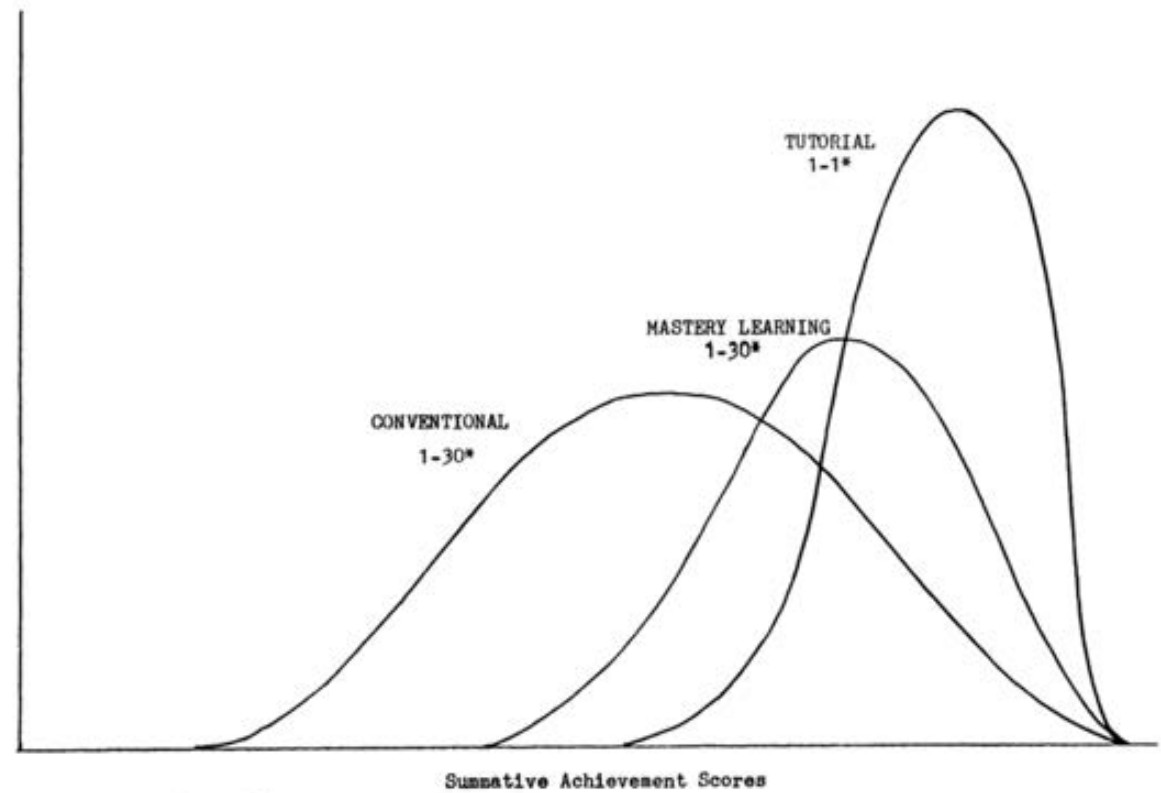


The 2 Sigma Problem: The Search for Methods of Group Instruction as Effective as One-to-One Tutoring

BENJAMIN S. BLOOM
University of Chicago and Northwestern University

FIGURE 1. Achievement distribution for students under conventional, mastery learning, and tutorial instruction.



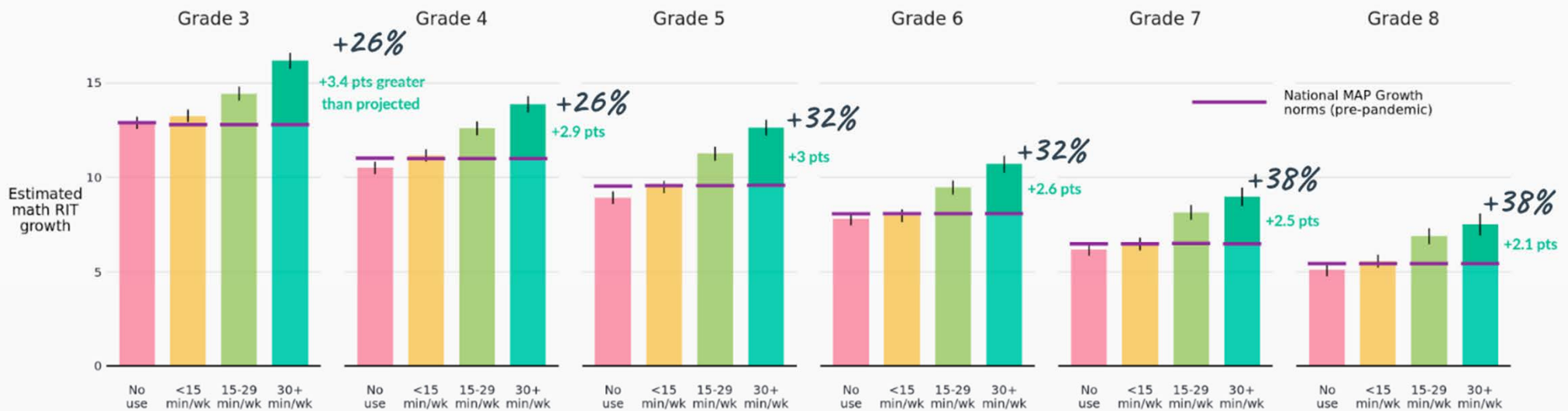
*Teacher-student ratio

June/July 1984

Across all grades use of MA for 30+ min/wk is associated with greater than expected growth, per NWEA national pre-pandemic grade-level norms

Association between MAP Growth math gains and MAP Accelerator usage

Note: Growth norms for each MAP Accelerator usage group vary slightly within grade due to differences among groups in baseline (Fall 2021) RIT score.



Source: Khan Academy/NWEA

**New York City Schools Ban
ChatGPT Amid Cheating Worries**

-CNET

*Alarmed by A.I. Chatbots, Universities
Start Revamping How They Teach*

-New York Times

**Professor catches student cheating
with ChatGPT: 'I feel abject terror'**

-New York Post

ChatGPT and the Death of Education

-Harvard Independent



Flags

Check a11y

Assign

Equations with parentheses

CCSS.Math: [8.EE.C.7](#), [8.EE.C.7b](#) Google ClassroomSolve for m .

$$3 - 2(9 + 2m) = m$$

$m =$

Stuck? [Review related articles/videos or use a hint.](#)[Report a problem](#)

Start over Do 4 problems

Check

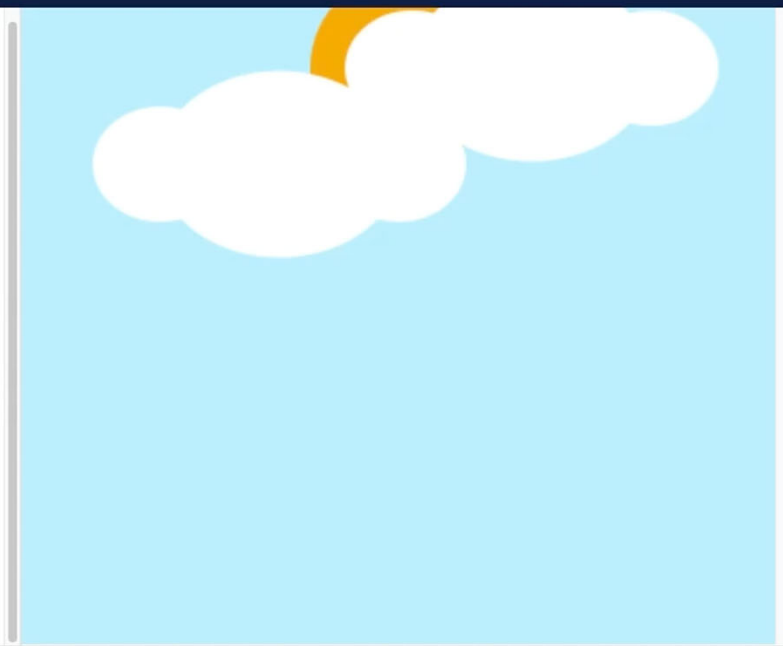


Flags

Check a11y

Assign

```
9 fill(255, 170, 0);
10 ellipse(200, 100, sunRadius, sunRadius);
11
12 // clouds
13 fill(255, 255, 255);
14 // left cloud
15 ellipse(leftX, 150, 126, 97);
16 ellipse(leftX+62, 150, 70, 60);
17 ellipse(leftX-62, 150, 70, 60);
18
19 // right cloud
20 ellipse(rightX, 100, 126, 97);
21 ellipse(rightX+62, 100, 70, 60);
22 ellipse(rightX-62, 100, 70, 60);
23
24 |
25
26 };
```



Undo

Start over



 Restart

Step 2/3



Next step



Up next: project



Flags

Check a11y



Khanmigo beta

AI power



This conversation is recorded and viewable by your teacher.

[Leave feedback](#)

Rate this response



Why do I need to learn this?



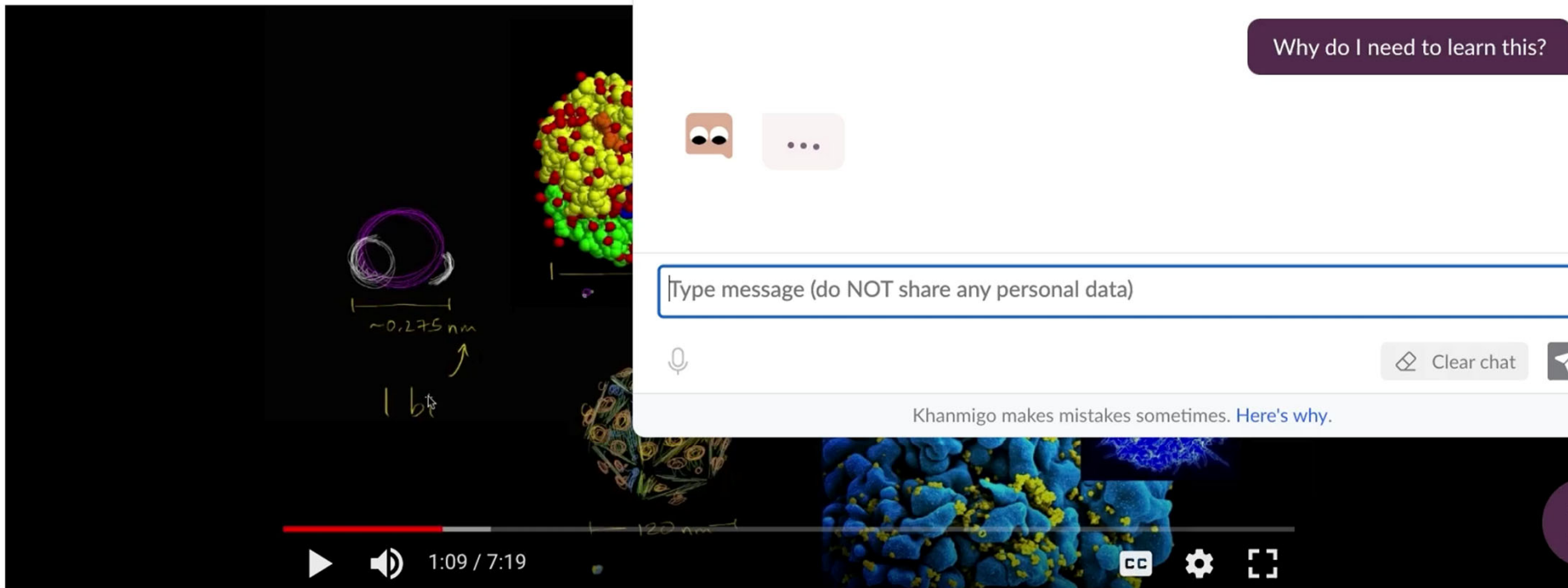
Type message (do NOT share any personal data)



Clear chat



Khanmigo makes mistakes sometimes. [Here's why.](#)



1:09 / 7:19



Up next: video





Flags

Check a11y

< Teacher Dashboard

Chat with a literary character



This chat is logged and viewable by your teacher.

Dorothy

Anne of Green Gables

Peter Rabbit

Alice from Wonderland

Jane Eyre

Winnie the Pooh

Kanga the Kangaroo

Eeyore the Donkey

[Leave feedback](#)

Rate this response



I would love to meet Eeyore the Donkey

Sending ...

Type message (do NOT share any personal data)



Clear chat



Khanmigo makes mistakes sometimes. [Here's why](#)

Activities

Let's learn together through any of these activities that interest you!

topics and beyond

Chat with a historical figure

Chat with a literary character

Craft a story



Flags

Check a11y

< Teacher Dashboard

Debate: High school topics and beyond



Khanmigo beta
AI power

This conversation is recorded and viewable by your teacher.

Will the United States continue to maintain its economic, military and cultural dominance in the coming 50 years?

Should standardized test scores determine college admissions?

[Leave feedback](#)

Rate this response



Yes, let's debate whether the government should cancel student debt



Type message (do NOT share any personal data)



Clear chat



Khanmigo makes mistakes sometimes. [Here's why.](#)

Activities

Let's learn together through any of these activities that interest you!

Debate: Elementary school topics and beyond

Debate: Middle school topics and beyond

Debate: High school topics and beyond

Chat with a historical figure



B I U Paragraph ▾



"In sophomore year, I struggled with depression. I felt like I was constantly battling against the darkness that seemed to be closing in on me. Until, that is, I found solace in the teachings of Steve Irwin.

When I first discovered Steve Irwin and his show "The Crocodile Hunter," I was captivated by his passion for wildlife. He was fearless, jumping into danger without hesitation to save an animal in need. But it was more than just his bravery that inspired me; it was his infectious energy and love for life. Watching him on TV, I couldn't help but kind of feeling a little bit better about my own struggles.

But it wasn't until I read his biography that I truly felt the impact Steve had on my life. In the book, he talked openly about his own struggles with depression. He talked about the dark moments in his life, when he felt like he was drowning in despair. But he also talked about how he fought back against the darkness, how he refused to let it consume him, and how he turned his depression into a career that allowed him to follow his biggest passions.

Reading Steve's words, I felt like he was speaking directly to me. I wasn't alone in my struggles if someone as brave and fearless as Steve had faced similar challenges. And that gave me the courage to keep going. I started visiting a therapist, exercising regularly, and practicing mindfulness meditation. Day by day, I lifted myself out of my depression—all with a healthy dose of "Crocodile Hunter" each evening after I finished my homework.

Loading suggestions

Structure

Each paragraph should have a clea...



Structure

Arguments

Take a different approach to how...



Arguments

Arguments

Take a different approach to how...



Vocabulary

Grammar

Be mindful of using overly comple...



Grammar



Spelling

Search



Plan

Assign Content

Create Quiz

Launch Game

All Teacher Tools

Polynomials Intro

CCSS.ELA: L.7.4.a, L.7.5, RI.7.4

Google Classroom

UNIT 1
Polynomial value intro



Equations



Get ready for
digit multiplication

Copy link

Net worth

Subtract

-3 negative = 0

- add a positive



Cell (biology)

 170 languages ▼

[Article](#)
[Talk](#)

[Read](#)
[View source](#)
[View history](#)
[Tools](#) ▼

From Wikipedia, the free encyclopedia

This article is about the basic unit of lifeforms. For the branch of biology that studies them, see [Cell biology](#).

The **cell** is the basic structural and functional unit of all *forms of life*. Every cell consists of **cytoplasm** enclosed within a **membrane**, and contains many **macromolecules** such as **proteins**, **DNA** and **RNA**, as well as many **small molecules** of nutrients and **metabolites**.^[1] The term comes from the **Latin** word *cellula* meaning 'small room'.^[2]

Cells can acquire specified function and carry out various tasks within the cell such as replication, **DNA repair**, protein synthesis, and motility. Cells are capable of specialization and mobility within the cell.

Most plant and animal cells are only visible under a **light microscope**, with dimensions between 1 and 100 **micrometres**.^[3] **Electron microscopy** gives a much higher resolution showing greatly detailed cell structure. Organisms can be classified as **unicellular** (consisting of a single cell such as **bacteria**) or **multicellular** (including plants and animals).^[4] Most **unicellular organisms** are classed as **microorganisms**.

The study of cells and how they work has led to many other studies in related areas of biology, including: **discovery of DNA**, **cancer systems biology**, **aging** and **developmental biology**.

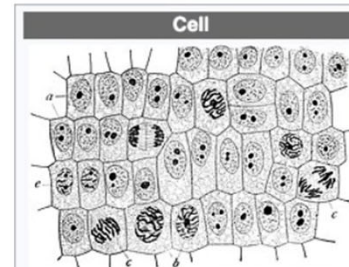
Cell biology is the study of cells, which were discovered by **Robert Hooke** in 1665, who named them for their resemblance to **cells** inhabited by **Christian monks** in a monastery.^{[5][6]} **Cell theory**, first developed in 1839 by **Matthias Jakob Schleiden** and **Theodor Schwann**, states that all organisms are composed of one or more cells, that cells are the fundamental unit of structure and function in all living organisms, and that all cells come from pre-existing cells.^[7] Cells emerged on Earth about 4 billion years ago.^{[8][9][10][11]}

Discovery

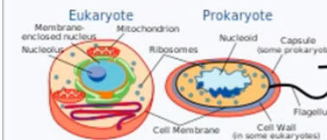
Main article: [Cell theory](#)

With continual improvements made to **microscopes** over time, magnification technology became advanced enough to discover cells. This discovery is largely attributed to **Robert Hooke**, and began the scientific study of cells, known as **cell biology**. When observing a piece of cork under the scope, he was able to see pores. This was shocking at the time as it was believed no one else had seen these. To further support his theory,

- Contents [\[hide\]](#)
- (Top)**
- Discovery
- Number of cells
- > [Cell types](#)
- > [Subcellular components](#)
- > [Structures outside the cell membrane](#)
- > [Cellular processes](#)
- > [Multicellularity](#)
- > [Origins](#)
- [History of research](#)
- [See also](#)
- [References](#)
- [Further reading](#)
- [External links](#)



Onion (*Allium cepa*) root cells in different phases of the **cell cycle** (drawn by E. B. Wilson, 1900)



A **eukaryotic cell** (left) and **prokaryotic cell** (right)

Identifiers

MeSH	D002477 
TH	H1.00.01.0.00001 
FMA	686465 

[Anatomical terminology](#)

[\[edit on Wikidata\]](#)



The 2 Sigma Problem: The Search for
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Effective as One-to-One Tutoring

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University of Chicago and Northwestern University



The 2 Sigma Opportunity: Using AI
to Provide a One-to-One Tutor for
Every Student and a Teaching
Assistant for Every Teacher

Coming soon:

- Interactive reading comprehension
- AI memory for long-lasting “tutor” and “teaching assistant” interactions
- Teachers assigning AI activities
- Assessments of written and other open ended work
- Narrative-based student progress reports
- Multi-user AI-intermediated activities
- Goal setting and study “advisory”
- Voice based interaction