Transforming Learning and Education in the Era of AI

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Director, MIT RAISE

Dean for Digital Learning

RAISE Initiative

Responsible AI for Social Empowerment and Educati

What is AI?

- Artificial Intelligence, refers to computer systems that can perform tasks typically requiring human intelligence.

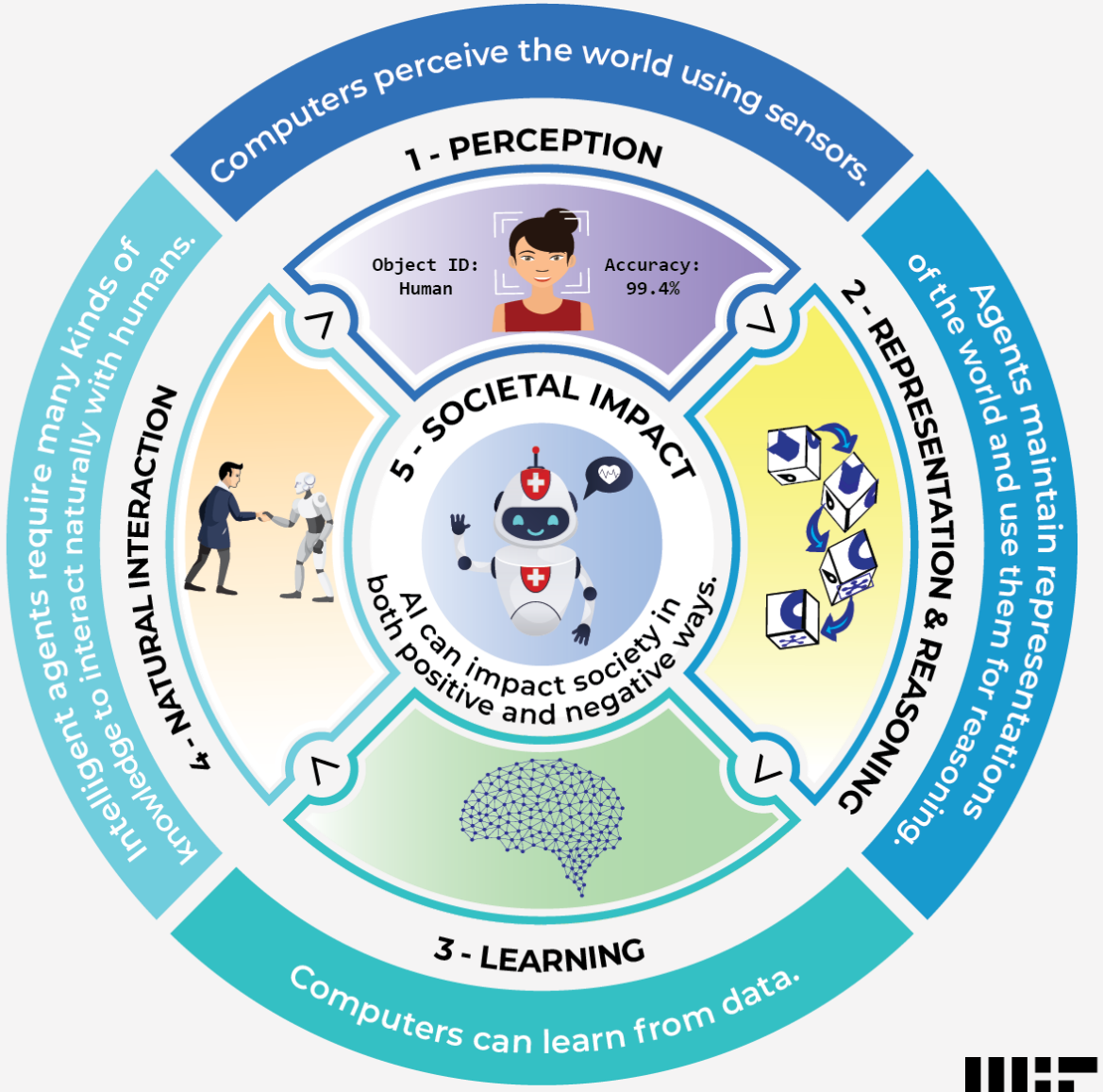
- The field of AI aims to create machines and technologies that sort of mimic human cognitive abilities, such as perceiving, reasoning, learning, and interacting with people and the environment.

- Unlike traditional programming where you explicitly tell the computer what to do, AI enables machines to learn and make decisions without being directly programmed for every scenario.

- There are many algorithmic methods advanced in the field of AI. Machine learning, planning, reasoning, search, etc.

- The ethical design, responsible use, and societal implications of AI have become important areas of study and advancement, too.

AI4K12 5 Big Ideas of AI



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Preparing kids for today & the future

AI could affect income and wealth inequality within countries with workers who can harness AI seeing an increase in their productivity and wages—and those who cannot falling behind. Younger workers may find it easier to exploit opportunities.

International Monetary Fund (2024)

There is a significant talent shortage in AI both domestically and globally.

81% of 1,200 executive and IT professionals surveyed think that they can use AI, but only 12% actually have the skills to do so. And 70% of workers likely need to upgrade their AI skills

Pluralsight AI Skills Report (2024)

While AI could likely take away 85 million jobs globally by 2025, it could also generate 97 million new jobs in fields ranging from big data and machine learning to information security and digital marketing.

World Economic Forum (2020)

Automating labor ultimately unlocks less value than augmenting it to create something new.

The Turing Trap: The Promise & Peril of Human-Like AI
E. Brynjolfsson (2022)

Up to 2/3 of kindergarten students will eventually work in jobs that do not exist due to scientific and technological advancement.

Careers of the Future Report (2014)
UK Commission for Employment & Skills

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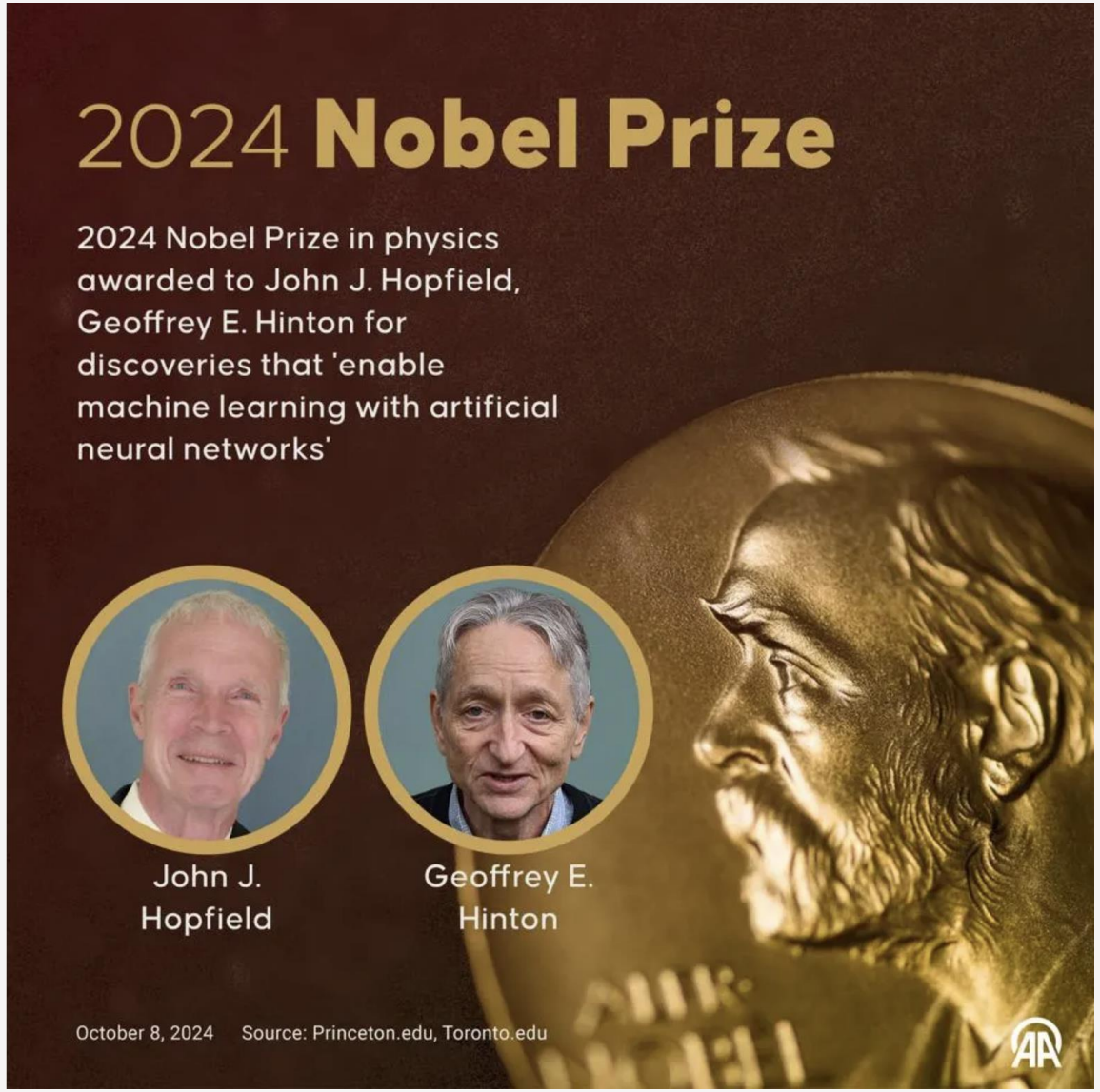

FORBES > INNOVATION > AI

Nobel Prizes Show How AI Is Shaping History: 5 Reasons You Should Care

NEWS AND ANALYSES

A New Precedent—A.I. Gets the "American Nobel" Prize in Medicine

AlphaFold was the first A.I. to receive the Lasker Award since these began in 1945

ERIC TOPOL
OCT 01, 2023

Why K12 AI Literacy?

70% of teens have used at least one type of genAI tool

Common Sense Media (2025)

AI is transforming personal, civic, & professional life starting in childhood

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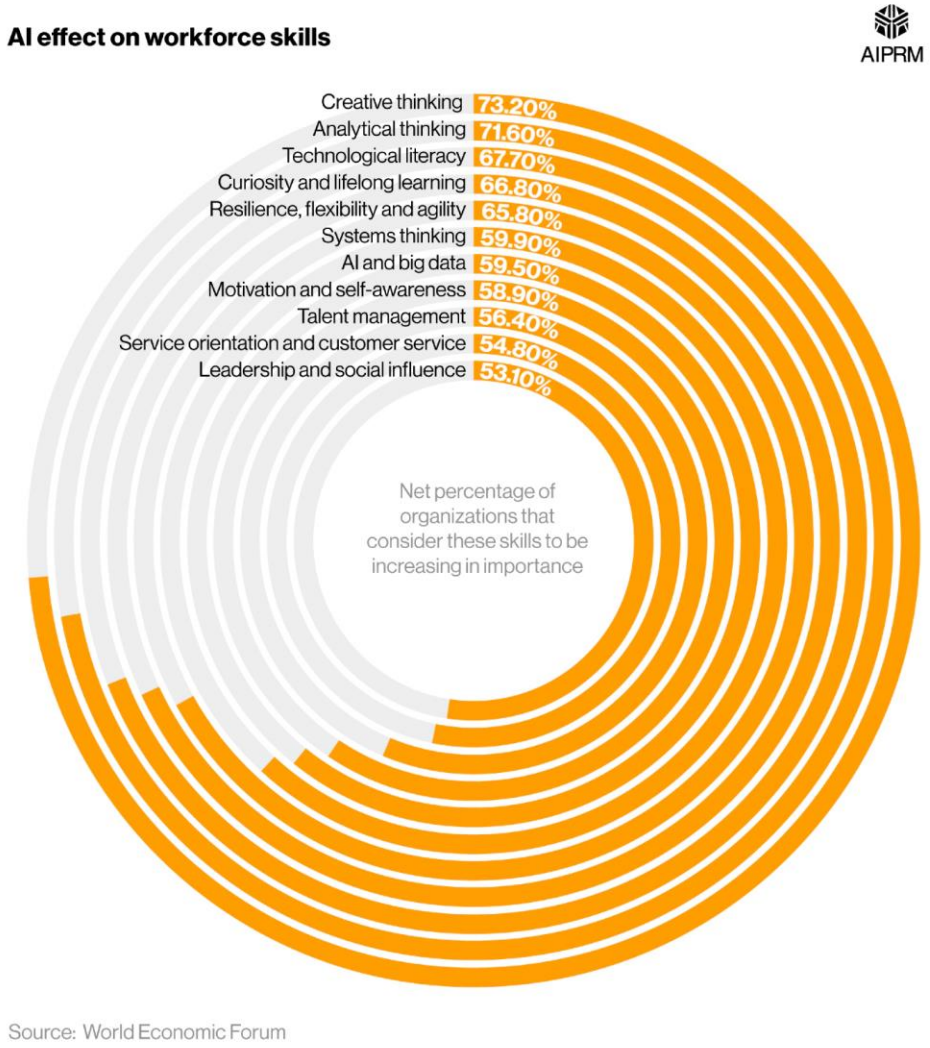
Holistic preparation for success in the era of AI

- Creative & Analytical Thinking
- Curiosity & Lifelong Learning
- Resilience & Agility
- Self-Efficacy & Motivation
- Teamwork & Social Skills
- Ethical Judgement



Misuse and Consequence

The New York Times

We Teach A.I. Systems Everything, Including Our Biases

Researchers say computer systems are learning from lots and lots of digitized books and news articles that could bake old attitudes into new technology.

BUSINESS NEWS OCTOBER 9, 2018 / 11:12 PM / A YEAR AGO

REUTERS

Amazon scraps secret AI recruiting tool that showed bias against women

DESMOG

CLEARING THE PR POLLUTION THAT CLOUDS CLIMATE SCIENCE

YouTube's Video Suggestion Engine Boosted Climate Science Denial as World Warmed, Study Finds

The Guardian

'Disastrous' lack of diversity in AI industry perpetuates bias, study finds

Report says an overwhelmingly white and male field has reached 'a moment of reckoning' over discriminatory systems

Tech Policy / AI Ethics

MIT Technology Review

AI is sending people to jail —and getting it wrong

Using historical data to train risk assessment tools could mean that machines are copying the mistakes of the past.

Two US lawyers fined for submitting fake court citations from ChatGPT

Law firm also penalised after chatbot invented six legal cases that were then used in an aviation injury claim

SAG-AFTRA is worried about AI, but can it really replace actors? It already has.

RAISE Initiative
Responsible AI for Social Empowerment and Education

To advance equity in learning, education, and empowerment through AI

by rethinking and innovating how to holistically and equitably prepare diverse K-12 students and an inclusive workforce

to be happy, engaged, and successful in an increasingly AI-powered society.

mit media lab

Open Learning

MIT Schwarzman College of Computing

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AI + Education Research Questions

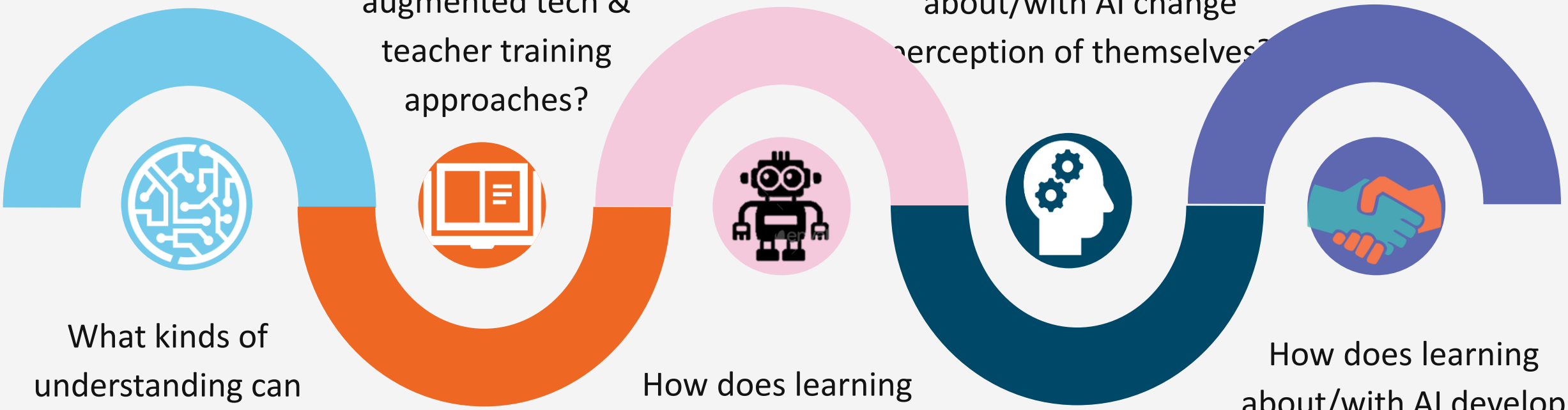
What kinds of understanding can learners with different backgrounds gain about/with AI?

What are effective curriculum, AI-augmented tech & teacher training approaches?

How does learning about/with AI impact learning and change attitudes about AI?

How does learning about/with AI change perception of themselves?

How does learning about/with AI develop human-centered skills and human-AI collaboration skills?



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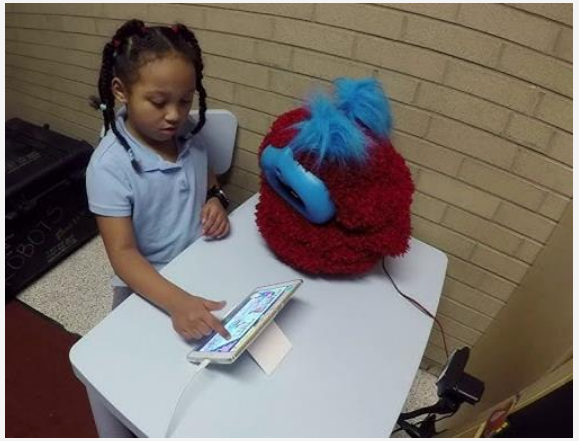
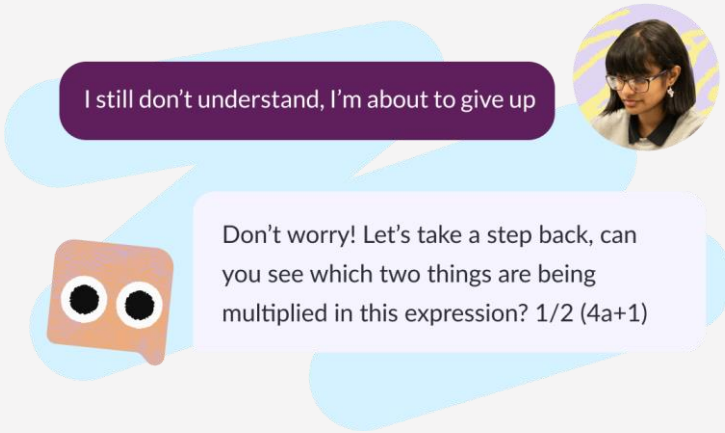
AI Supported Learning for Early Childhood

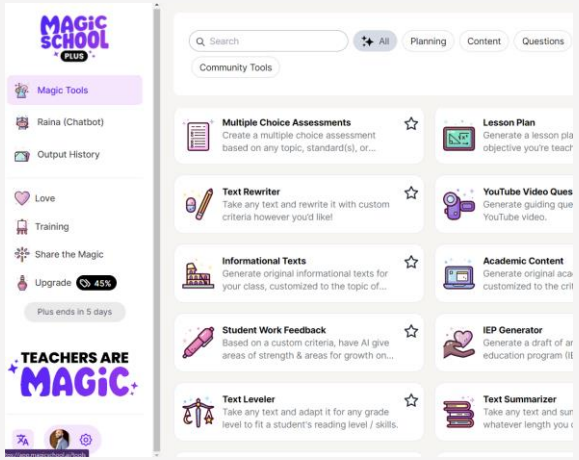
AI tools are proliferating in the classroom



Social robots that provide personalization



Chatbots that provide learning instruction and support



GenAI that supports educators in lesson planning

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AI-Supported Learning

- AI-powered **learning companions** as a **playful practice partner** for early literacy and language skills. Supplements, does not compete with teacher's role.
- Augment and enrich how young children learn through **socio-emotional interaction with the robot <u>& people</u>**
- **Models Peer-like interactions** that socially includes teachers, parents & peers.
- **Adaptively personalizes** content and behavior through AI during real-time interaction to maximize engagement & learning

personal robots

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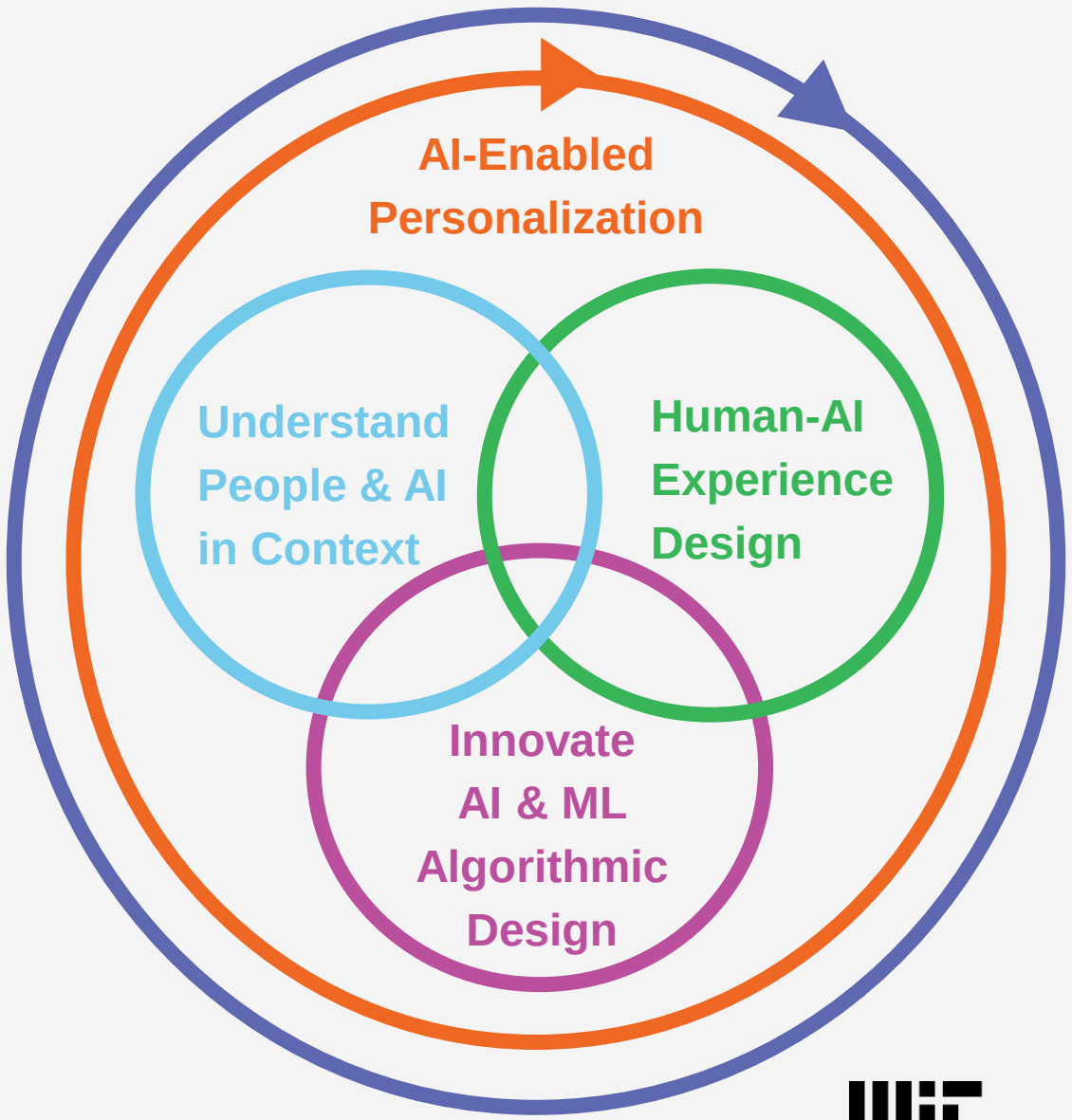
AI + Co-Design

With teachers, parents & children of at-risk schools (Boston, Atlanta)



personal robots

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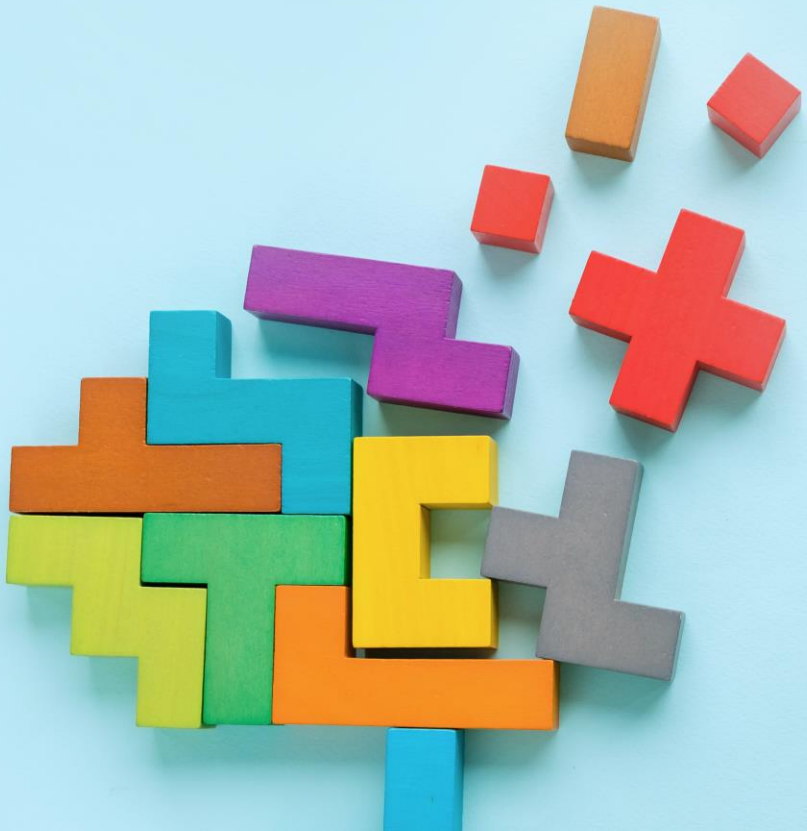
Personalized, Real-World Socially Situated Learning

Personalized, Playful Practice Partner

- Increased learning (skills, knowledge)
- Greater emotional engagement
- Social emulation: attitudes & mindsets
- Personalization + stronger relationship enhances outcomes

Social Catalyst for Child-Parent Storytime

- Increased parent-child conversational time
- Parents discuss/converse more with child
- Adaptation benefits higher-needs parents (e.g., ESL) the most



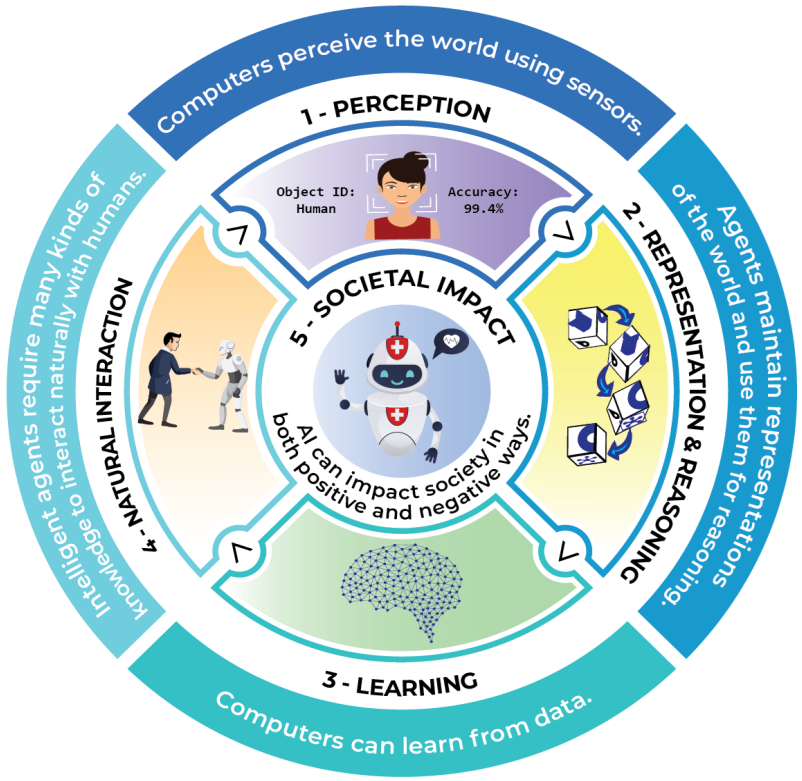
AI Literacy & Fluency

Students as co-creators and responsible citizens

Demystify AI: Understand how it works, and how to design responsibly

AI + Digital Citizenship: Responsible user & informed citizen

Self-Efficacy & Empowerment Creative AI makers and solvers

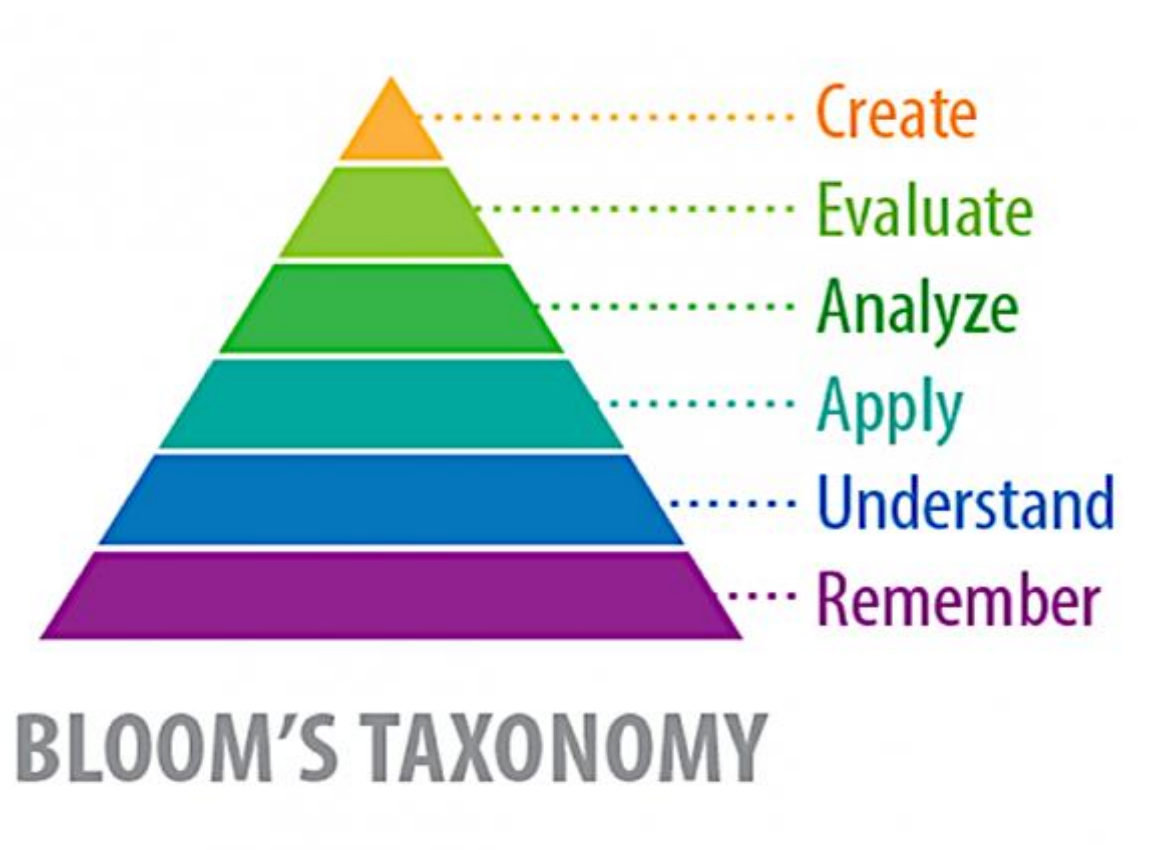


Foundational AI knowledge & Critical Judgement of AI Solutions

Awareness of Citizenship Responsibilities in the era of AI

Inclusive, Sustainable AI Design

AI Fluency Framework: 3 progression levels



3. Evaluate and Create AI

2. Use and Apply AI

1. Know and Understand AI

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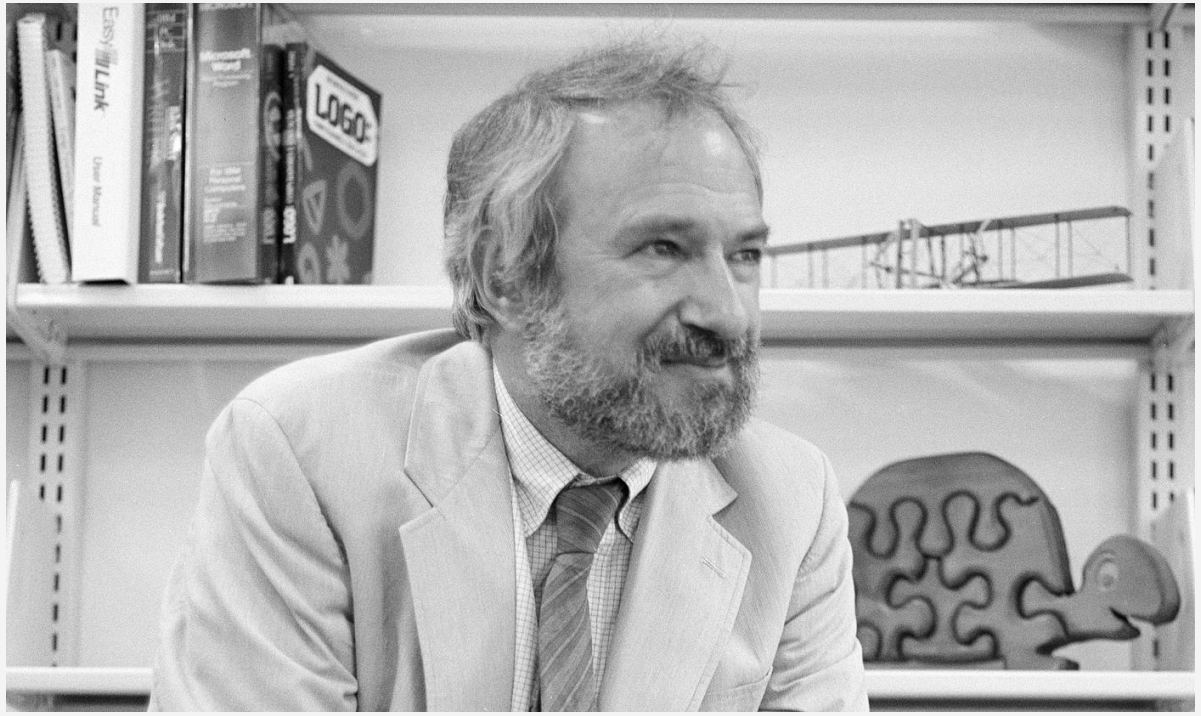
Our Pedagogical Philosophy



Seymour Papert
(1928-2016)

Constructionist Learning: Students draw their own conclusions through creative experimentation and making objects that others can see and use

Envision an educational system in which technology is … something children themselves learn to manipulate, to extend, to apply to projects

… and to make the world a better place

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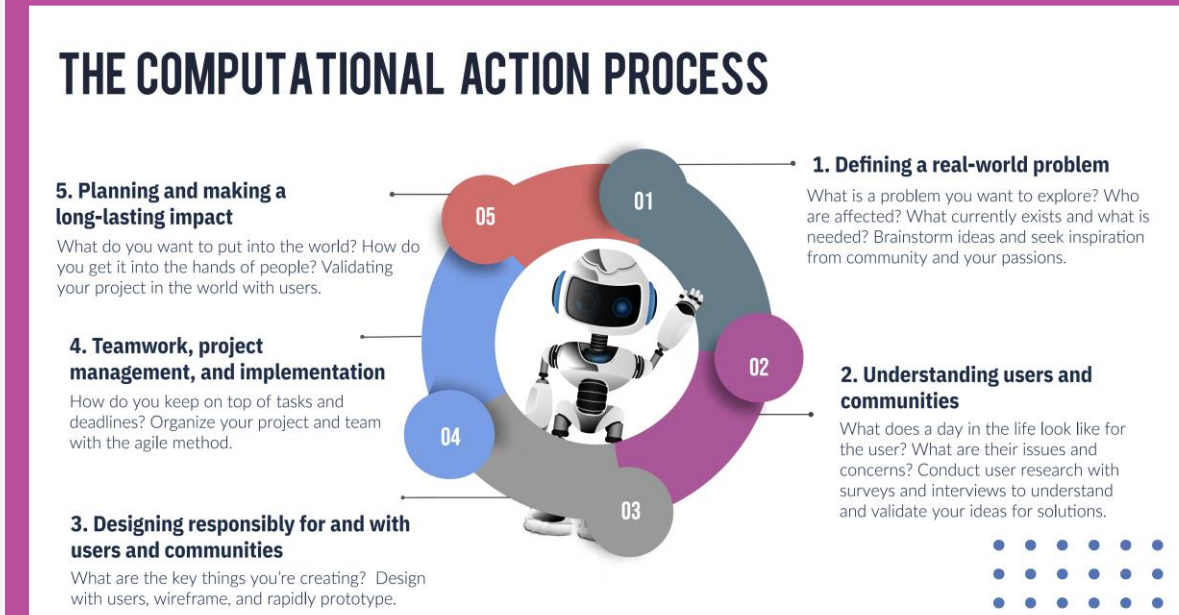
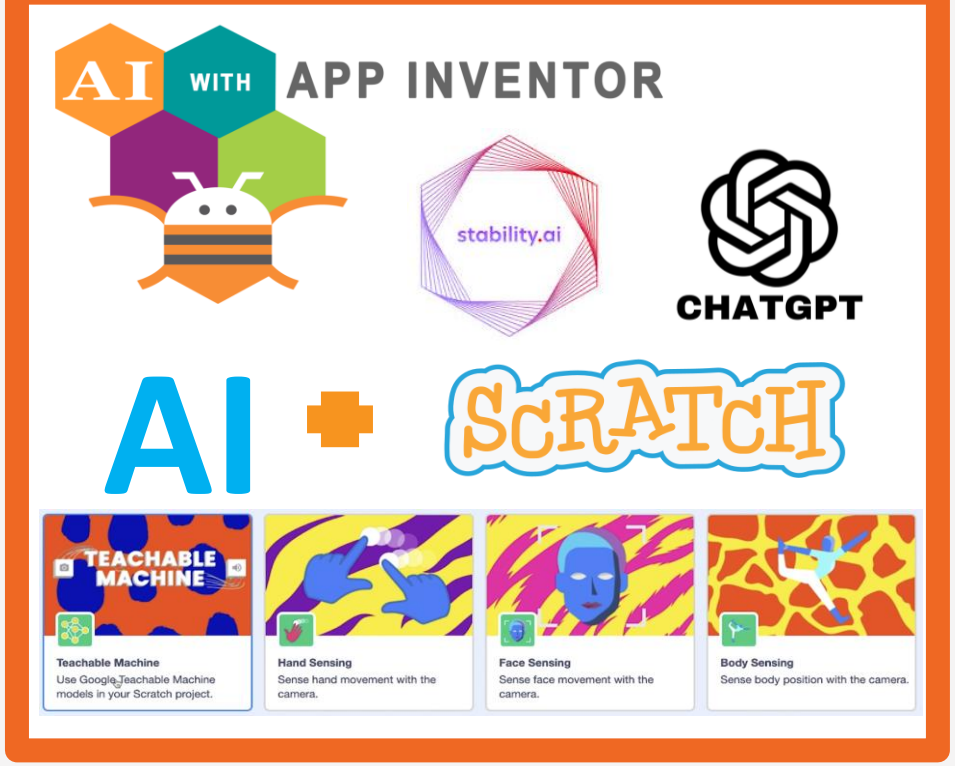
Innovative Tools & Pedagogy: Learning by Making & Solving with AI

Computational Action



AI + Programming Toolkits



Computational action: Using the power of AI to make a meaningful societal impact.

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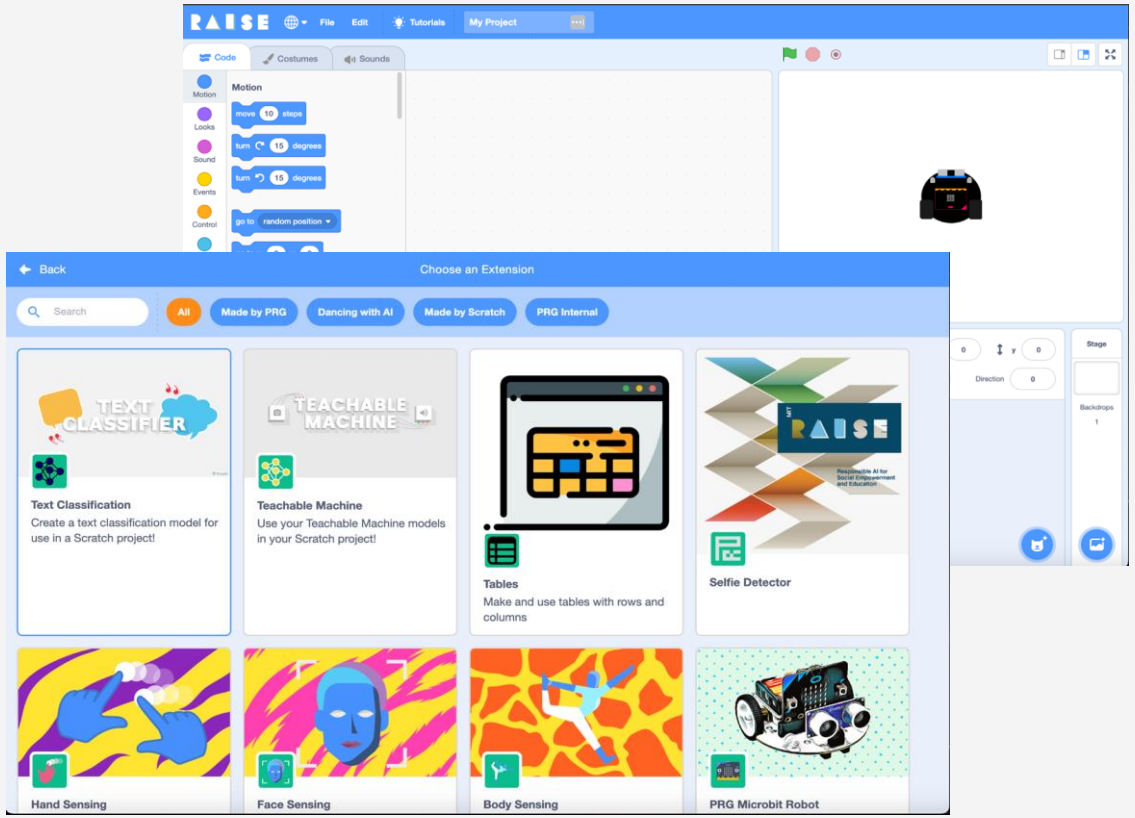
RAISE Playground



playground.raise.mit.edu

Scratch[1]-based block programming environment that exposes students to machine learning models, robotics, and AI capabilities directly in the browser.

- Image classification
- Text classification
- Natural language processing
- Music generation
- Affective computing
- Gesture recognition
- Reinforcement learning
- Social robotics
- Microcontroller robotics
- …and more!

1 - The RAISE Playground is NOT affiliated with the Scratch Foundation

PoseBlocks

A Toolkit for Creating (and Dancing) with AI

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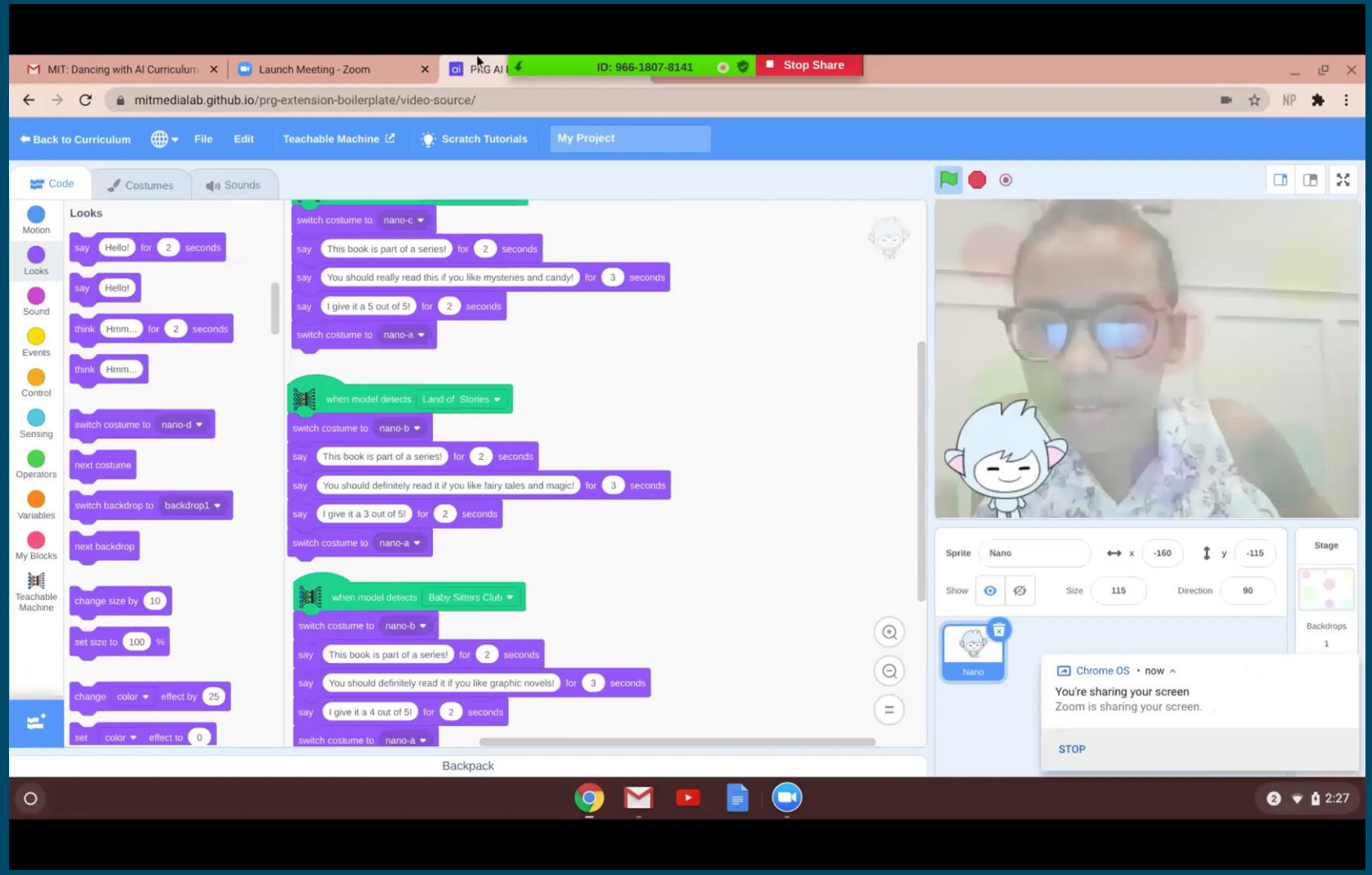
“Show and Tell” Book Recommender



Kid Power & AI

empowering and preparing youth to make a positive difference with AI… right now!

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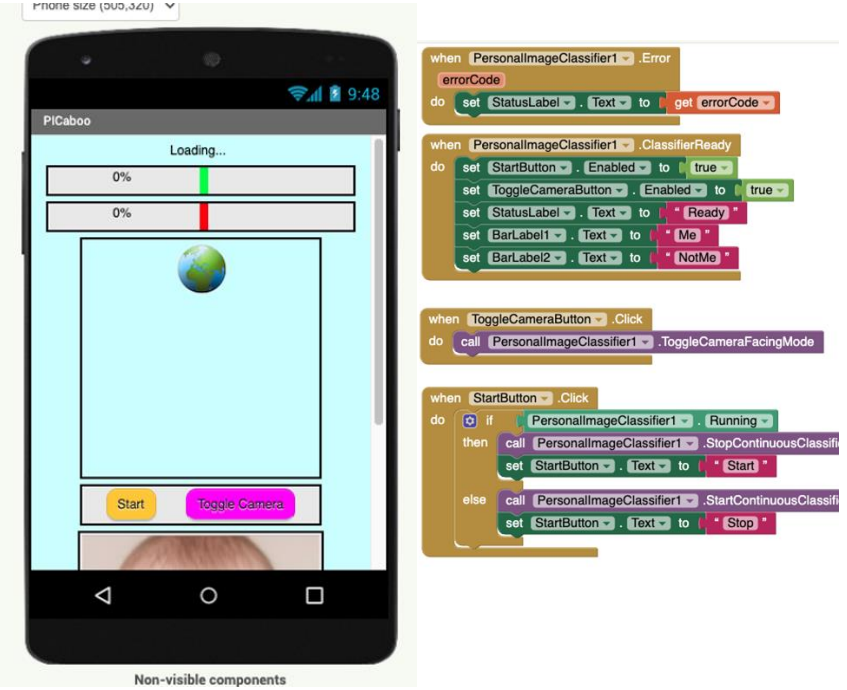
MIT App Inventor is one of the most widely used educational platforms

- **Free open-source** web platform that allows anyone to create mobile apps, the most accessible modality for under-resourced populations.
- Backed by **10+ years of research** from MIT and Google.
- 18 million users in 195 countries since launch in 2012
- 47% users in low-/middle-income countries in 19 languages
- 84.6 million projects created



Anyone can create apps with global impact

Dharavi Girls created an app for one of India's largest slums

THE HINDU

Tech girls and the making of the Dharavi code

MUMBAI » MUMBAI LOCAL

MUMBAI, April 10, 2016

Updated: April 10, 2016 01:53 IST

Nawneet Ranjan helps girls of Nayabasti learn computers at the Dharavi Diary school in Mahim, Mumbai. Photo: Arunangsu Roy Chowdhury. The Hindu

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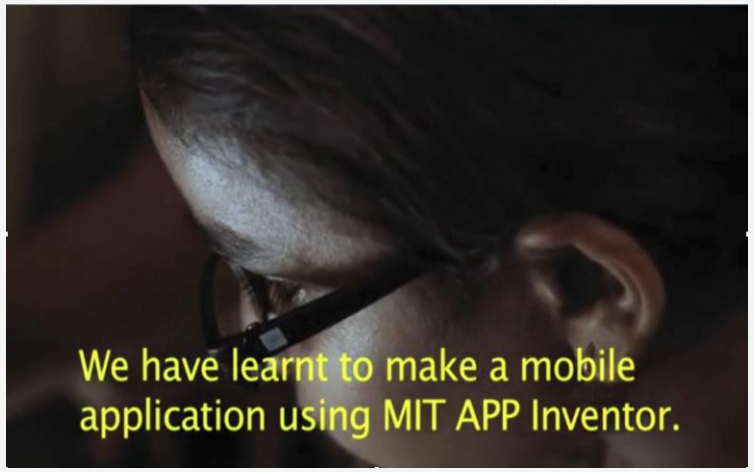
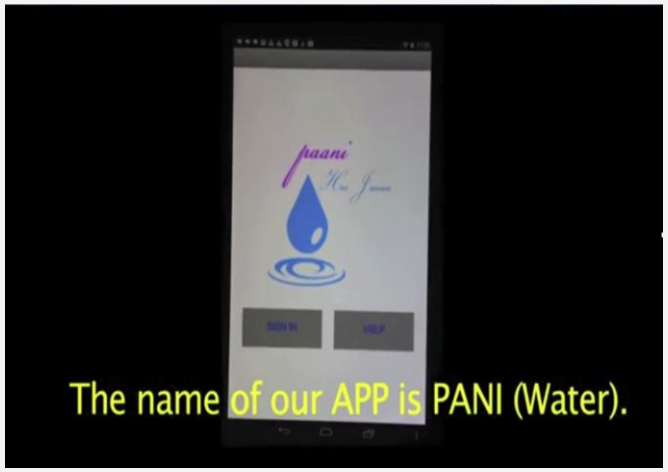
MIT App Inventor & Technovation





Even children in the poorest communities can create tools to improve life for people around them

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Innovative K12 Curriculum, Pedagogy, & Tools

Hundreds of hours of innovative curriculum from Kindergarten to High School. Open and Free.

- Hands-on, Minds-on, Hearts-on creative learning and solving
- Age and grade appropriate learning and activities
- Student-relatable, multidisciplinary use cases. Spans a range of AI topics with up-to-date AI tools and technologies
- Responsible design and ethical use of AI in the classroom to support learning
- Assessments & aligned with learning standards. Both-And: learn AI literacy skills while using AI to learn academics.
- Teacher professional development for in-classroom instruction
- Research and Evaluation

Examples: Developed and under development. Used globally

- **Day of AI program**. Short format K—12 AI literacy
- **Interactive AI storybooks** for US grade 1-3
- **DAILy.** Full-semester project-based learning curriculum from US grade 5 – 12
- **MIT FutureMakers**. Summer 6-week technical and entrepreneurial intensives for high school

School-Aligned Curriculum Under Development

- Short-format, cross-subject, hands-on curriculum (Math, Science, Art, English, Social Studies, Computing) US grades 6—8
- Short-format AI curriculum for computing class US grades 3 – 12

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Day of AI

all K-12

4—8 hrs for in-classroom learning on AI literacy, digital citizenship, and responsible AI design

Data Activism

high school

6-week intensive on data science & critical participatory action research

MIT FutureMakers

Middle, high, early undergrad

6-week technical AI & entrepreneurship summer intensive

1. Learn the Basics

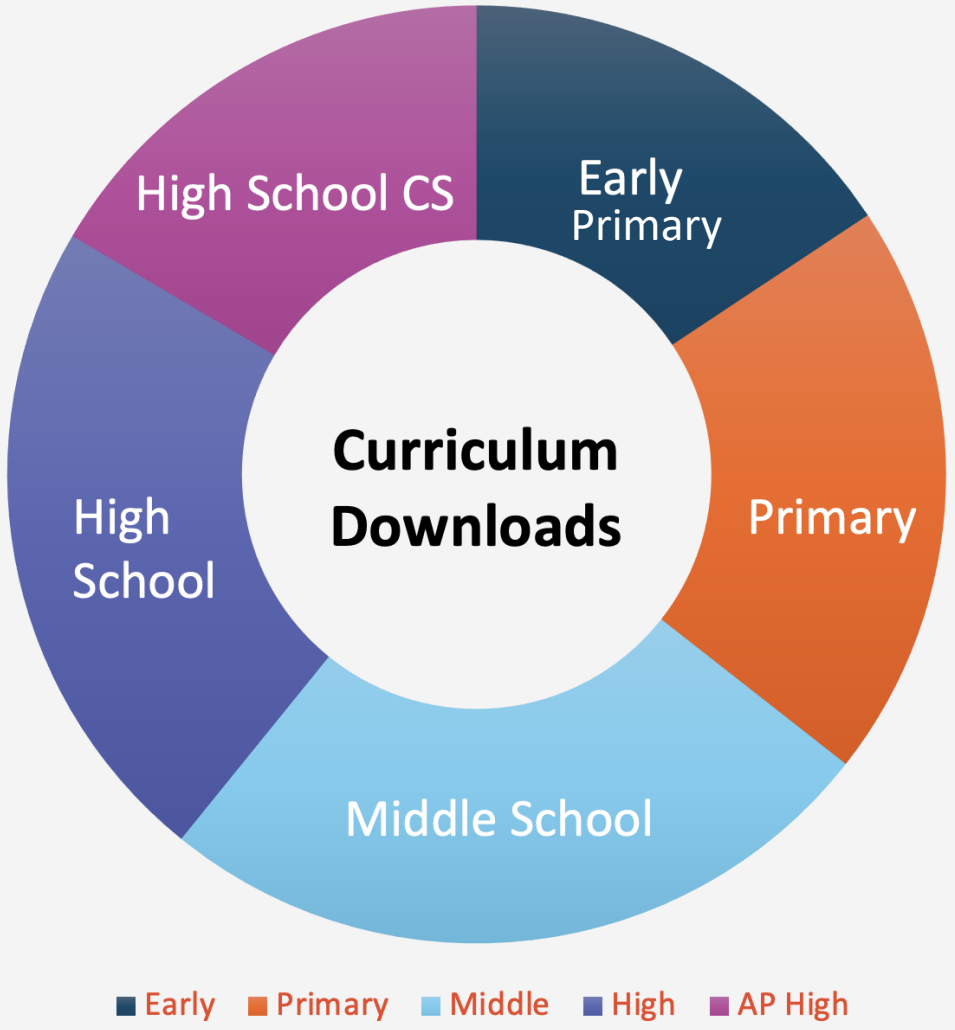
AI is for everyone.
Empower students with the knowledge and skills to understand how they responsibly use and create with these technologies.

2. Identify the Benefits and Risks

AI should be designed responsibly. Give students the knowledge to make informed decisions about AI in their lives.

3. Design and Create

Kids will shape the future. Inspire students to use these technologies to create a better world.



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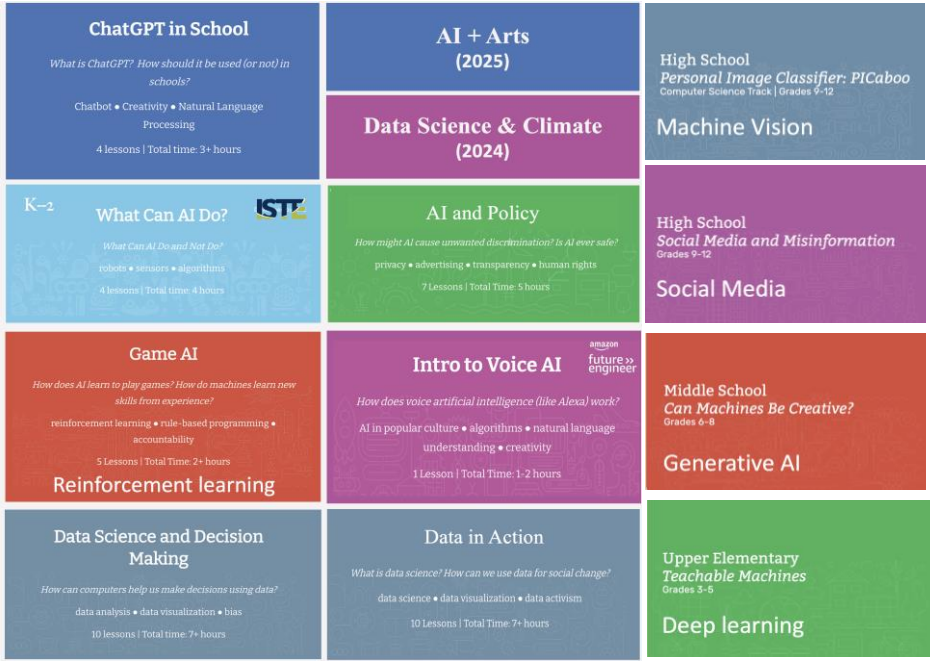
Example: Day of AI

dayofai.org

- **All K-12 students & their teachers** (any subject or tech experience) for in-classroom learning
- **Short-format, multi-disciplinary** across student-relevant themes. Relevant to different **academic subjects**, too
- **Accessible** "plugged" and "unplugged" activities to for varying levels of tech readiness and coding experience
- **Free + Open** curricula & professional development, **Educators can adapt** to their students and educational context.



UNESCO AI competency framework for students

Competency aspects	Progression levels		
	Understand	Apply	Create
• Human-centred mindset	• Human agency	• Human accountability	• Citizenship in the era of AI
• Ethics of AI	• Embodied ethics	• Safe and responsible use	• Ethics by design
• AI techniques and applications	• AI foundations	• Application skills	• Creating AI tools
• AI system design	• Problem scoping	• Architecture design	• Iteration and feedback loops

Day of AI Celebration Events in Boston, MA

Museum of Science, 2024
AI, Data Science and Climate

@Edward Kennedy Institute, 2023
AI Policy: AI and Human Rights

@Dearborn STEM Academy, 2023
ConvoAI with Amazon Future Engineer

WBUR CitySpace, 2022 (inaugural event)

@MIT Media Lab, 2021 Launch event with MA Governor

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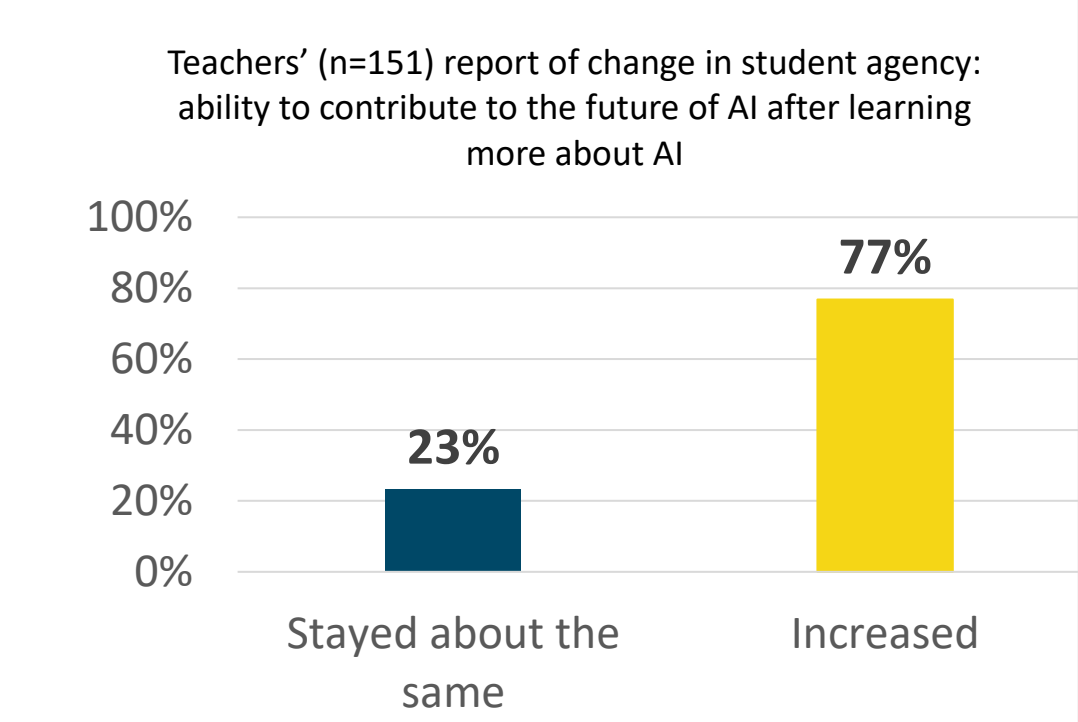
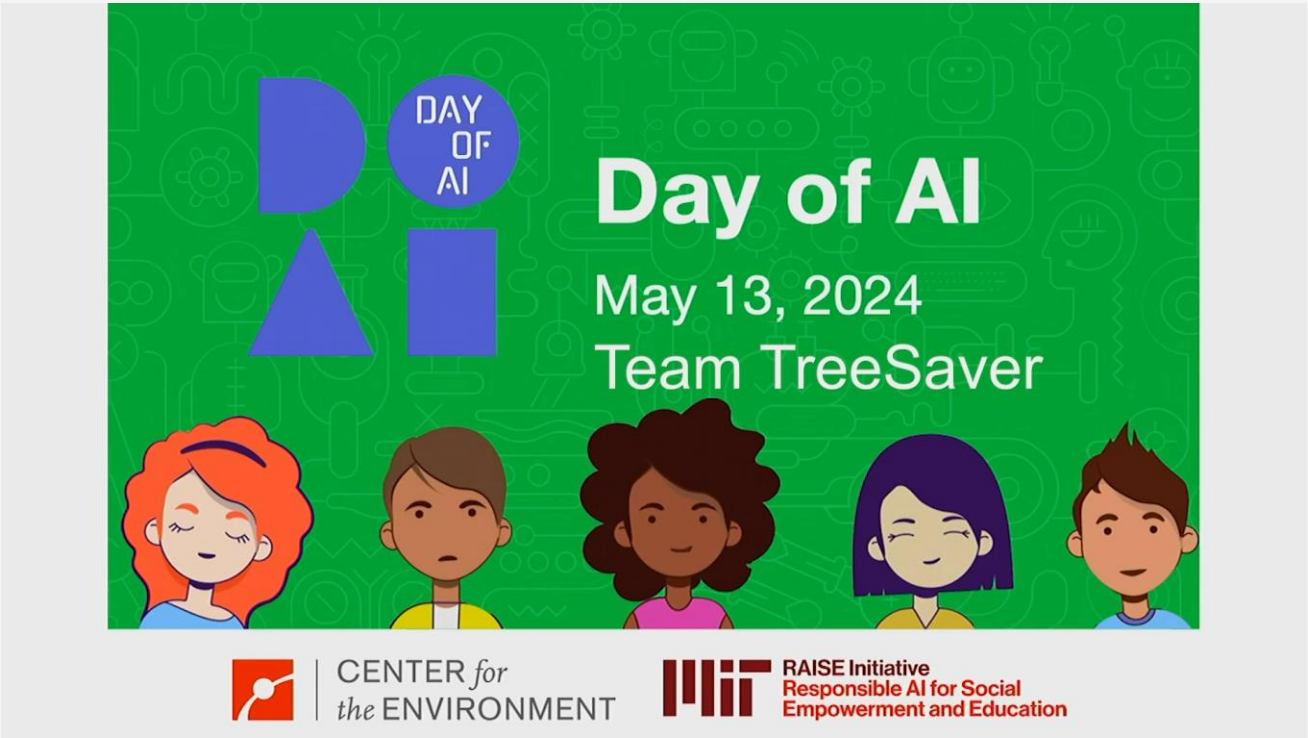
Student Agency & Empowerment





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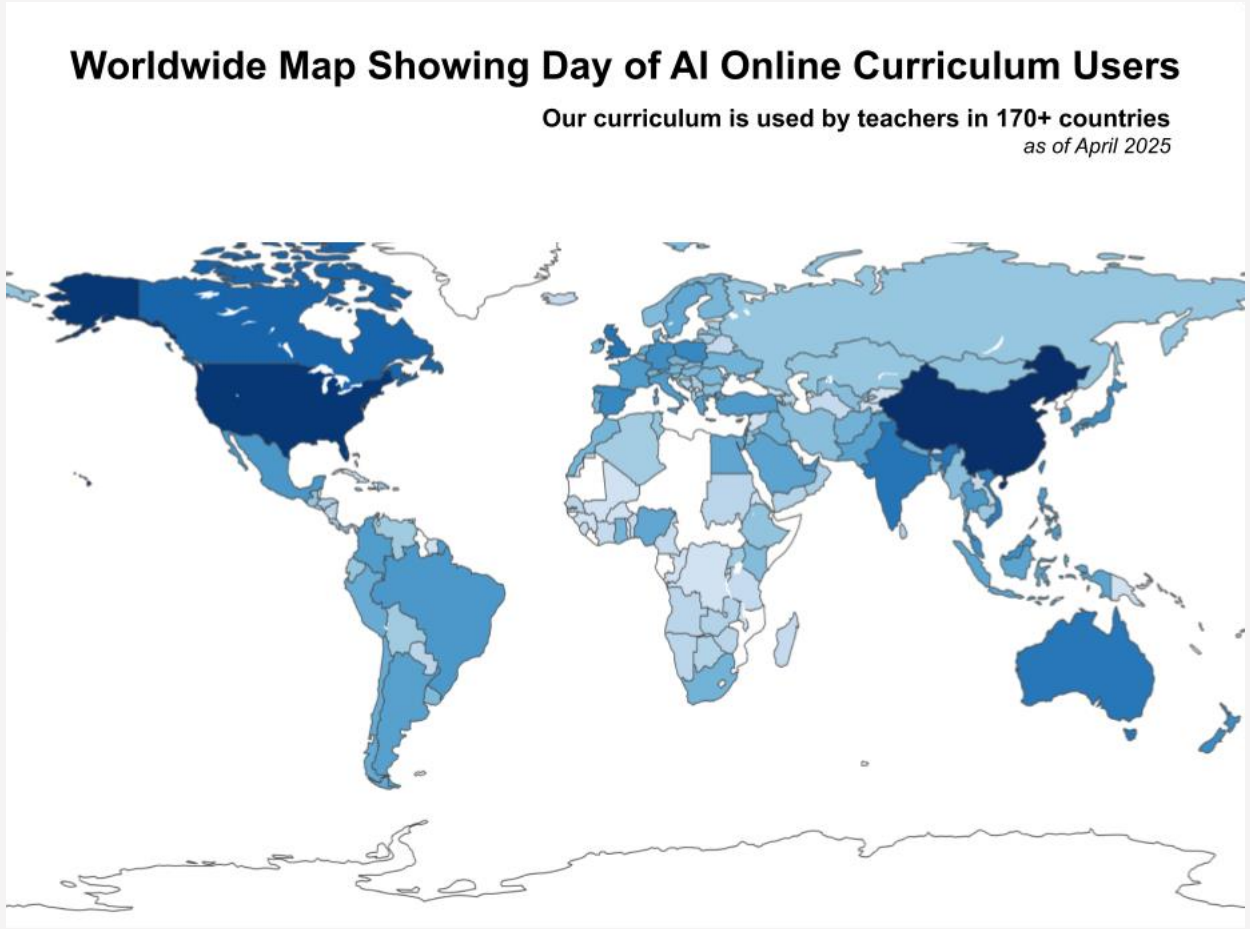
What do kids solve with AI?

Just Society

Thriving Planet

Flourishing People

Day of AI ”Grassroots” Global Growth



Day of AI has brought AI literacy to
1M students
30K teachers
170 countries

- Open & Free materials
- Adaptation/ Localization/ Translation
- In-Classroom Implementation
- **Teacher Training + Train-the-trainer**
- **Research & Evaluation**

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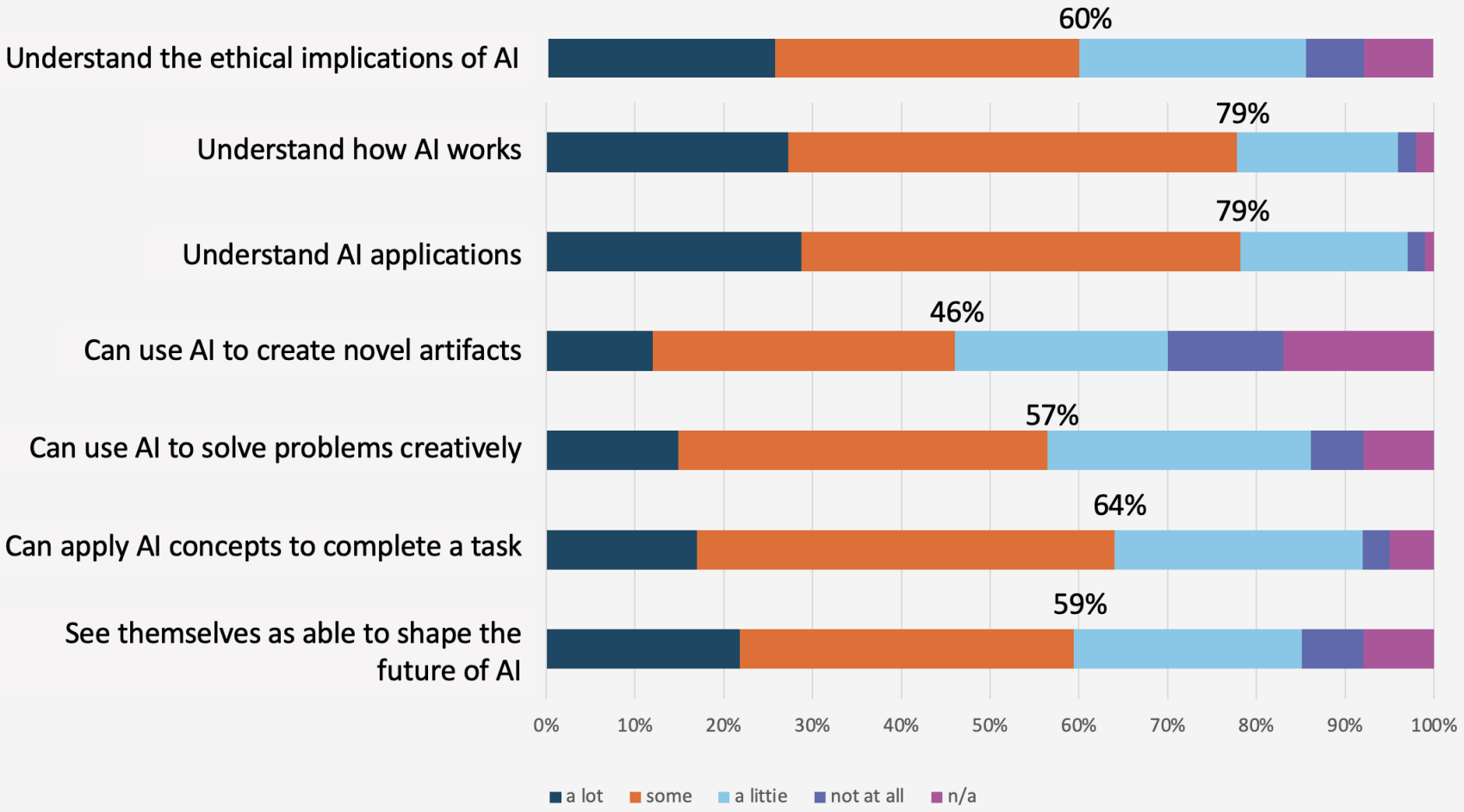
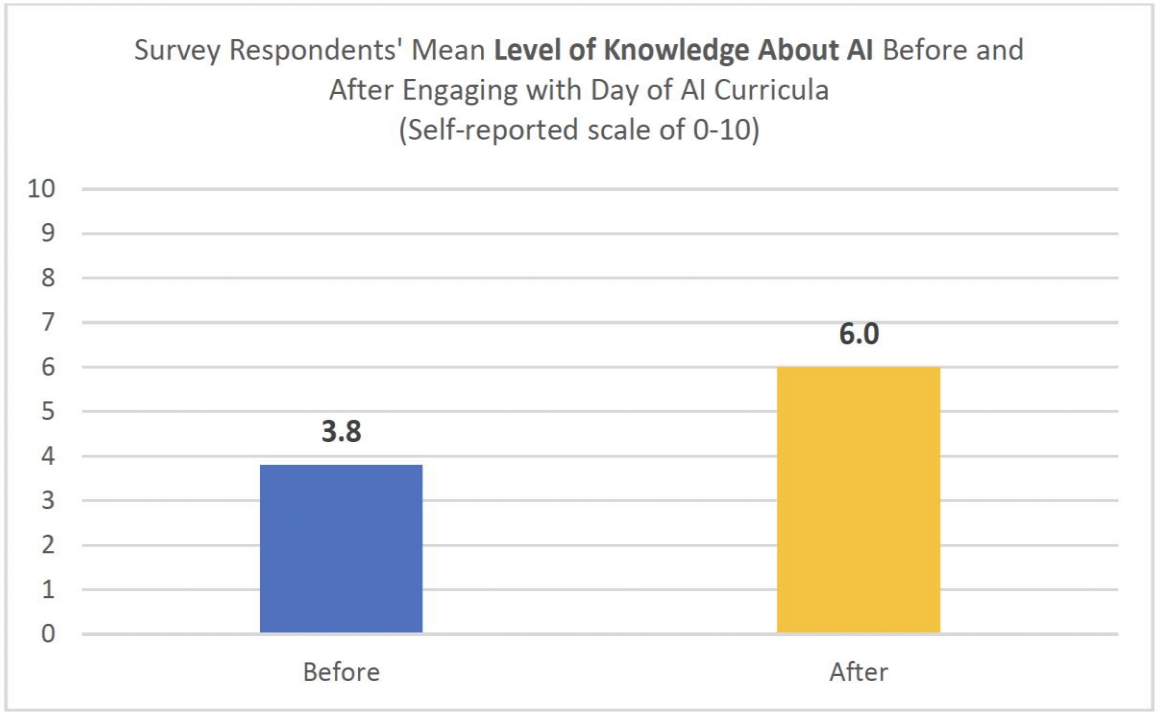
Students' Learning AI Fluency

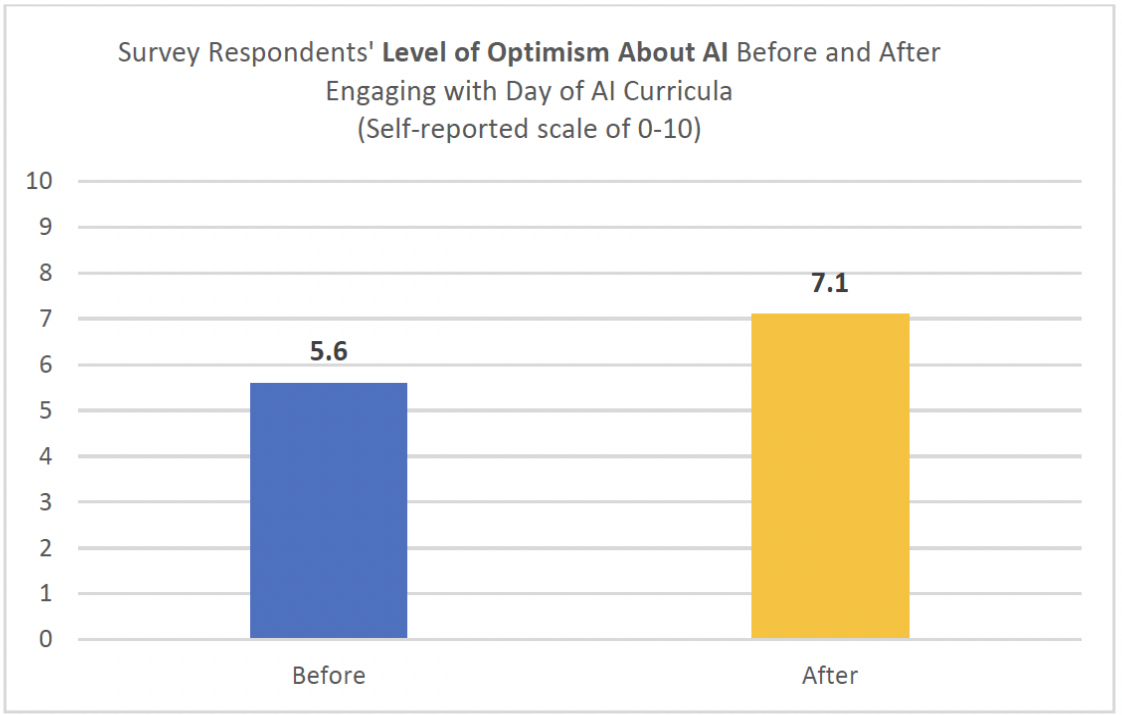


Surveys & Interviews
190 teachers,
38 countries,
12K students,
K-12 Day of AI Curriculum In Classrooms

Teachers Learning about AI

"I feel more optimistic about the spread of AI now that I know there is a concerted effort to teach our youth about how it works, the benefits and risks, and how it could be effectively and ethically used in the classroom."

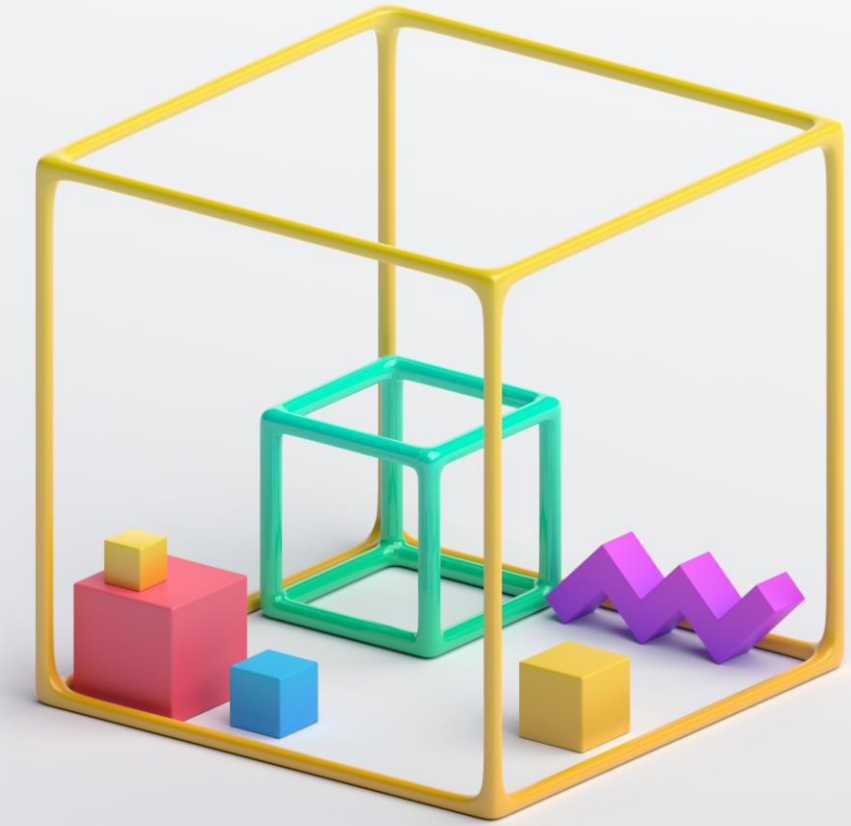




2025 Day of AI Projection

- Educate 1.8M students
- Train 75,000 K12 teachers
- 150 countries

Day of AI expands outreach through grassroots, direct-to-user efforts, complemented by strategic, large-scale collaborations with ministries of education and education non-profits



PISA 2029

Core B Media & AI Literacy

What's Next: Cross-Grade, Short-Format Approach

AI and Citizenship in our AI-Powered Society (middle school)

MATH	SCIENCE	ENGLISH	ART	SOCIAL STUDIES	CS / TECH
Social Media: Data Viz & Analysis (Privacy)	How Brains and Machines Learn, Sensing + Perception (Bias)	GenAI, Creative Writing (Responsible use in school)	GenAI and Self Expression, Self Portraits (DeepFakes, Bias)	AI, Human Rights, & Society (AI Policy)	Computational Action Project
5 lessons	5 lessons	5 lessons	5 lessons	5 lessons	12 lessons
Responsible AI	Responsible AI	Responsible AI	Responsible AI	Responsible AI	Responsible AI
Fluency	Fluency	Fluency	Fluency	Fluency	Design
Common Core	Common Core	Common Core	Common Core	Common Core	Common Core
					Capstone Project

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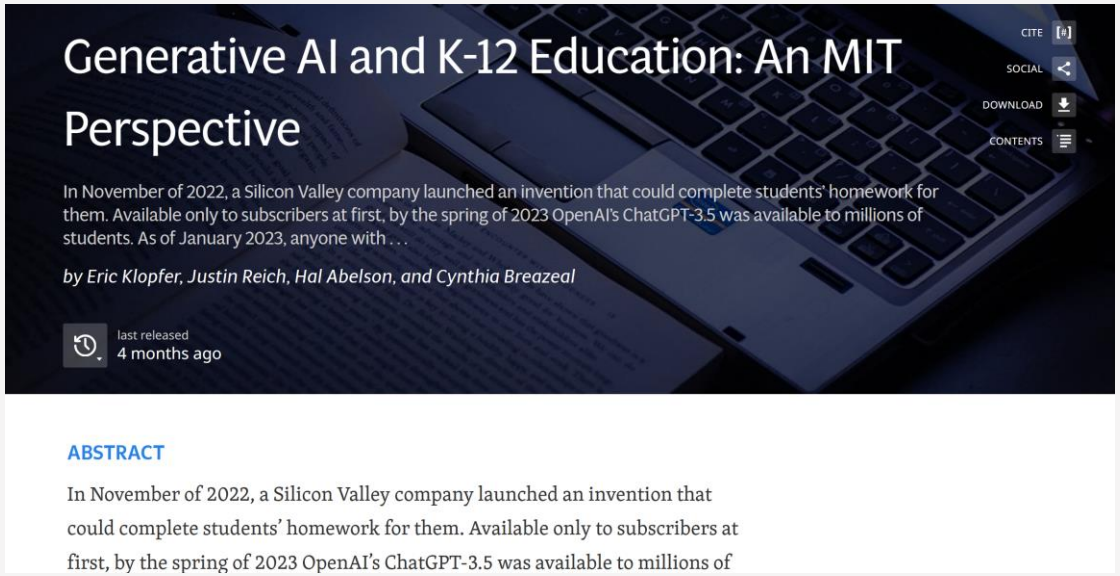
Power of Sharing Free, Open Resources



By 2022, only 15 countries had included AI learning objectives in their national curricula

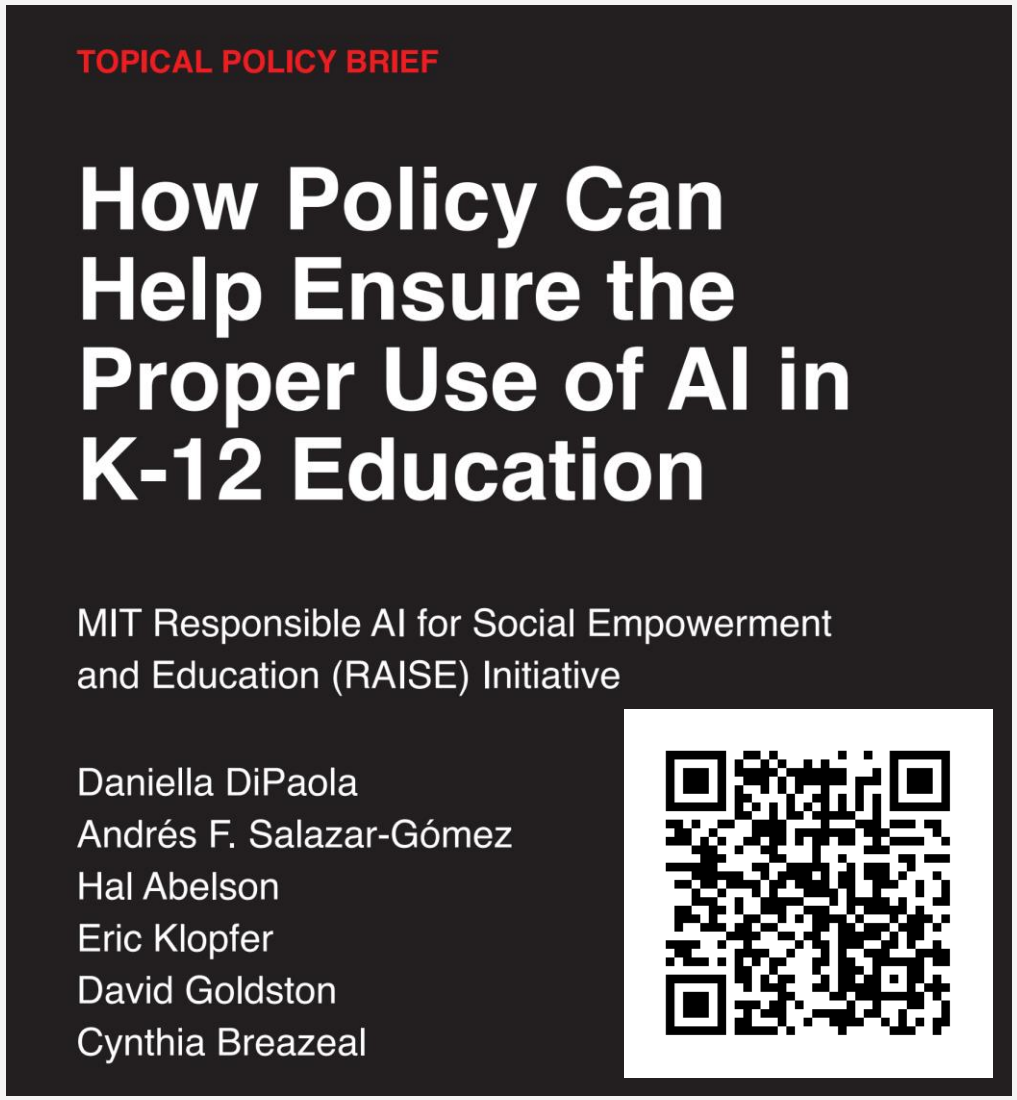
Free & Open K12 Curriculum & Professional Development

dayofai.org

UNESCO AI Competency Framework for Students

https://unesdoc.unesco.org/ark:/48223/pf0000391105

Power of Sharing Free, Open Resources



- Research on AI in K-12 Education
- Technical Standards and Auditing
- Procurement Assistance
- Educational Guidance
- AI Literacy

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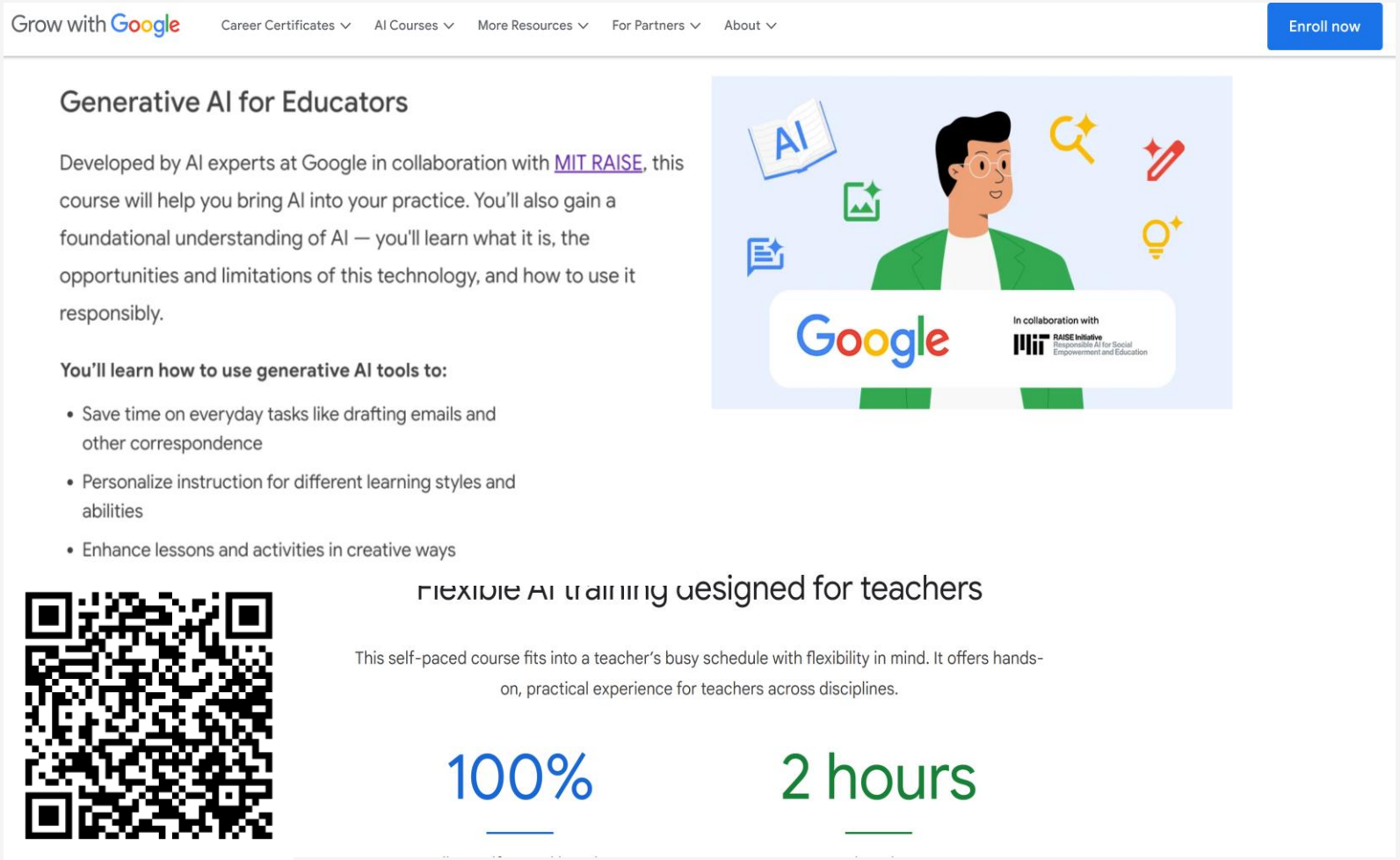
Power of Sharing Free, Open Resources



https://grow.google/ai-for-educators/

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Thank You

DP WORLD

The Hong Kong Jockey Club
RIDING HIGH TOGETHER

Liberty Mutual INSURANCE

One Step Forward
EDUCATION FOUNDATION

amazon future engineer

NSF

axim

tdm. GROWTH PARTNERS

Google