad, Watts, and Rebeck 2007). The distribution of test scores is based on 3,255 college and university students who took the microeconomics version of the TUCE-4 as a pretest and posttest.

Created with Datawrapper

### Distribution of Pre- and Post-test Scores on Macro TUCE-4: Matched

- - Pre Test — Post Test



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]

Monday Morning Economist





# FOUNDATION for ECONOMIC EDUCATION EST. 1946

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

Joel Miller

### AI+Education Summit: AI in the Service of Teaching and Learning

Accelerator fo



5:19-6:10

Stanford University

# 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



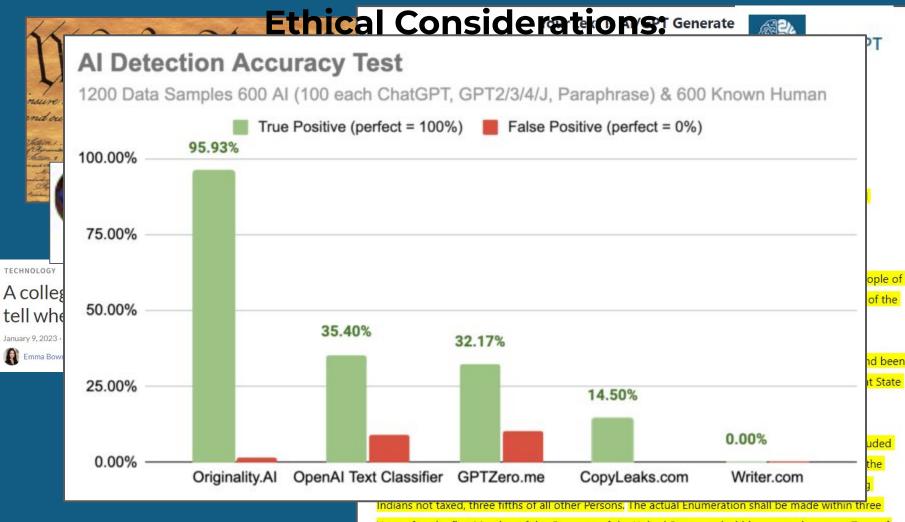
Chris Piech Assistant Professor, Computer Science Education, Stanford University



### John Mitchell

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





Years after the first Meeting of the Congress of the United States, and within every subsequent Term of





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?**



### Al+Education Summit: Al in the Service of Teaching and Learning



### 13:45-14:45

Stanford University Human-Centered Artificial Intelligence

# STUDENT STRUGGLES: Motivation



# **Room for Instructional Improvement**



What are some growth mindset phrases I can use in class to motivate students to overcome learning difficulties?

- \$ Tea of 1Grd to $\bigcirc$ So Su htt
- 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:
- L. "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."

35%

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# AI Ethics in Action: Charting The Path Forward

### 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?"

# AI Ethics in Action: Charting The Path Forward

### **Debrief:**

"What is one key **ethical consideration** you discussed **and** a possible corresponding **best practice** or strategy identified in response."









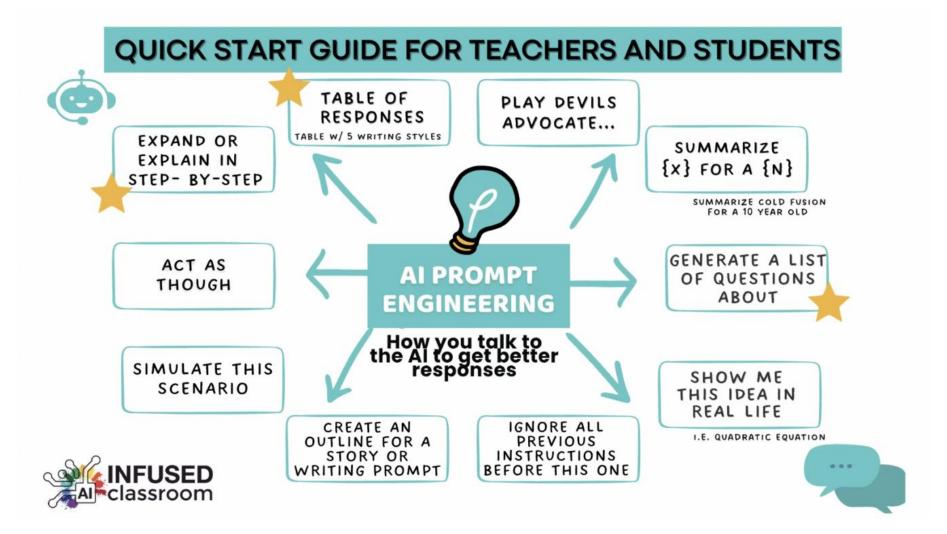
### Derek D'Angelo

### ddangelo@fee.org

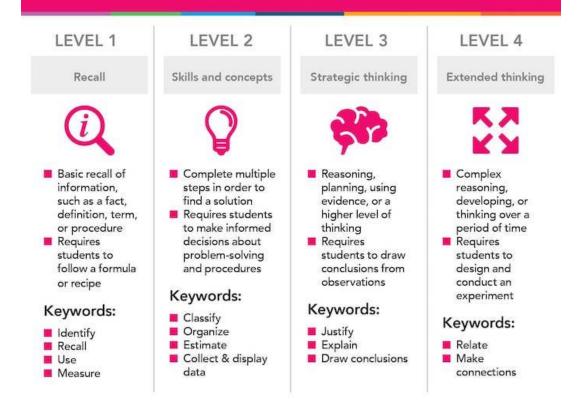


**Strategies & Examples of** Classroom **Applications** 





#### DOK DEPTH OF KNOWLEDGE SNAPSHOT





## Ask ChatGPT to help me practice interview skills.



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.



Example

# 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.



#### Debate with ChatGPT.

#### Example

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. 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.



#### Make the text more approachable.



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



#### 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".



## 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.



## 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?



#### Provide tutoring or coaching.



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.



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



Paste a Wall Street Journal article and ask it to summarize it as if you were 12.



#### Ask ChatGPT to create a review guide.

#### Example

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?



## Ask ChatGPT to help you write your lesson plans.



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



#### Ask ChatGPT to create your next test.



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



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



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.



## Ask ChatGPT to create an outline for a paper.



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. 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.



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



Provide an outline of the history of Apple.

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



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?

#### 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





Midjourney, March 2022 vs. Midjourney, March 2023 -- same prompt ("Donald Trump and Barack Obama playing basketball")

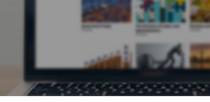


# Foundation for Economic Education





**Learning Center** 









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STANDARD 2: DECISION MAKING

STANDARD 3: ALLOCATION

STANDARD 5: TRADE

INCENTIVES

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STANDARD 7: MARKETS AND PRICES

STANDARD 8: ROLE OF PRICES

STANDARD 9: COMPETITION AND MARKET STRUCTURE

STANDARD 10: INSTITUTIONS

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#### Please Complete Session Survey! https://www.tfaforms.com/5079059

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