

CSCI 1377

Tools for Thought

Learning I

Educational Technology

“I believe that the motion picture is destined to revolutionize our educational system and that in a few years it will supplant largely, if not entirely, the use of textbooks.”

— Thomas Edison (1922)

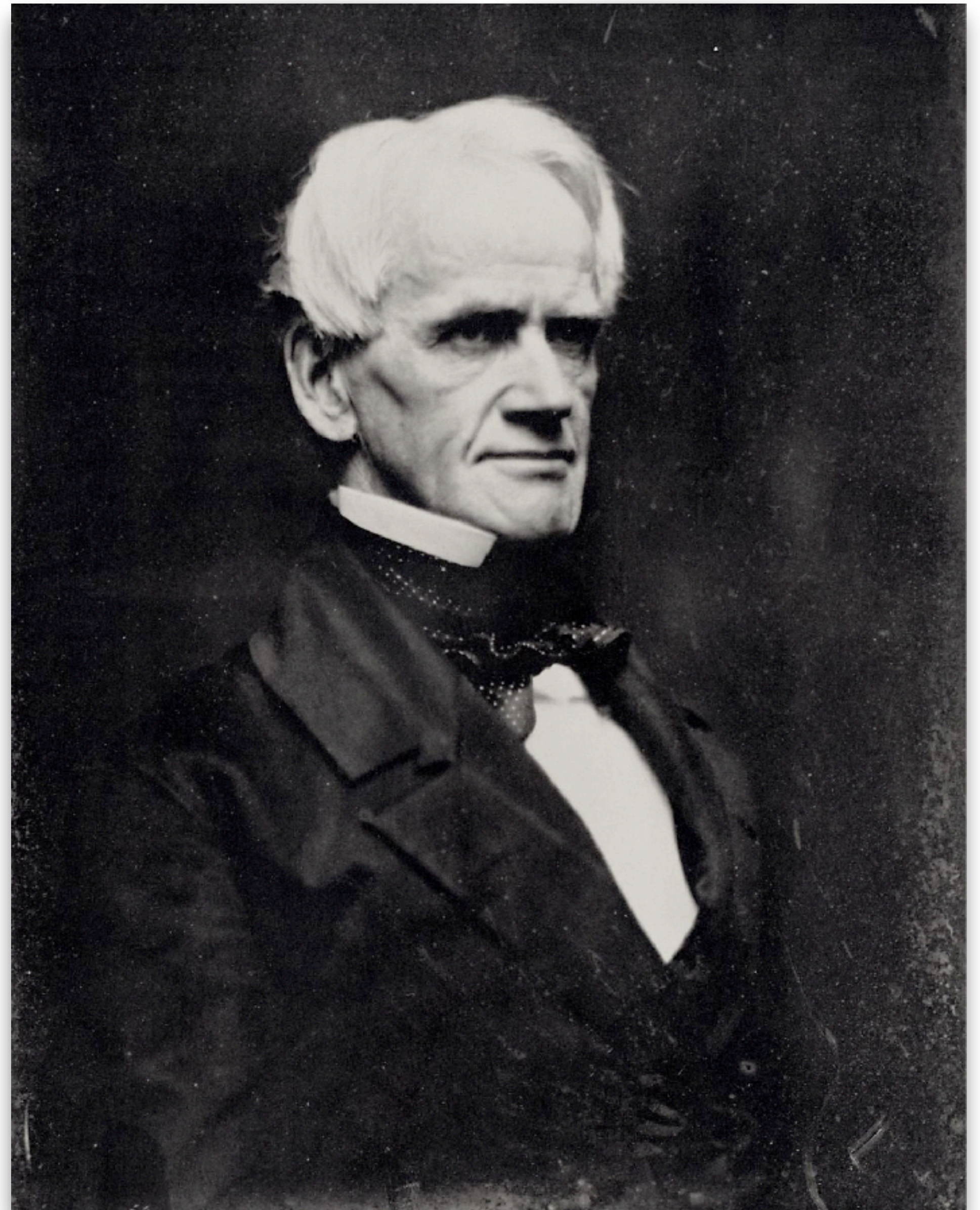
What is the purpose of an education?

Horace Mann (1796 - 1859)

**Abolitionist, education reformer,
Congressional representative for
Massachusetts**

**Proponent of the Common
School movement**

**Buried in North Burial Ground,
only 30mins walk from here!**



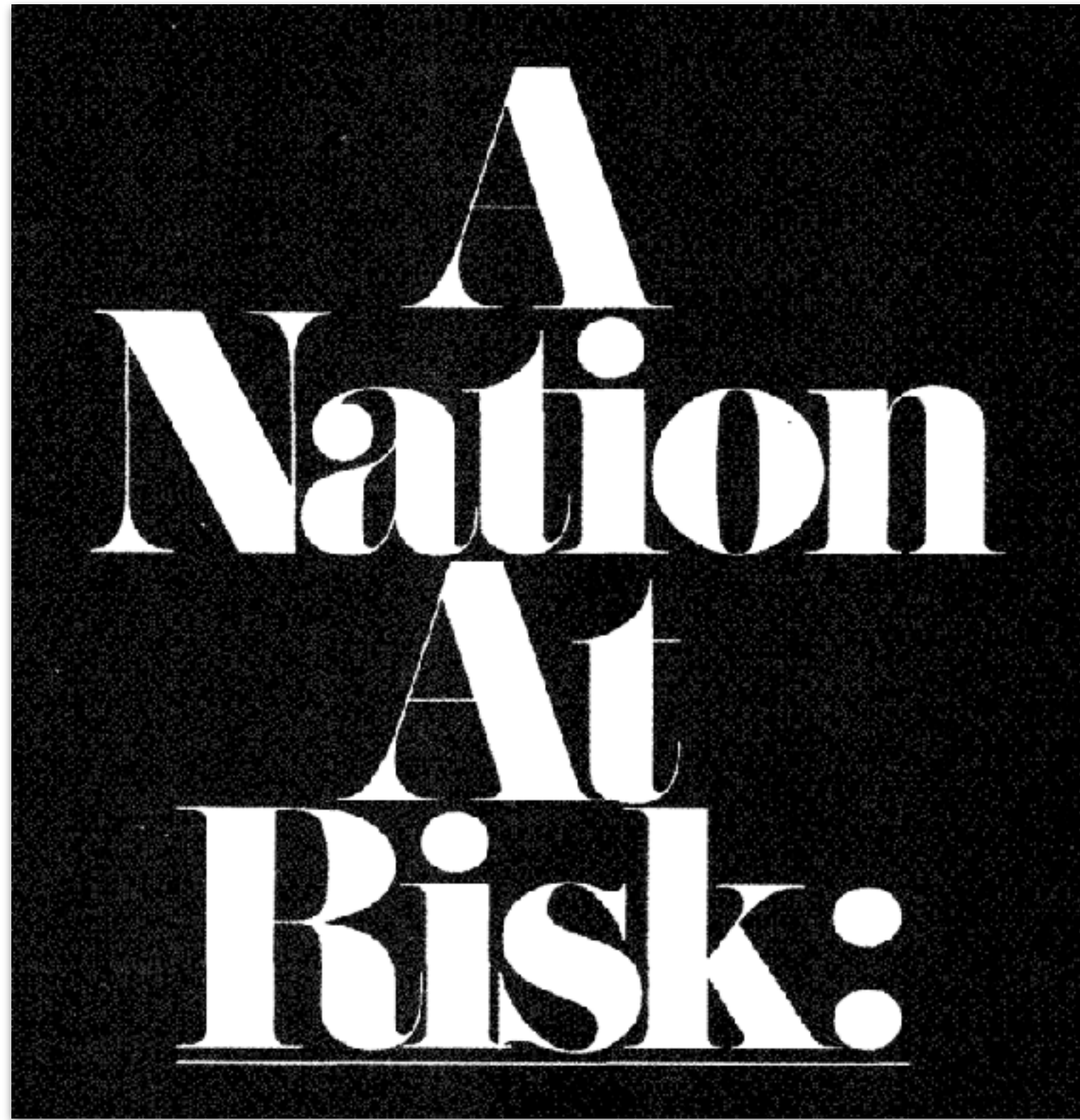
via Wikimedia Commons

[Mann's Twelfth Annual Report]

Tenets of Mann's goals for public schooling

- **Physical education: improving the health of the public**
 - e.g. human anatomy, hydro engineering, temperance
- **Intellectual education: “removing poverty and securing abundance”**
 - Education is “a thousand times more lucrative than fraud; and adds a thousand fold more to a nation’s resources than the most successful conquests”
 - Education as a social equalizer vs. unfettered capitalism or feudalism
- **Political education: improving good governance**
 - “elector and elected [...] tend to the same level [...] legislators are a mirror reflecting the moral countenance of their constituents”

In the 1970s and on, the US feared stagnation



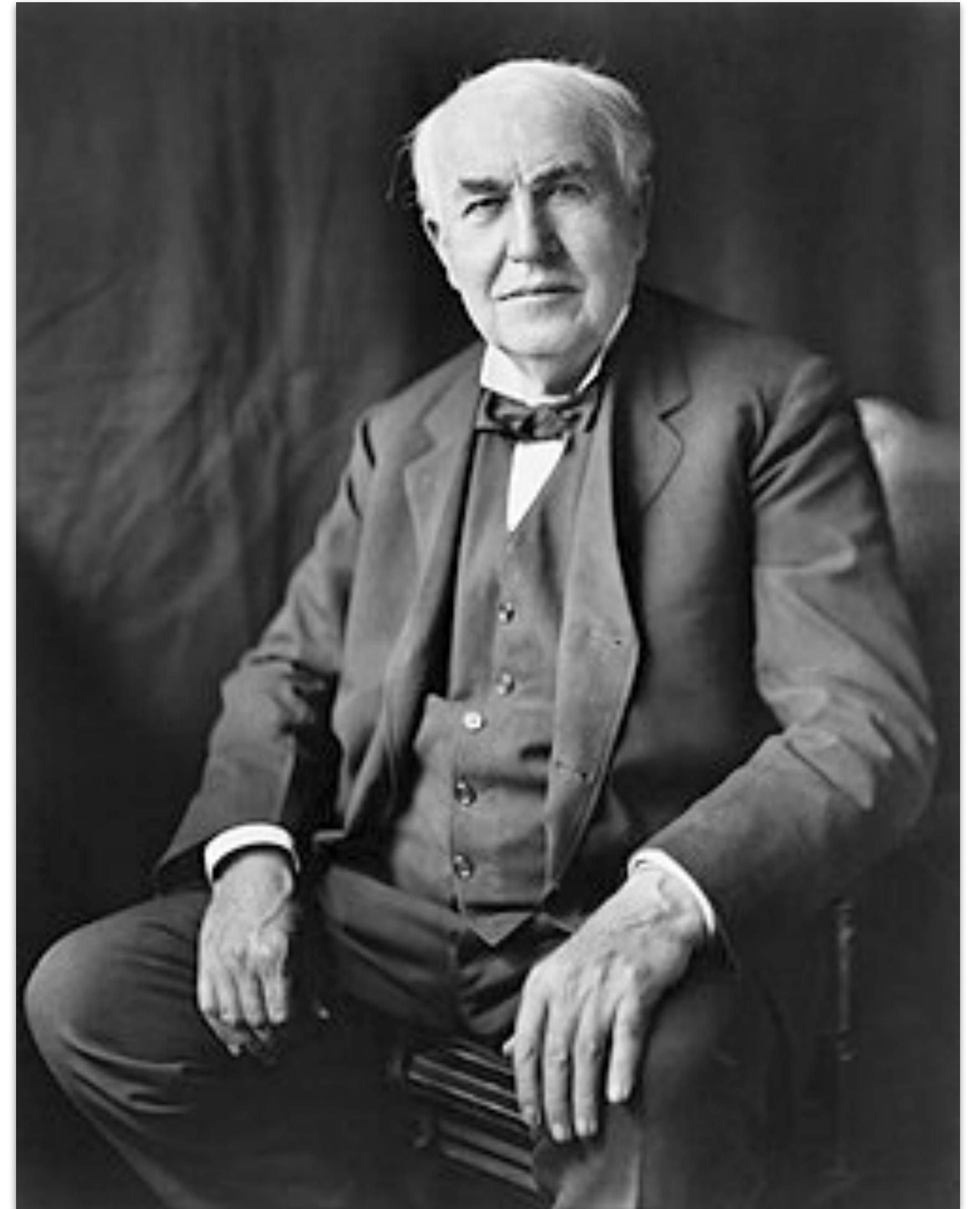
(1983)

“Our once unchallenged preeminence in commerce, industry, science, and technological innovation is being overtaken by competitors throughout the world. [...] The time is long past when America's destiny was assured simply by an abundance of natural resources and inexhaustible human enthusiasm, and by our relative isolation from the malignant problems of older civilizations. The world is indeed one global village. We live among determined, well-educated, and strongly motivated competitors. We compete with them for international standing and markets, not only with products but also with the ideas of our laboratories and neighborhood workshops. America's position in the world may once have been reasonably secure with only a few exceptionally well-trained men and women. It is no longer.”

Technology has a long history at promising educational reform

“Books will soon be obsolete in the public schools. Scholars will be instructed through the eye. It is possible to teach every branch of human knowledge with the motion picture. Our school system will be completely changed inside of ten years.”

— Thomas Edison (1913)



Starting in the 90s, computers became the future

1. Modern computers and learning devices will be accessible to every student.
2. Classrooms will be connected to one another and to the outside world.
3. Educational software will be an integral part of the curriculum—and as engaging as the best video game.
4. Teachers will be ready to use and teach with technology.

— Clinton administration, 1996

Ed tech has since taken many forms

1994	Bulletin Board Systems	11	2007	Second Life and Virtual Worlds	97
1995	The Web	15	2008	E-Portfolios	101
1996	Computer-Mediated Communication	21	2009	Twitter and Social Media	107
1997	Constructivism	27	2010	Connectivism	115
1998	Wikis	37	2011	Personal Learning Environments	123
1999	E-Learning	43	2012	Massive Open Online Courses	129
2000	Learning Objects	49	2013	Open Textbooks	137
2001	E-Learning Standards	57	2014	Learning Analytics	143
2002	The Learning Management System	63	2015	Digital Badges	151
2003	Blogs	69	2016	The Return of Artificial Intelligence	155
2004	Open Educational Resources	77	2017	Blockchain	161
2005	Video	85	2018	Ed Tech's Dystopian Turn	169
2006	Web 2.0	91			

1980s-2000s: hardware outpaced adoption

- **Computers were quickly adopted across American schools**
 - 1981: 125 students per computer → 1991 / 18 → 2001 / 5
- **Computers were used for one-off exercises and logistics**
 - “As for enhanced efficiency in learning and teaching, there have been no advances over the last decade that can be confidently attributed to broader access to computers.”
 - “Teachers at all levels of schooling have used the new technology basically to continue what they have always done: communicate with parents and administrators, prepare syllabi and lectures, record grades, assign research papers.”
- **My experience: used computers primarily for word processing**
 - Teachers would sometimes roll in the computer cart for one-off activities

Interactive
whiteboards to
the rescue!



Interactive whiteboards gained significant traction in the early 2000s

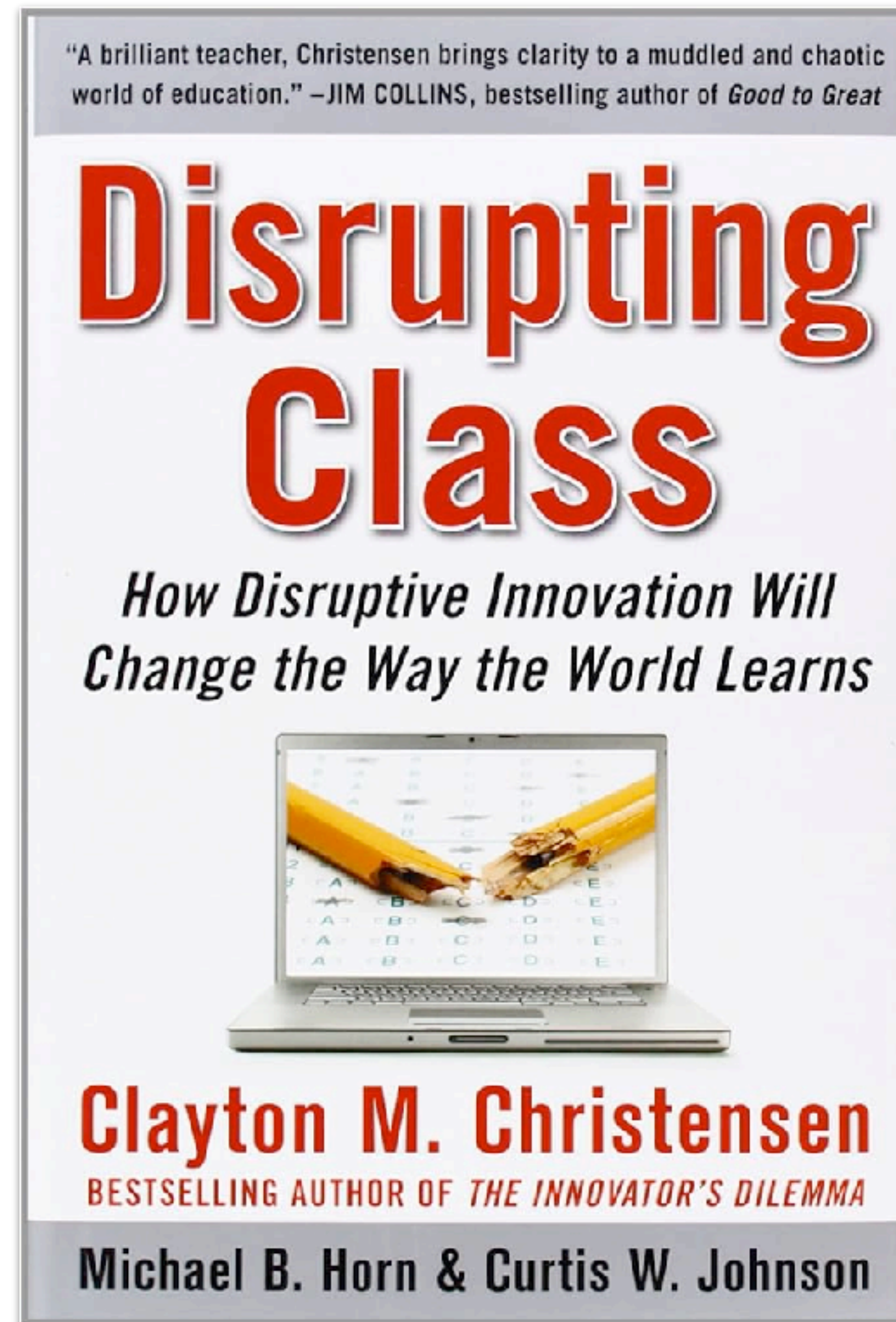
- **Boards blanketed the US and UK, costing \$3-5k a piece**
 - Often funded by federal dollars under No Child Left Behind and later policies
- **Minimal training provided to teachers in its use**
- **Research shows no impact on educational outcomes**

IWBs were not warmly received by all teachers

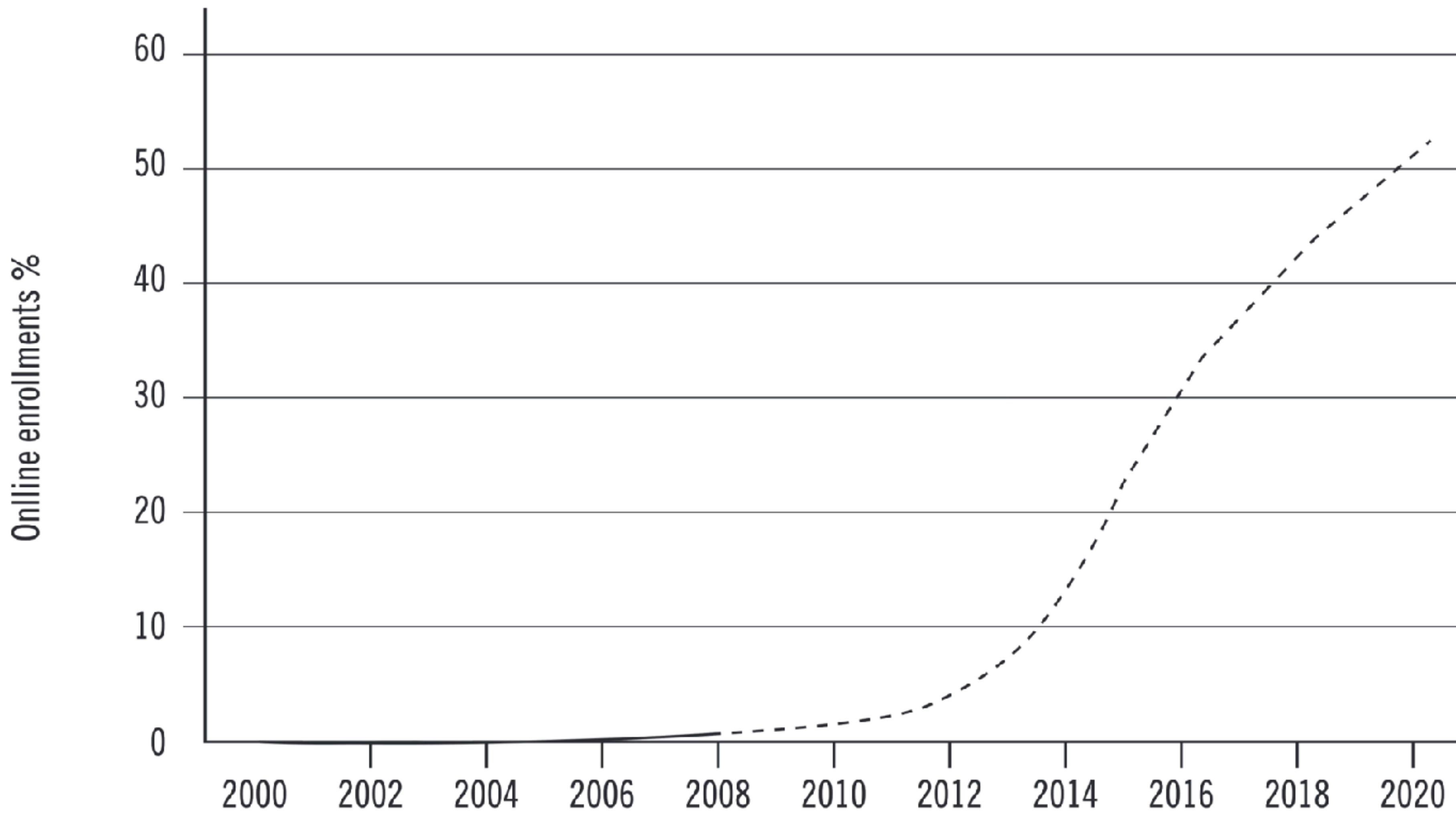
“Most of the time, interactive whiteboard programs are, in fact, nothing more than vain attempts to buy change. Rarely paired with a clear vision of the classrooms we’d like to see, a set of tangible objectives that can be measured, or any systematic attempts to evaluate outcomes, these high-priced contraptions are sad examples of the careless decision-making and waste that are crippling some of our schools and systems.”

— Bill Ferriter, “Why I Hate Interactive Whiteboards” (2010)

Maybe the kids want a digital learning environment with better instructors?



HBS profs argued in 2008 that an online course takeoff was imminent





youtu.be/nTFEUsudhfs

2012: The year of the Massive Open Online Course

The New York Times

Opinion

Revolution Hits the Universities

By Thomas L. Friedman

Jan. 26, 2013

The New York Times

VIRTUAL U.

College of Future Could Be Come One, Come All

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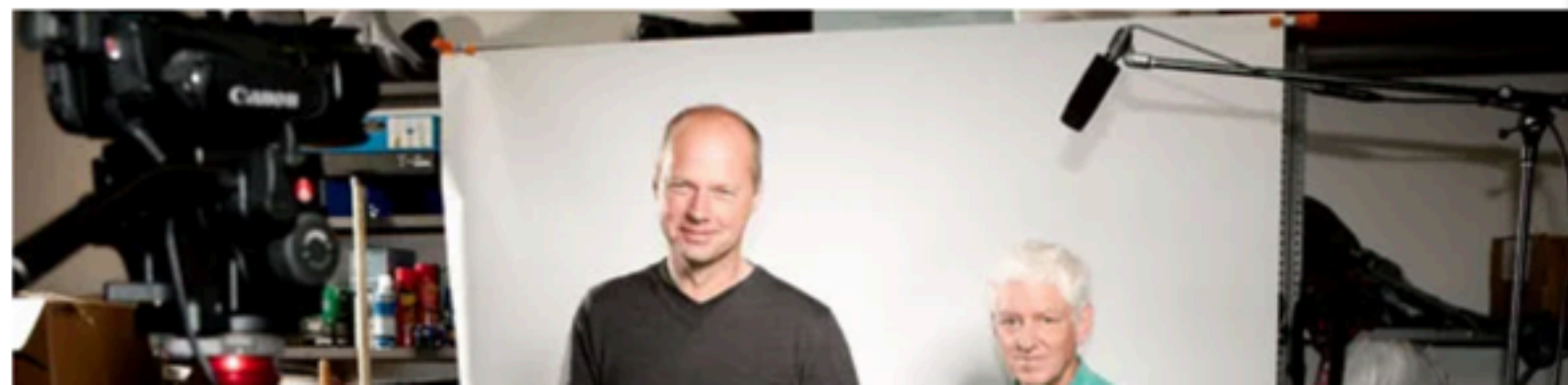
WIRED

NEWSLETTERS [SUBSCRIBE](#)

STEVEN LECKART SCIENCE MAR 28, 2012 9:34 PM

The Stanford Education Experiment Could Change Higher Learning Forever

Wired correspondent Steven Leckart and 160,000 others around globe sign on when two professors let the public take their AI course online for free.



MIT Technology Review

UNCATEGORIZED

The Crisis in Higher Education

Online versions of college courses are attracting hundreds of students, millions of dollars in funding, and accolades from administrators. Is this a fad, or is higher education about to undergo the overhaul it needs?

By Nicholas Carr
September 27, 2012

BUSINESS

The Big Idea That Can Revolutionize Higher Education: 'MOOC'

Massive open online courses combine the best of college -- exceptional instruction -- with the best of technology -- online interactive learning

By Laura McKenna

MAY 11, 2012

SHARE SAVE

Massive open online courses combine the best of college -- exceptional instruction -- with the best of technology -- online interactive learning. Is this the future of efficient, effective education?

The New York Times

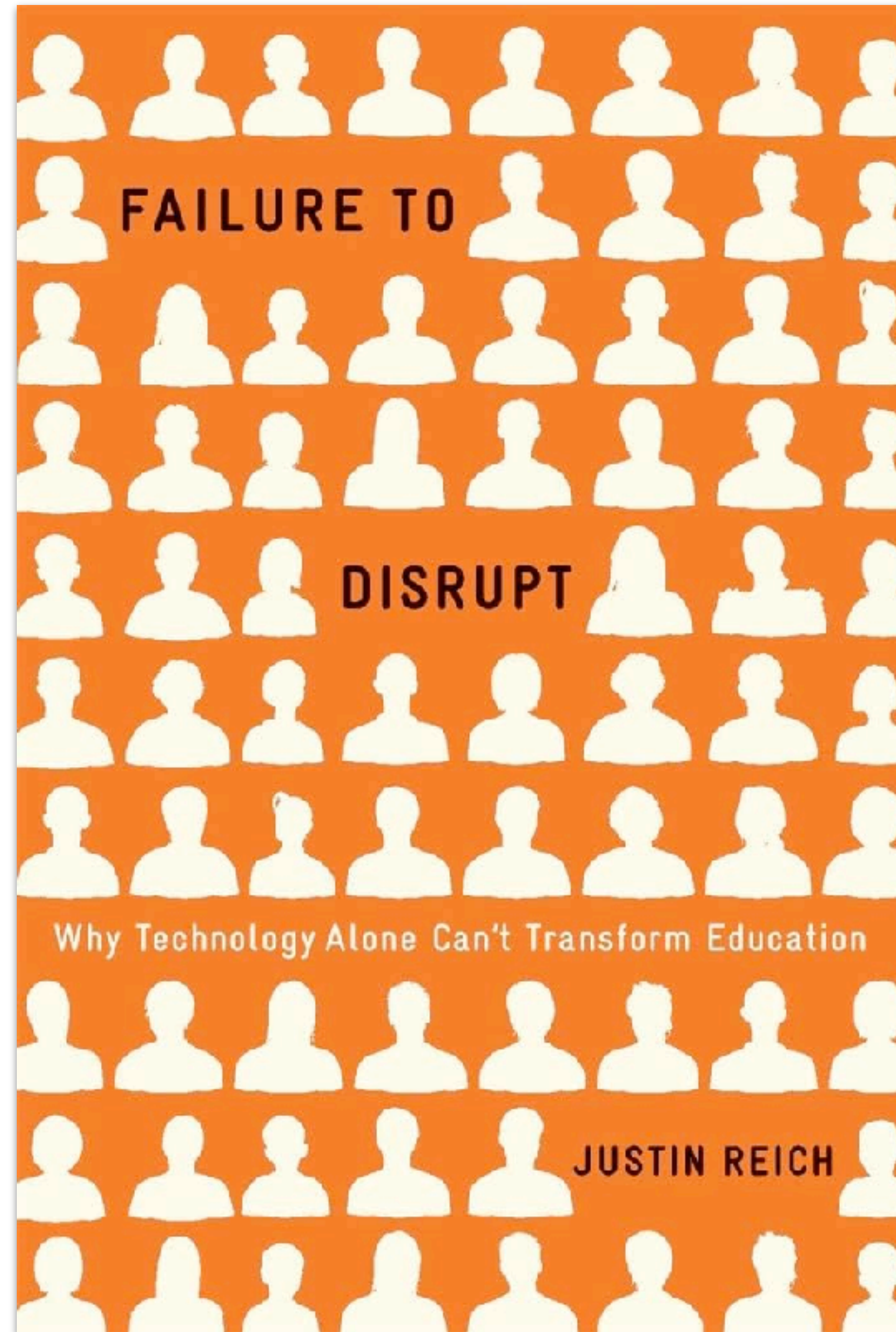
***After Setbacks, Online Courses Are Rethought* (2013)**

Completion rates: “[...] only about half of those who registered for a course ever viewed a lecture, and only about 4 percent completed the courses.”

As a university replacement: “80 percent of those taking the university’s MOOCs had already earned a degree of some kind.”


On mentored MOOCs: “pilot classes [...] did worse than those who took the classes on campus. In the algebra class, fewer than a quarter of the students — and only 12 percent of the high school students — earned a passing grade.”

Justin Reich's theses on the limits of MOOCs



- Innovative MOOC techniques (esp. peer learning) put aside in favor of familiar “instructionist” approach
- Learning gains accrued to high-performing students, not those who needed help the most
- Auto-grading is a too simplistic form of evaluation to give useful feedback

MOOC businesses have not been successful

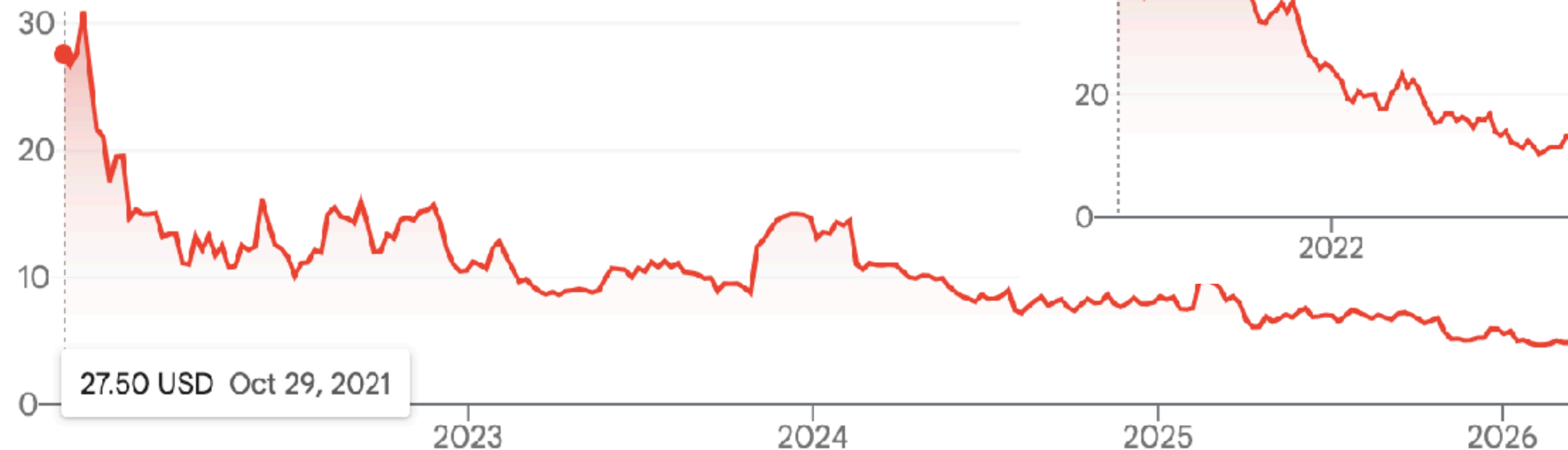
 **Udemy Inc**
NASDAQ: UDMY

4.86 USD

-22.64 (-82.33%) ↓ all time

Closed: Mar 9, 4:03 PM EDT • [Disclaimer](#)
After hours 4.86 0.00 (0.00%)

1D | 5D | 1M | 6M | YTD



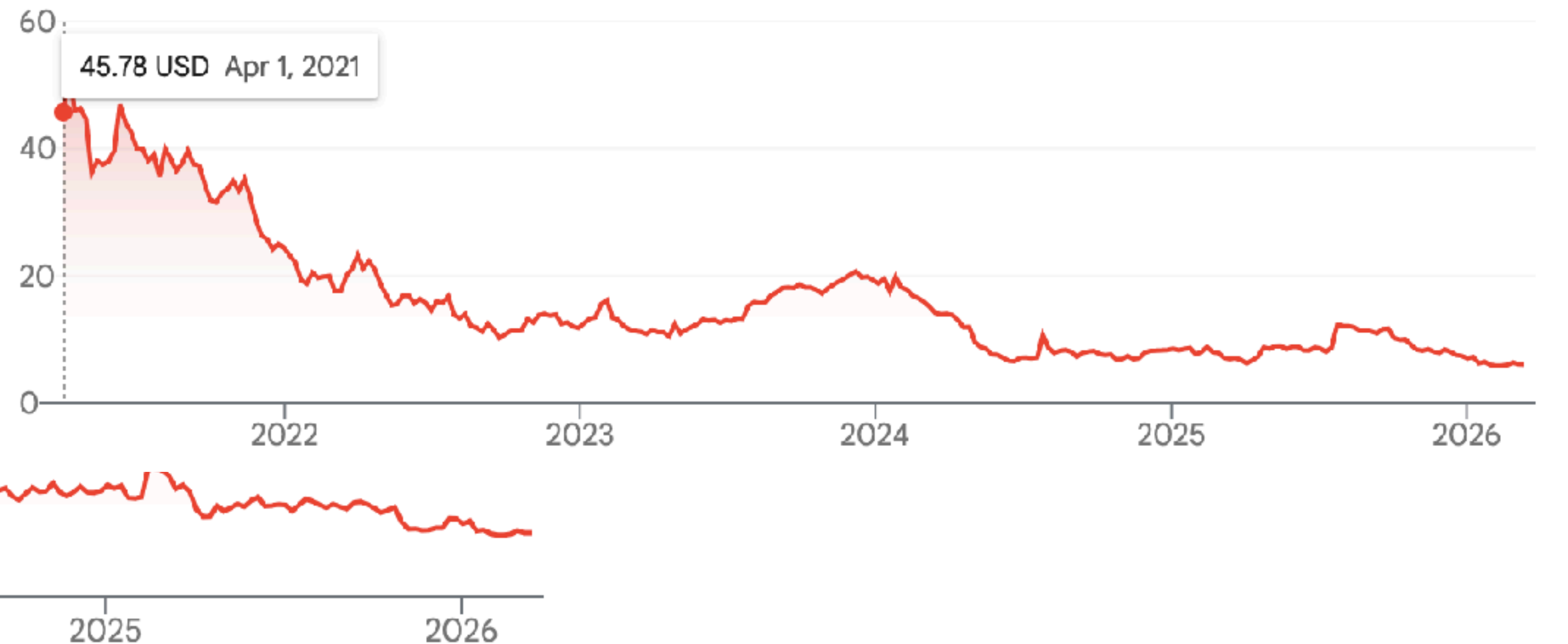
 **Coursera Inc**
NYSE: COUR

6.15 USD

-39.63 (-86.57%) ↓ all time

Closed: Mar 9, 4:03 PM EDT • [Disclaimer](#)
After hours 6.15 0.00 (0.00%)

1D | 5D | 1M | 6M | YTD | 1Y | 5Y | [Max](#)



Recent KA study shows marginal gains on math

- Study: analyze Khan Academy usage of 200,000 students benchmarked against standardized math scores
 - See paper for statistical controls
- On average, students use KA about 10min/week, receiving +0.031SD benefits \approx 0.27 “RIT points”
 - Students generally gain 3-6 RIT points per year under standard math education
- Baseline upper quartile students at 30min/week receive +0.241SD benefits \approx 2.1 RIT points
 - Students who were already high-performing benefit more!

How to make learning as addictive as social media



youtu.be/P6FORpg0KVo

Recap

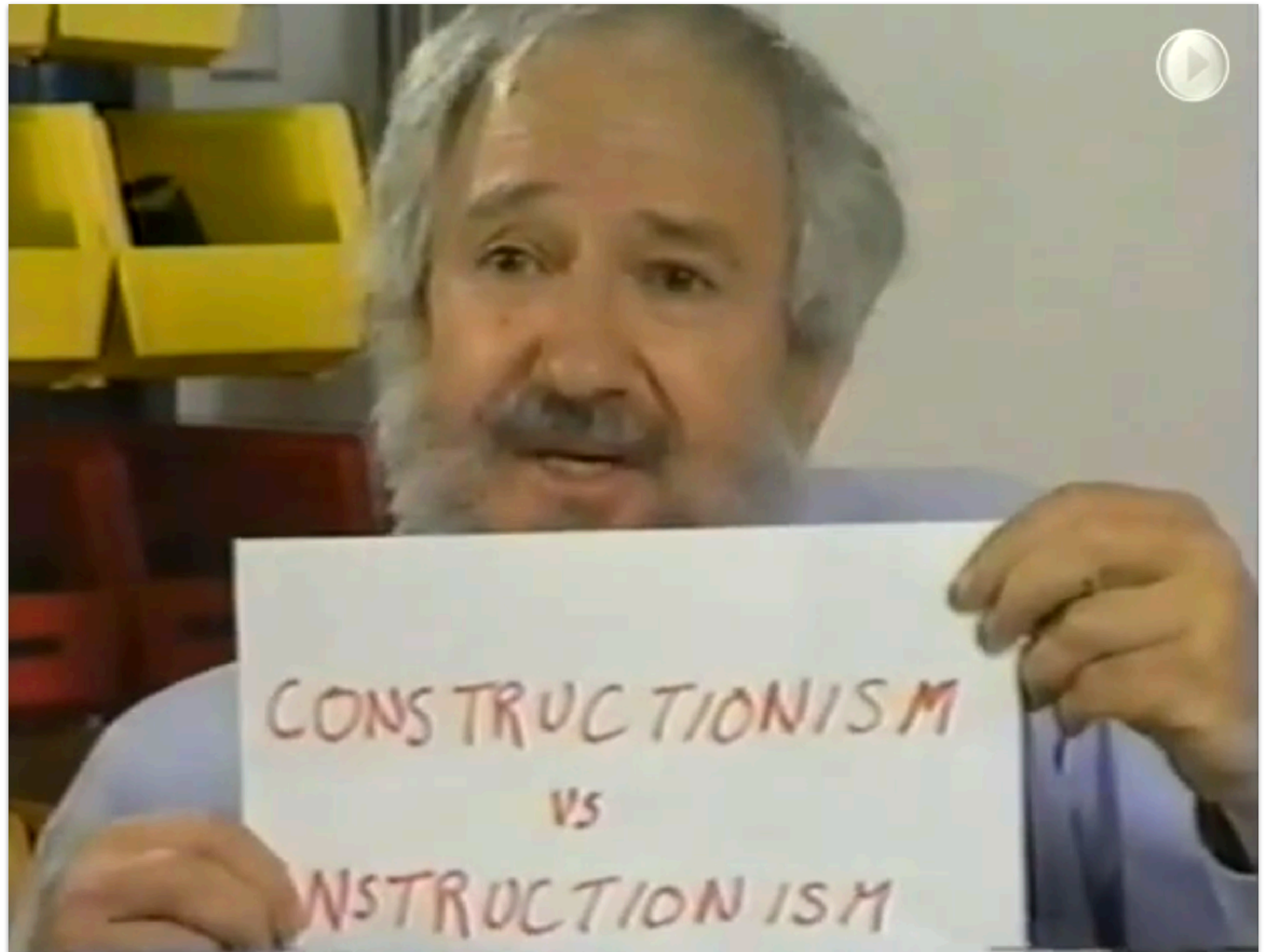
- **What is the purpose of an education?**
 - To improve society's health, equity, and governance?
 - To improve the US GDP and compete economically with other countries?
 - To keep kids occupied while parents go to work?
- **What is the goal of putting computers into education?**
 - Fears of low test scores, and a sense that technology is the future
 - Leads to purchases of desktops, smart boards, tablets, etc. with no clear purpose
 - Engaging students vs. teaching students?1
- **What are the big ideas in ed tech?**
 - Multimedia: students will find videos, interactibles, etc. more engaging
 - MOOCs: the "best" instructors can share their content with everyone
 - Tutors: personalize education to each student based on needs

Constructionism

Seymour Papert
1928 - 2016

**Inventor of the Logo
turtle and language**

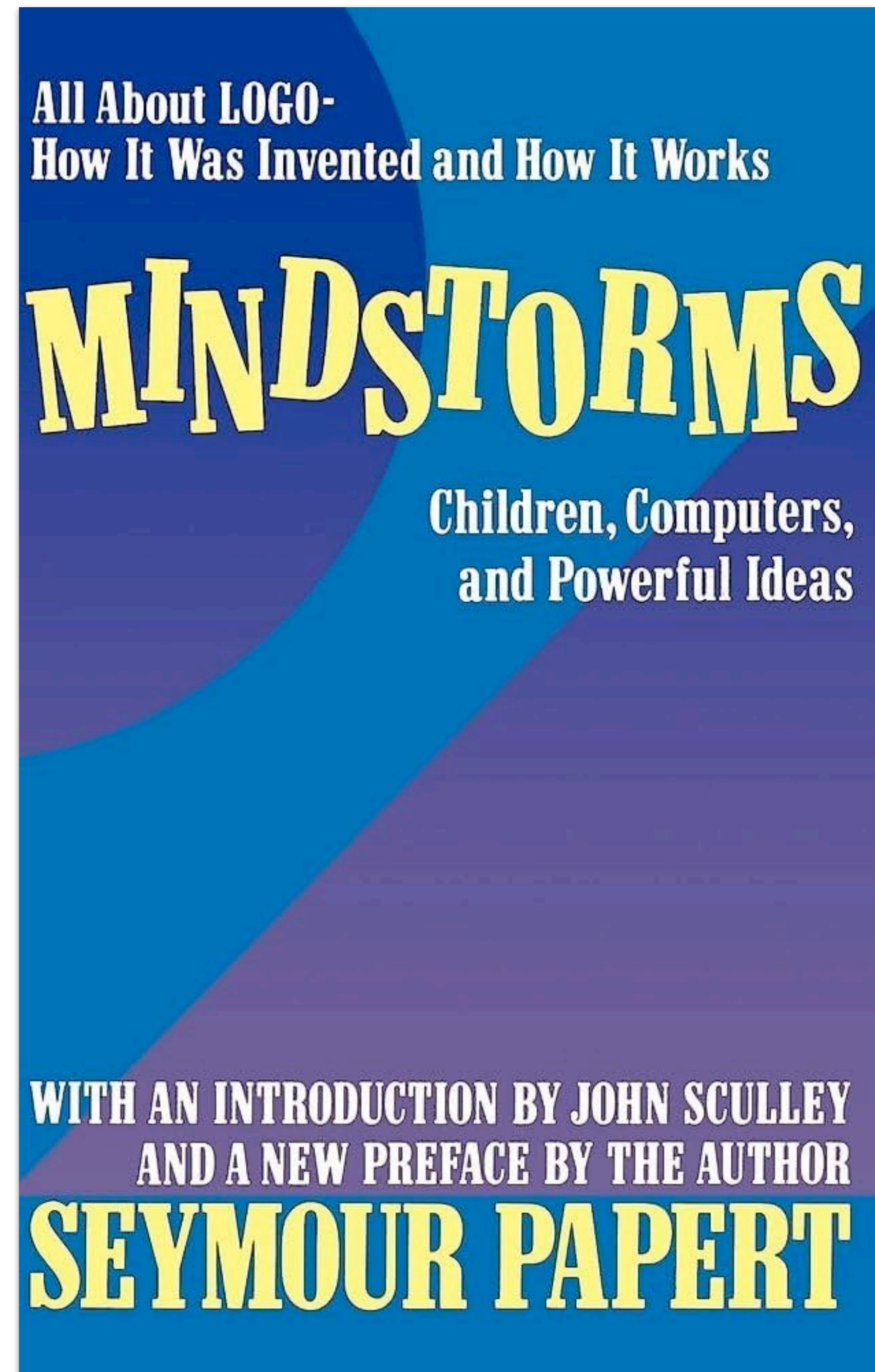
**Leader of the
constructionist
movement**



youtu.be/7cUxutkuJdE

“In this book I discuss ways in which the computer presence could contribute to mental processes not only instrumentally but in more essential, conceptual ways, influencing how people think even when they are far removed from physical contact with a computer. It is about an end to the culture that makes science and technology alien to the vast majority of people. [...]

The idea of "talking mathematics" to a computer can be generalized to a view of learning mathematics in "Mathland"; that is to say, in a context which is to learning mathematics what living in France is to learning French.”





youtu.be/1jLNmi5mGqw