



**New Challenges for
Tertiary Education
in the 21st Century**
Hong Kong, 17 June 2019







Robot Doctors Replacing Real Doctors

washingtonpost.com



Physician's assistant Jeffrey E. Placitelli is accompanied on morning rounds by Dr. Louis Kavoussi, who joins him by way of video conference on a robot "doctor" at Johns Hopkins Hospital in Baltimore.





SOUTHFIELD 10
SCHOOL
GRADE 6
SOUTHFIELD MICH
DEC 21 1950



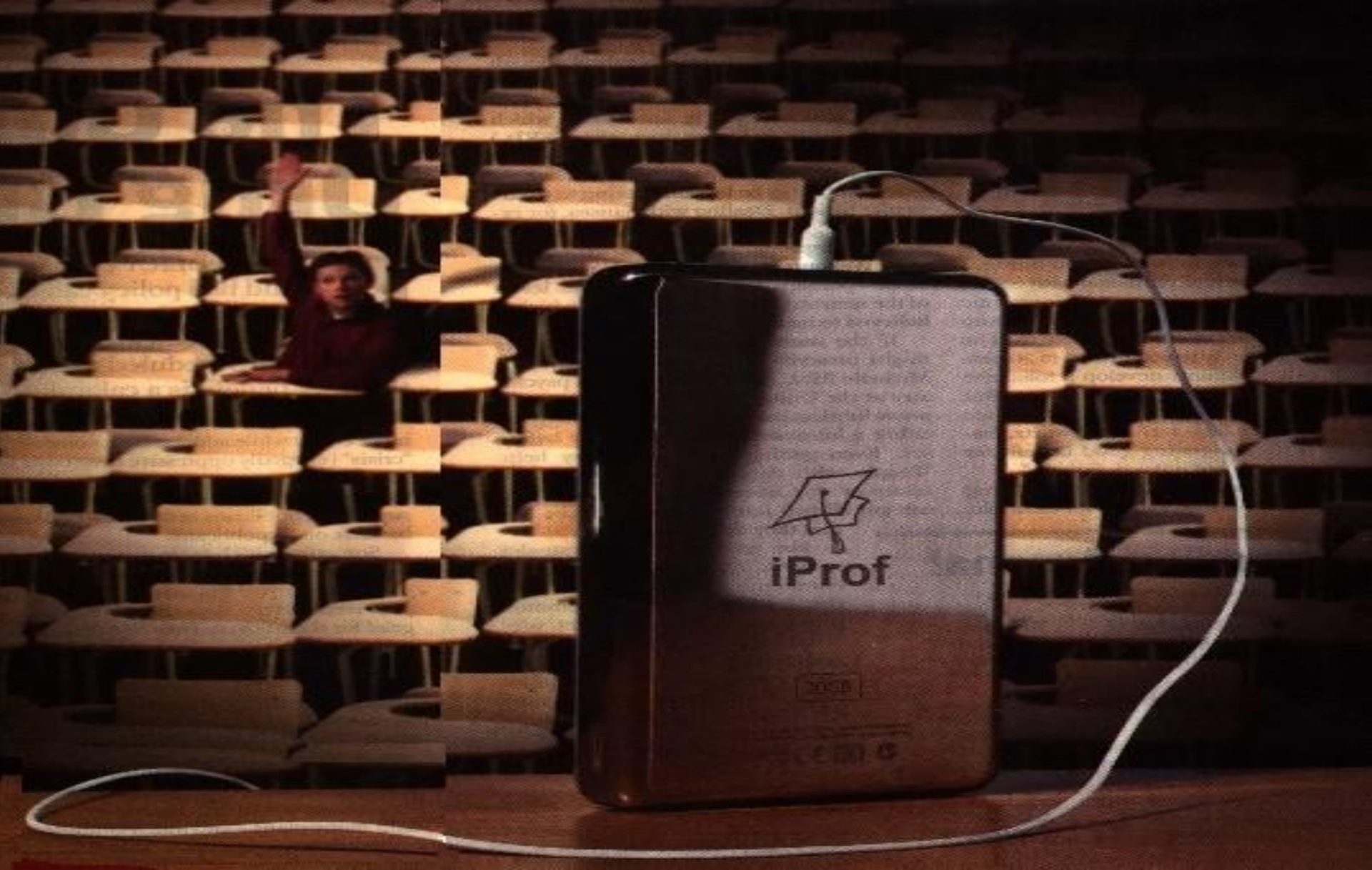
The future of tertiary education?

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Global Tertiary Education Expert



A world of science fiction?

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Are your universities ready?

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Outline

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- Knowledge for Innovation
- Innovation in Teaching and Learning

Imagine ...

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- A poor country without natural resources
- With a 5% tertiary education enrolment rate at the time of independence
- Where would this country be today if it had focused only on basic education and not built top universities?

Which country fits this description?

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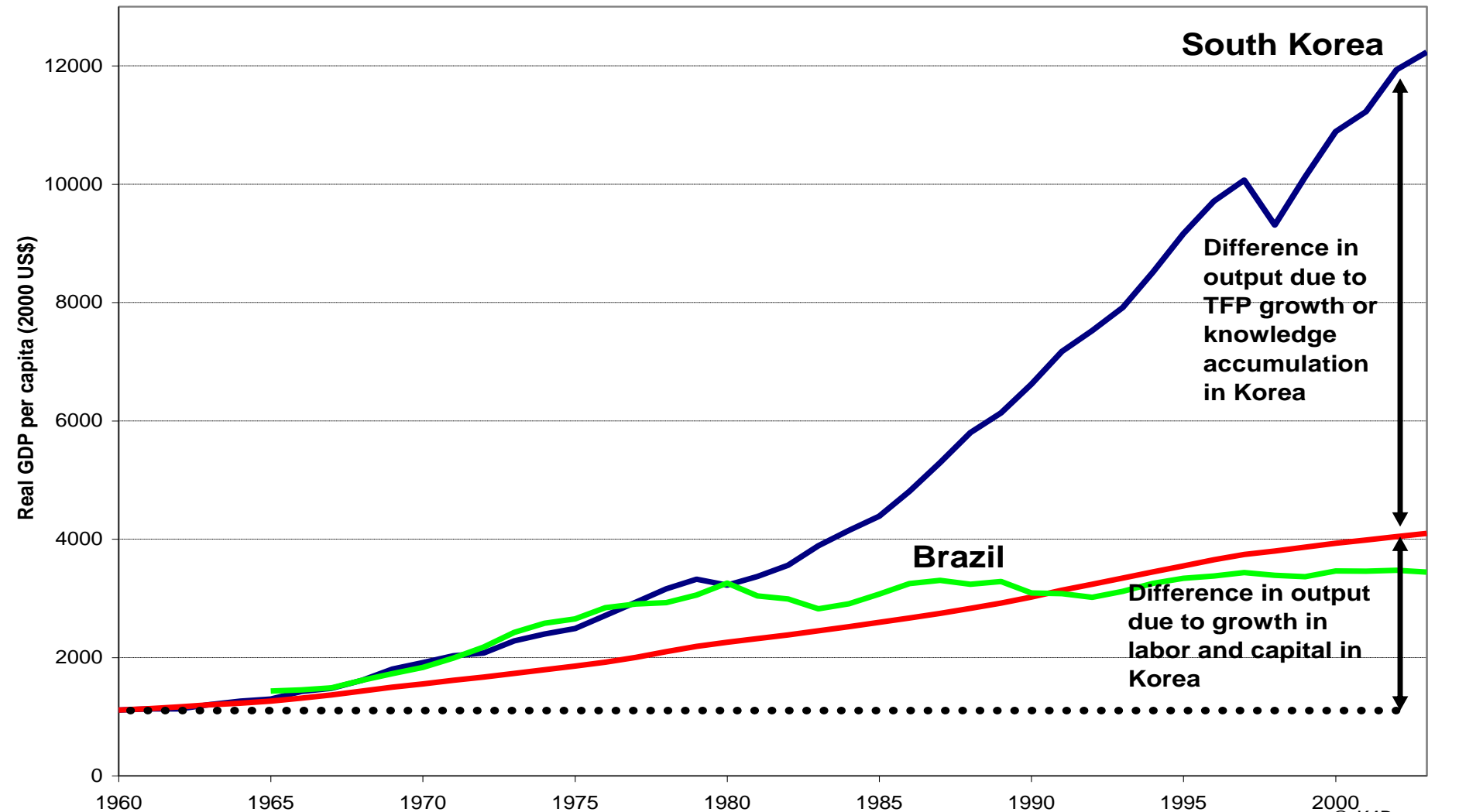


Brazil?

South Korea?

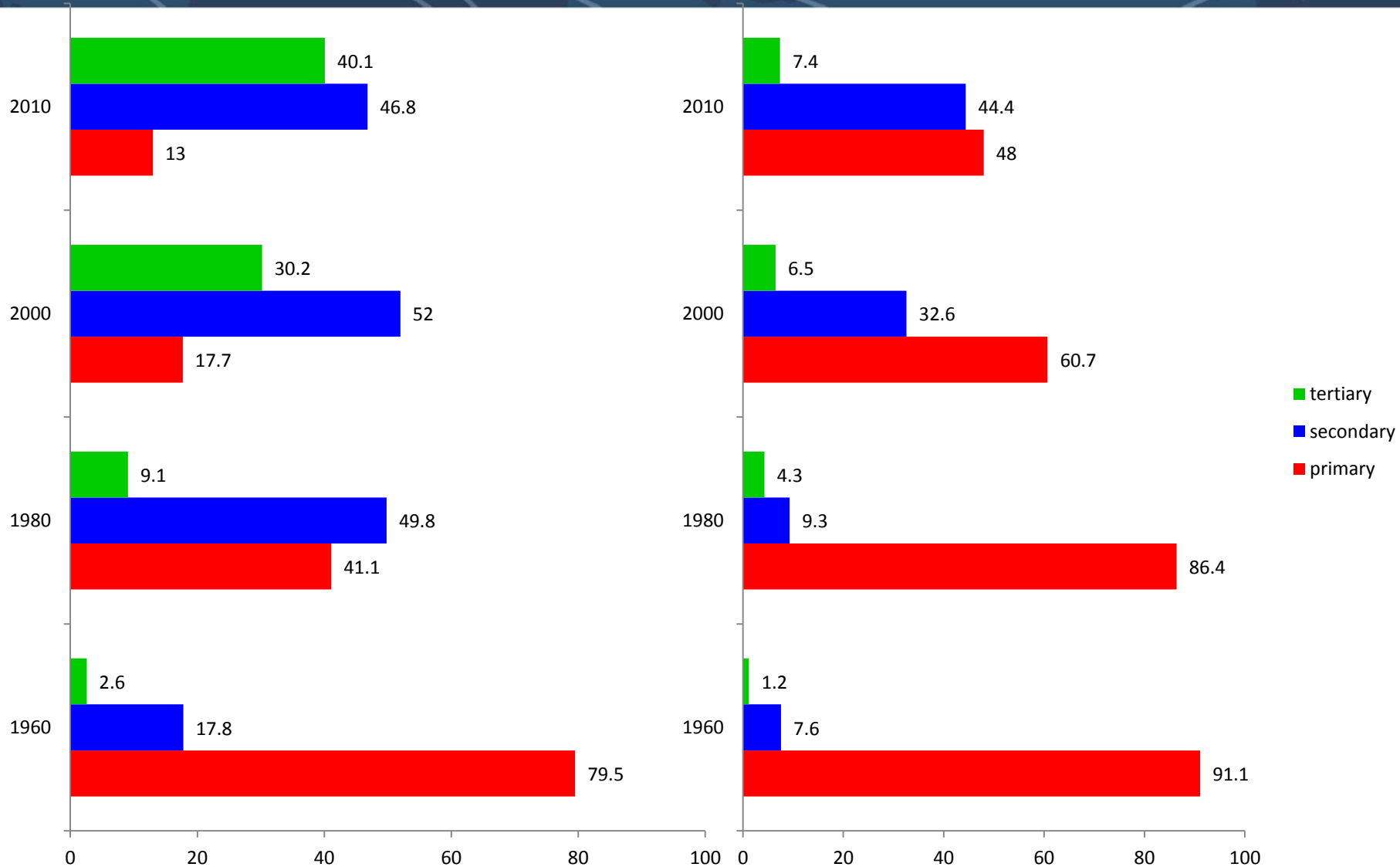
Explaining the difference between poverty and wealth

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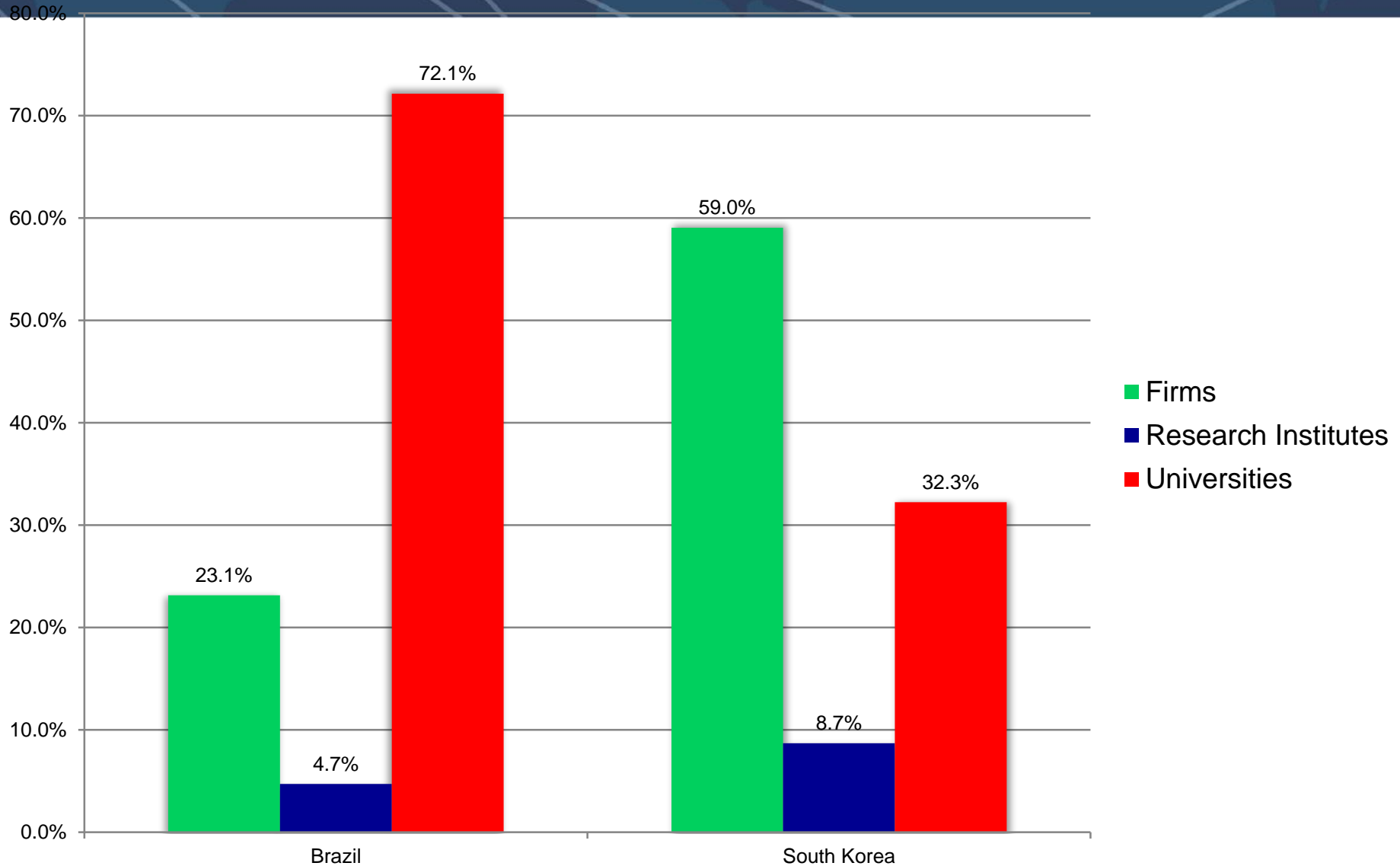
South Korea and Brazil

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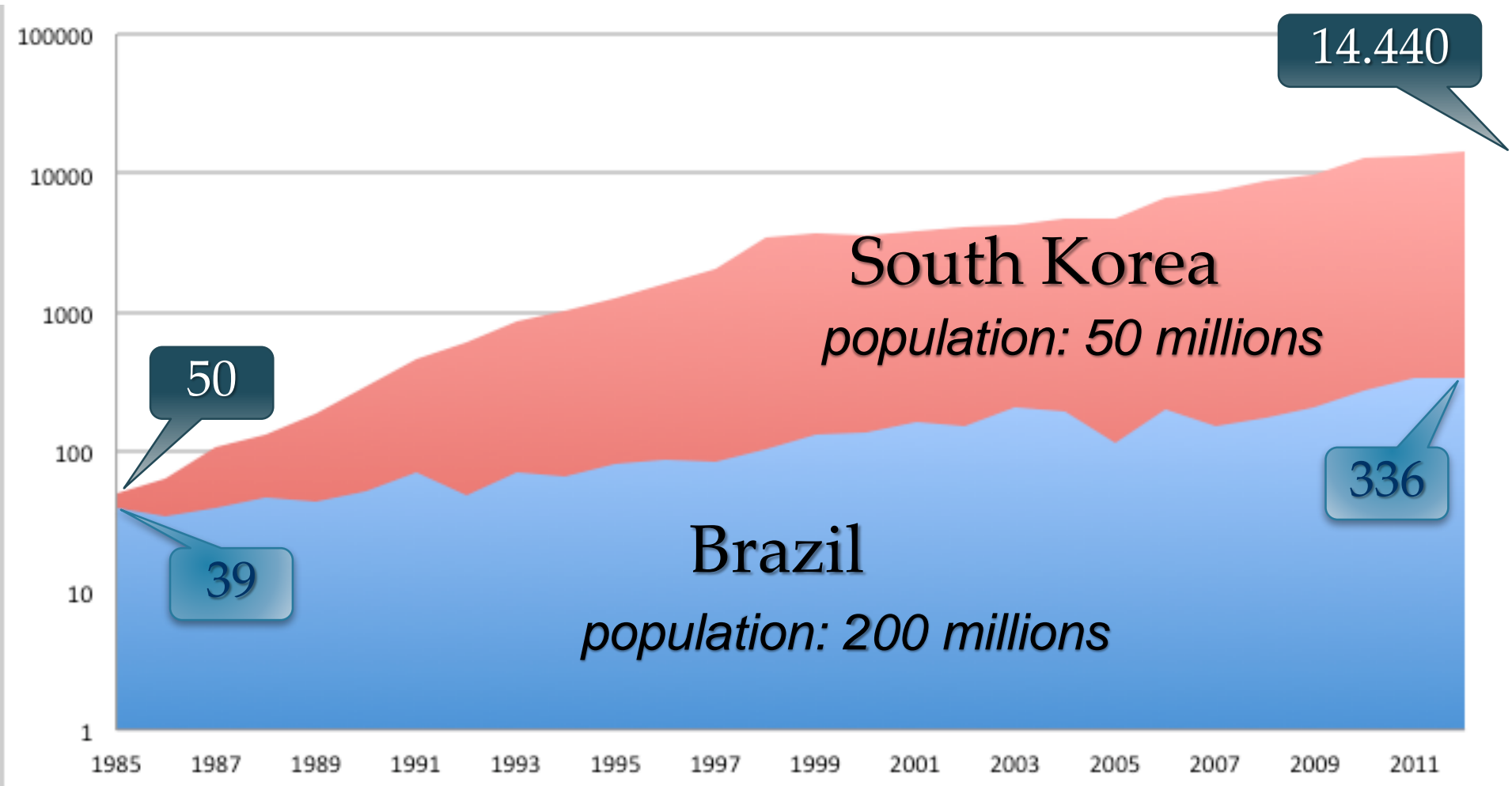
Scientists active in R&D

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Patents/USPTO, 1985-2012

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Exception

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INSTITUTO TECNOLÓGICO DE AERONÁUTICA



Oulu



OULUN KAUPUNKI
City of Oulu

OULUN YLIOPISTO
University of Oulu

NOKIA

Nokia E7
Biểu tượng mới
của người thành đạt



NOKIA
Connecting People

NOKIA
Connecting People

OPEN: 08h00

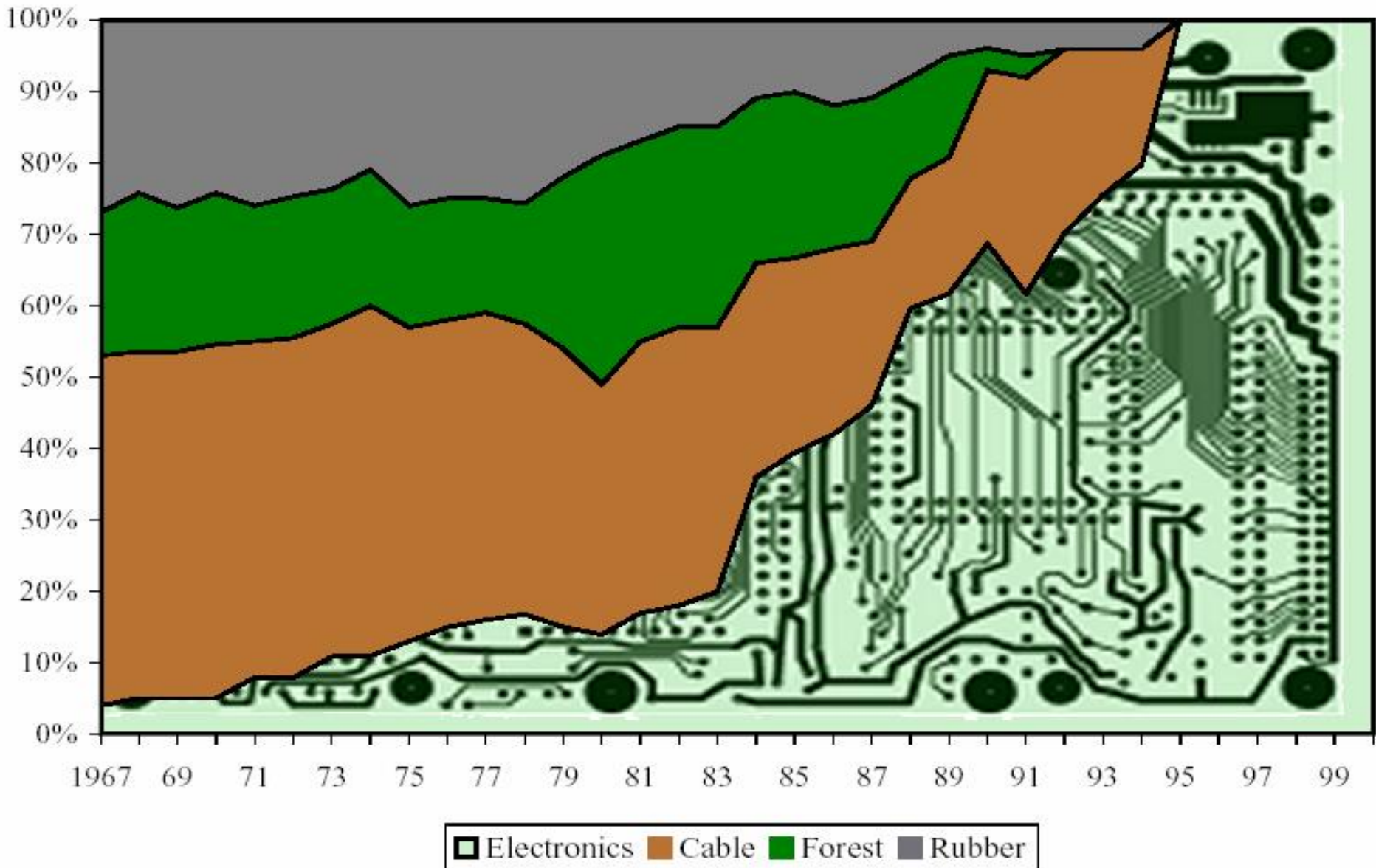
CLOSE: 21h00

Nokia E7
Biểu tượng
của người thành đạt



Evolution of Nokia turnover

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Tertiary education at the heart of economic growth

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- Nordic countries
- Lisbon agenda of the EU
- Asian tigers / dragons





Creation of the Research Institute



Knowledge Enterprise

FEBRUARY 2010
A Publication of National University of Singapore

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NUS Solar Energy Research Institute: Taking the lead in solar energy research and development 2



Research in
Renewable Energy
by NUS researchers

Supported by:



NUS Enterprise



Contribution of NUS

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- Institute of Solar Energy Institute
 - 3.5 billion dollar investment
- Asian Logistics Institute
 - 166 billion dollar sector

Frugal Innovations

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Isobar

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Typhidot

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- Diagnosis of typhus
- Instead of 5 days with electricity and cold chain, 55 minutes
- New equation for universities:
number of lives saved instead of
dollars earned

1 NO POVERTY



2 NO HUNGER



3 GOOD HEALTH



4 QUALITY EDUCATION




5 GENDER EQUALITY




6 CLEAN WATER AND SANITATION



7 RENEWABLE ENERGY



8 GOOD JOBS AND ECONOMIC GROWTH



9 INNOVATION AND INFRASTRUCTURE



10 REDUCED INEQUALITIES



11 SUSTAINABLE CITIES AND COMMUNITIES



12 RESPONSIBLE CONSUMPTION



13 CLIMATE ACTION



14 LIFE BELOW WATER



15 LIFE ON LAND



16 PEACE AND JUSTICE



17 PARTNERSHIPS FOR THE GOALS



THE GLOBAL GOALS
For Sustainable Development

Tertiary Education & the SDGs

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- Preparation of skilled professionals
- Knowledge generation, adaptation & diffusion
- Institutional development & capacity building
- Values & citizenship skills

Excellence and corruption in Colombia

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University	Corruption ranking	Excellence ranking	Status
U Externado de Colombia	1	15	Private
U. Pontificia Javeriana	2	7	Private
U Los Andes	3	1	Private
U Santo Tomás	4	49	Private
U Nacional de Colombia	5	2	Public
U Libre	5	50-100	Private
U del Rosario	7	3	Private
U de Antioquia	8	6	Public
U del Norte	8	11	Private

Most corrupt professions in Colombia

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Profession	Percentage
Lawyers	43%
Business, Finance, Economics and Accounting	28%
Engineers & Architects	16%
Doctors and Dentists	7%
Humanities	5%
Hard Sciences	1%

SDGs	Preparation of Skilled Professionals	Knowledge Generation, Adaptation & Diffusion	Institutional Development & Capacity Building	Values & Citizenship Skills
1. Poverty Ended	X	X	X	X
2. Sustainable Agriculture to End Hunger	X	X	X	
3. Healthy Lives	X	X	X	X
4. Inclusive & Equitable Quality Education	X	X	X	X
5. Achieve Gender Equality	X		X	X
6. Water & Sanitation for All	X	X	X	X
7. Sustainable Energy	X	X	X	
8. Inclusive & Sustainable Economic Growth	X	X	X	
9. Resilient Infrastructure	X	X	X	
10. Reduced Inequality	X			X
11. Sustainable Cities	X	X	X	X
12. Sustainable Consumption & Production		X		X
13. Managed Climate Change		X	X	X
14. Sustainable Marine Resources	X	X	X	X
15. Sustainable Use of Terrestrial Systems	X	X	X	X
16. Peaceful & Inclusive Societies		X	X	X
17. Global Partnership for Sustainable Development			X	X

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Outline

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- Knowledge for Innovation
- **Innovation in Teaching and Learning**

Three dimensions of innovation

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- New competencies, skills, attitudes and behaviors
- New pedagogical practices
- Innovative use of new technologies



The future of jobs (labor markets in the digital era)



International New York Times



DRC
Hubo

2

KAIST
KAREE
CAREX



The future of jobs

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- Jobs that disappear (700 professions)
- New jobs

Jobs that did not exist 10 years ago

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- App developer
- Social media manager / YouTube content creator
- Digital risk manager
- Smart city / smart building architect
- Driver-less car engineer
- Cloud computing specialist
- Big data analyst
- Sustainability manager
- Drone operator

IT Jobs most popular in 10 years

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- Computer vision engineer
- Machine learning engineer
- Network analyst
- Security analyst
- Cloud engineer
- App developer
- Business intelligence analyst (growth hacker)
- DevOps lead
- Database administrator
- User support specialist

The future of jobs

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- Jobs that disappear (700 professions)
- New jobs
- Jobs that are undergoing transformation (47%)
 - UK: 23% lacking basic digital skills
 - Africa: 1% of graduates have coding skills

21st-Century Skills

Foundational Literacies

How students apply core skills to everyday tasks



1. Literacy



2. Numeracy



3. Scientific literacy



4. ICT literacy



5. Financial literacy



6. Cultural and civic literacy

Competencies

How students approach complex challenges



7. Critical thinking/
problem-solving



8. Creativity



9. Communication



10. Collaboration

Character Qualities

How students approach their changing environment



11. Curiosity



12. Initiative



13. Persistence/
grit



14. Adaptability



15. Leadership



16. Social and cultural awareness

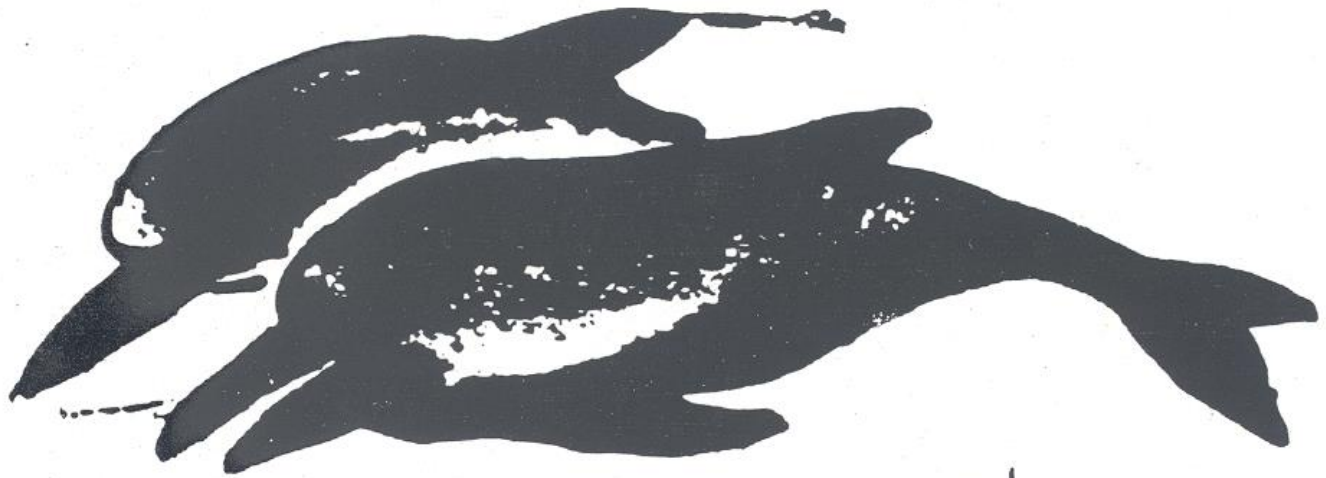
Lifelong Learning

Generic complex competencies

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- Information analysis, critical thinking & problem solving
- Global contextual analysis
- Teamwork / collaboration
- Communication



J. Harris

“Although humans make sounds with their mouths and occasionally look at each other, there is no solid evidence that they actually communicate among themselves.”

Generic complex competencies

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- Information analysis, critical thinking & problem solving
- Global contextual analysis
- Teamwork / collaboration
- Communication
- Creativity

Design

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prada phone



AURA™

THE RETURN OF ARTISTRY





PORSCHE DESIGN

LEICA

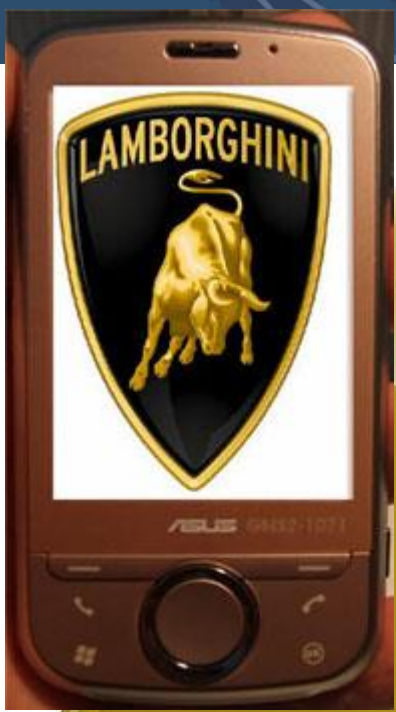


HUAWEI

















Creativity

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Process of generating original ideas and insights that
have value

Sir Ken Robinson

Creativity

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**“I didn’t know
you could do that!”**



STEAM, no STEM

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Meet my son Karim...

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Character qualities / Socio-emotional competences

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- Curiosity (motivation)
- Initiative (entrepreneurial thinking)
- Persistence / grit / resilience
- Adaptability
- Leadership
- Ethical awareness & reasoning (social, cultural & environmental dimensions)



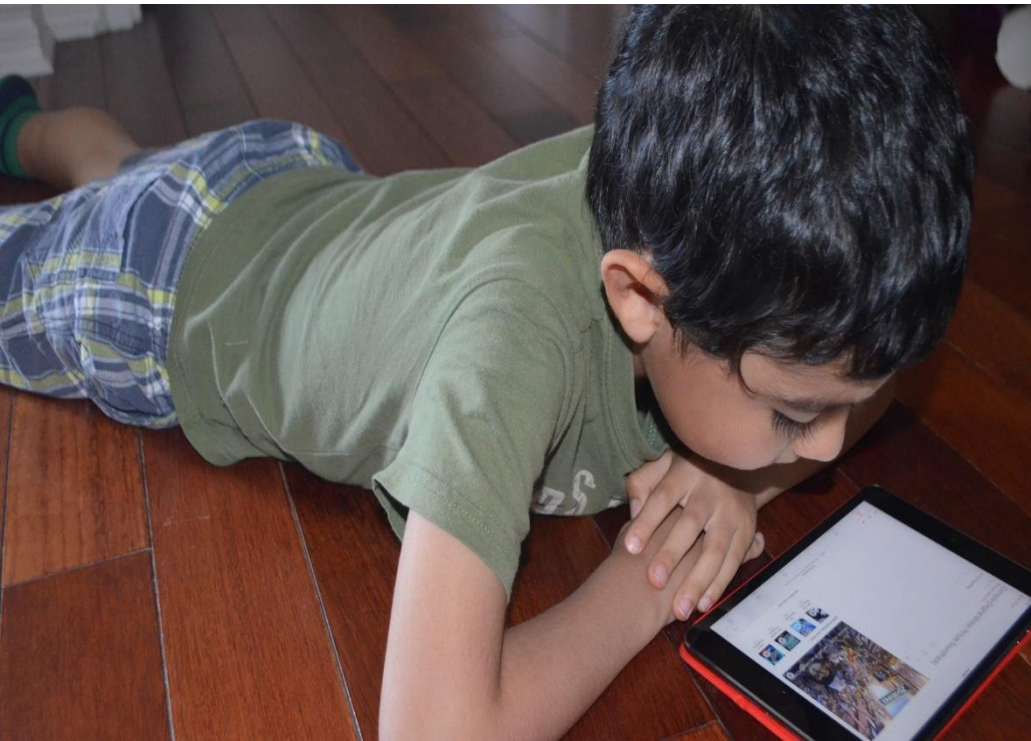
1990



2019

Meet my grandson Emilio...

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twitter



You



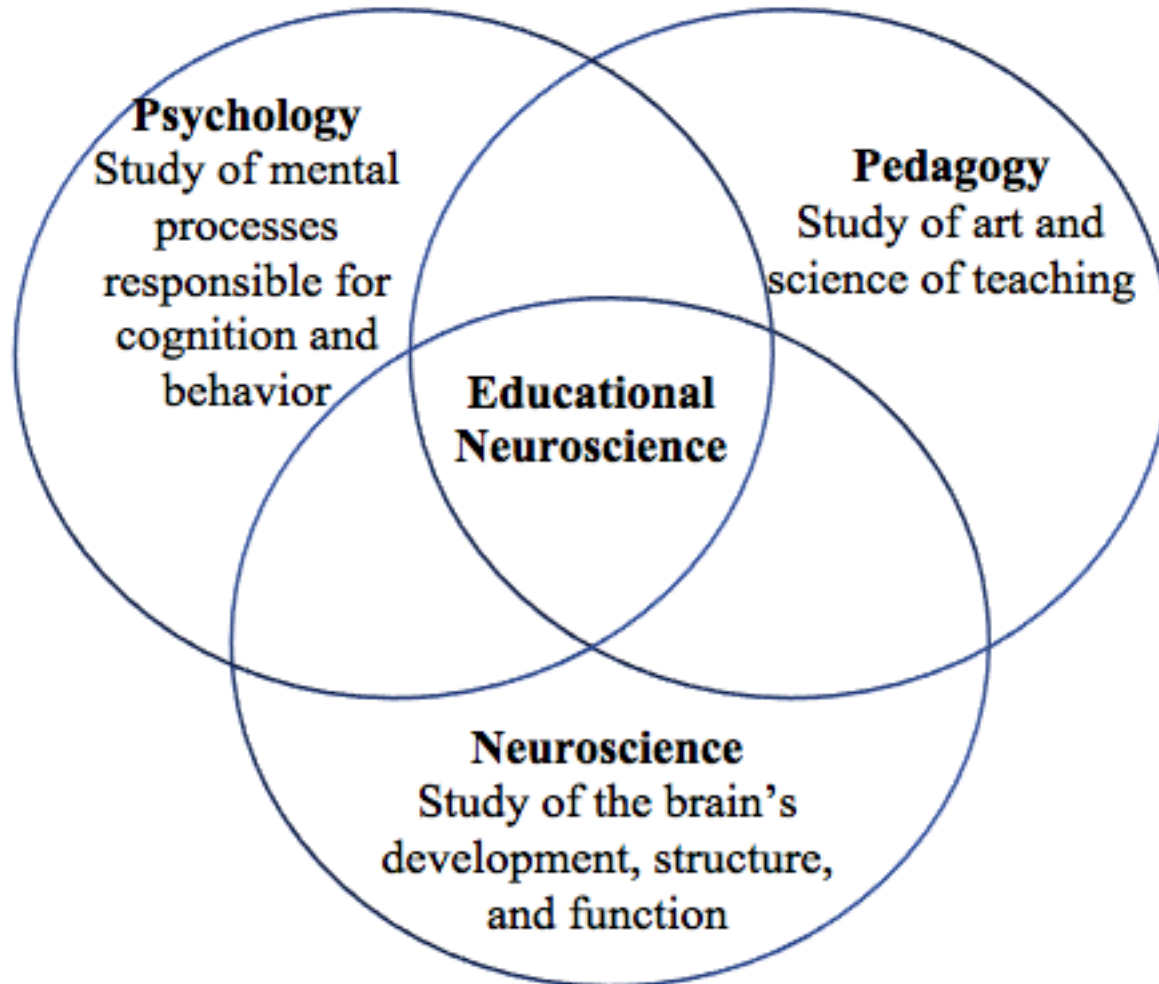
WIKIPEDIA
The Free Encyclopedia

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Educational Neuroscience

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Growth mindset

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Fixed Mindset	Growth Mindset
Intelligence is static	Intelligence can be developed
Avoids challenges	Embraces challenges
Gives up easily when facing obstacles	Persists despite obstacles
Sees efforts as fruitless	Sees efforts as path to mastery
Ignores useful feedback	Learns from criticism
Threatened by others' success	Inspired by others' success

Take aways

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- Intellectual simulation enhances development
- Enjoyable educational experiences provokes pleasure
(chemical reaction associated with dopamine hormone)

Curricular innovations

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- Experiential learning (coop, service, simulations, role playing)
- Multi-disciplinary programs
 - Amsterdam University College
 - U of Queensland School of Chemistry and Molecular Biosciences
- Competency-based learning
 - Western Governors' University
- Internationalization

Innovative pedagogical approaches

*IAU/UNESCO
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- Peer learning
 - Clickers / Flipped classroom
- Project and design based learning
 - Olin, Roskilde, Aalborg, Maastricht
 - Simulations
 - Serious games
- Self-learning using AI-based software

Advantages of peer learning

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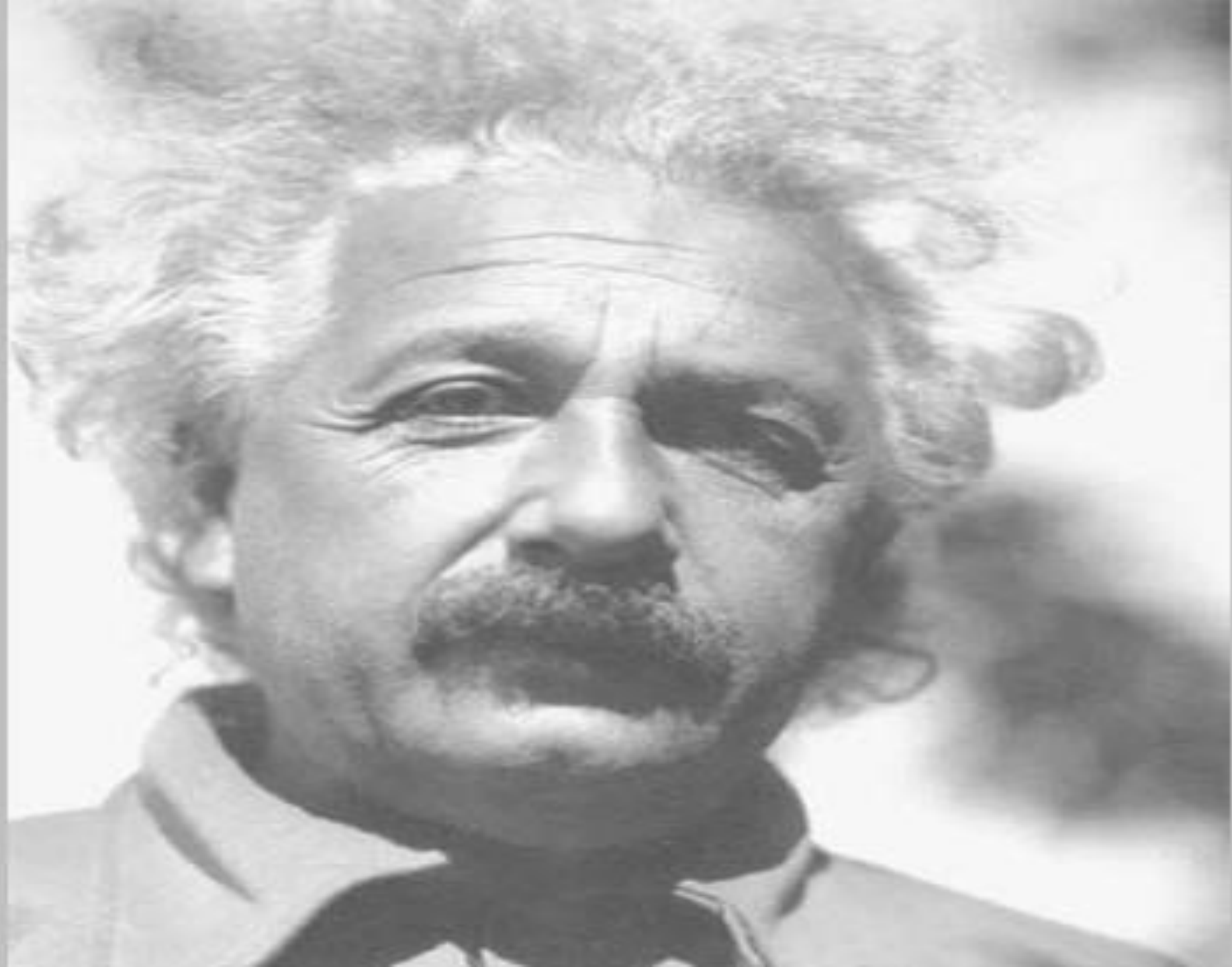
- Students know best how to communicate with each other
- Students pay more attention to their friends than to the prof
- Students may be more intelligent than their professors
- Professors are such experts that they don't always know how to communicate their knowledge
- Students feel more at ease sharing their doubts with other students (fear, shame)

Assessment

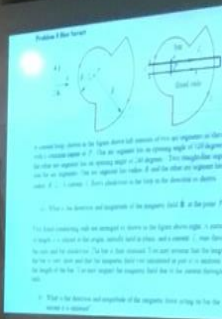
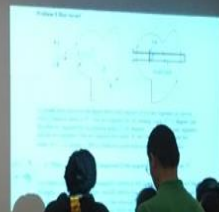
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- “Assessment = killer of learning”
 - Need for alignment
- Multi-dimensional assessment: general education, key competencies, trajectory
- e-portfolios as self-evaluation and growth assessment instruments







Learning Café, NUS

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IE window

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Торакоскопия







10 Team-Building Games that Promote Critical Thinking

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1. If You Build It
2. Save The Egg
3. Zoom
4. Minefield
5. Worst-Case Scenario
6. A Shrinking Vessel
7. Go For Gold
8. It's A Mystery
9. 4-Way Tug-of-War
10. Keep it Real



TeachThought.com

Mixed Reception

Gather clues - Interview suspects - Analyze evidence Solve a mysterious death

This activity is set in a research group that is developing an antivenom for spider bites. In the opening scene, Nelson Pogline, a talented graduate student, dies unexpectedly at a university reception. As a detective, you must use chemistry concepts to determine if this was murder and if so, solve the case. You can interview suspects using Quicktime movies, investigate the crime scene for clues with Quicktime Virtual Reality images, and analyze the evidence from the crime lab.



This activity requires basic knowledge of formula weight, stoichiometry and the scientific method to solve the mystery.

Additional concepts that are discussed include: molecular recognition, limiting reagents, and mass spectrometry.

Note to instructors: The Windows-based software is suitable for high school and college introductory chemistry students. Mixed Reception can be used as a homework assignment for individual students, or as an in-class group activity. Solving the case takes between 40 and 50 minutes.

Activity and Materials:

Activity:

[Mixed Reception Activity](#) [260 MB Zip file]
[Installation instructions](#)

Classroom Materials:

[User Walkthrough](#) [.pdf]
[Activity Worksheet](#) [.doc]
[Periodic Table](#) [.pdf]
[Final Report](#) [.doc]

Classroom CD's:

(CD includes activity and classroom materials)

Fill out a form to [request free CD's](#)
[Email us](#) for teacher solutions and hints
[Download .iso file](#) to make your own CD's



Please [email us](#) for additional information, or just to tell us what you think.



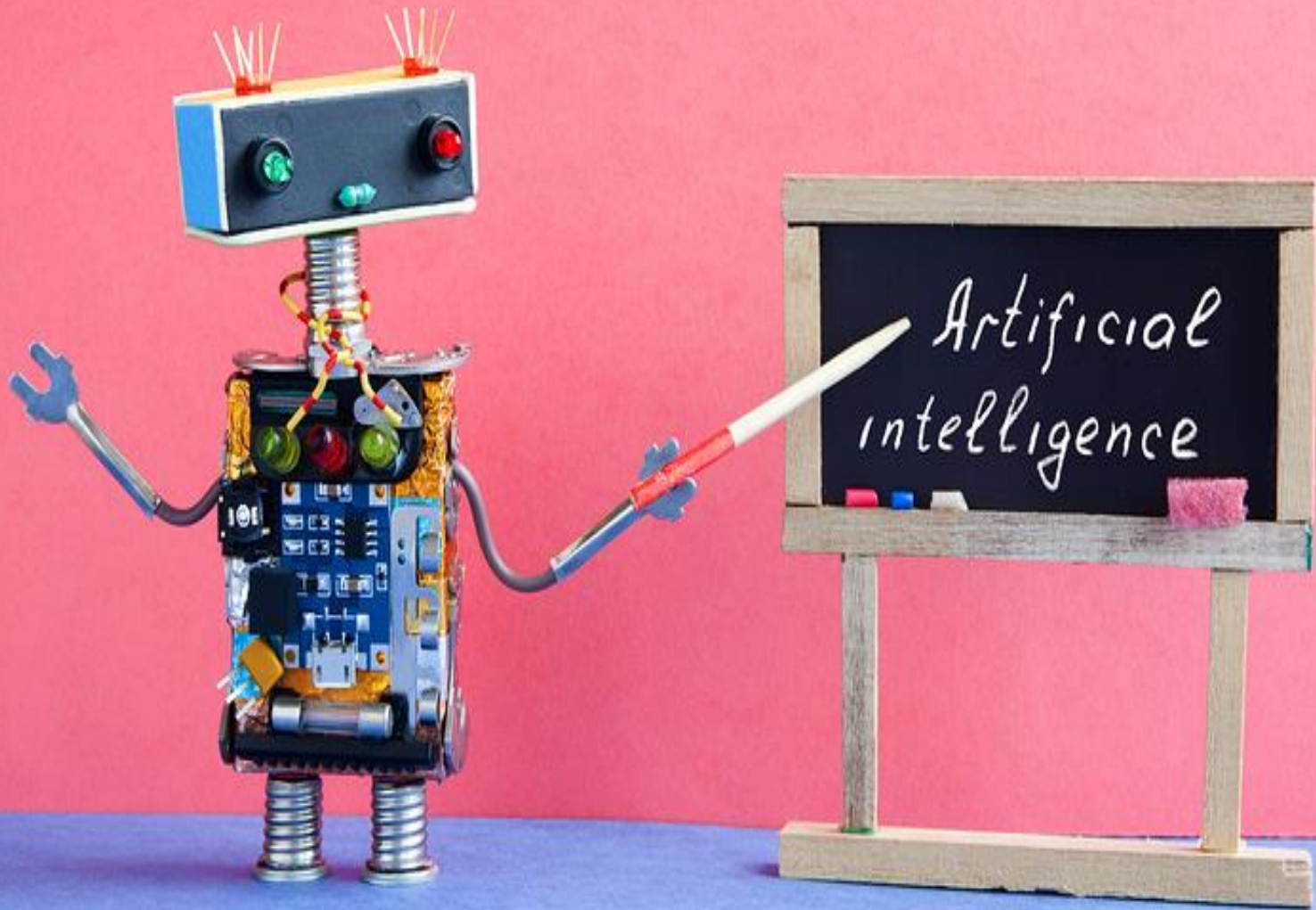
THE
SCIENCE
LAB

New Technologies

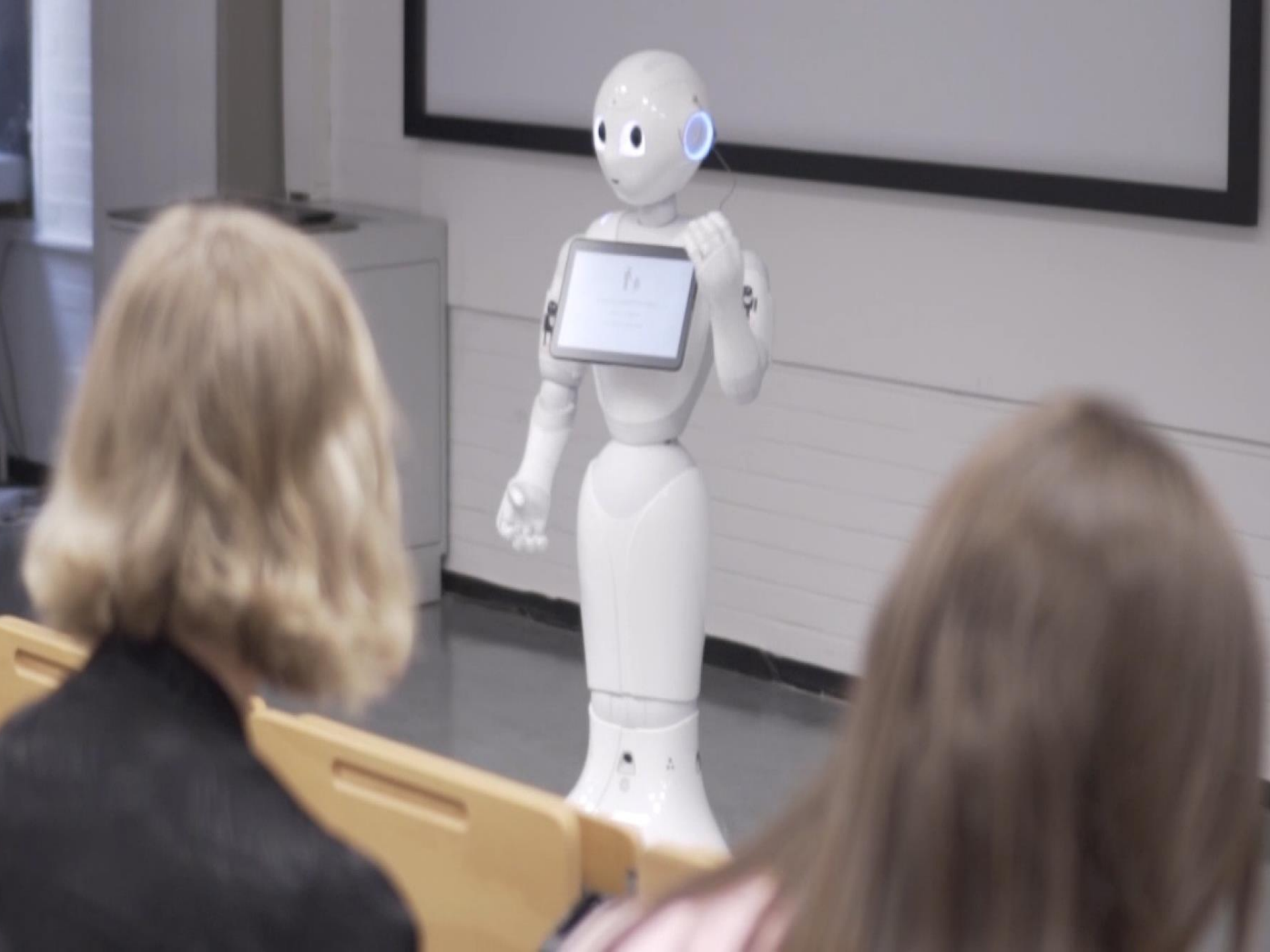
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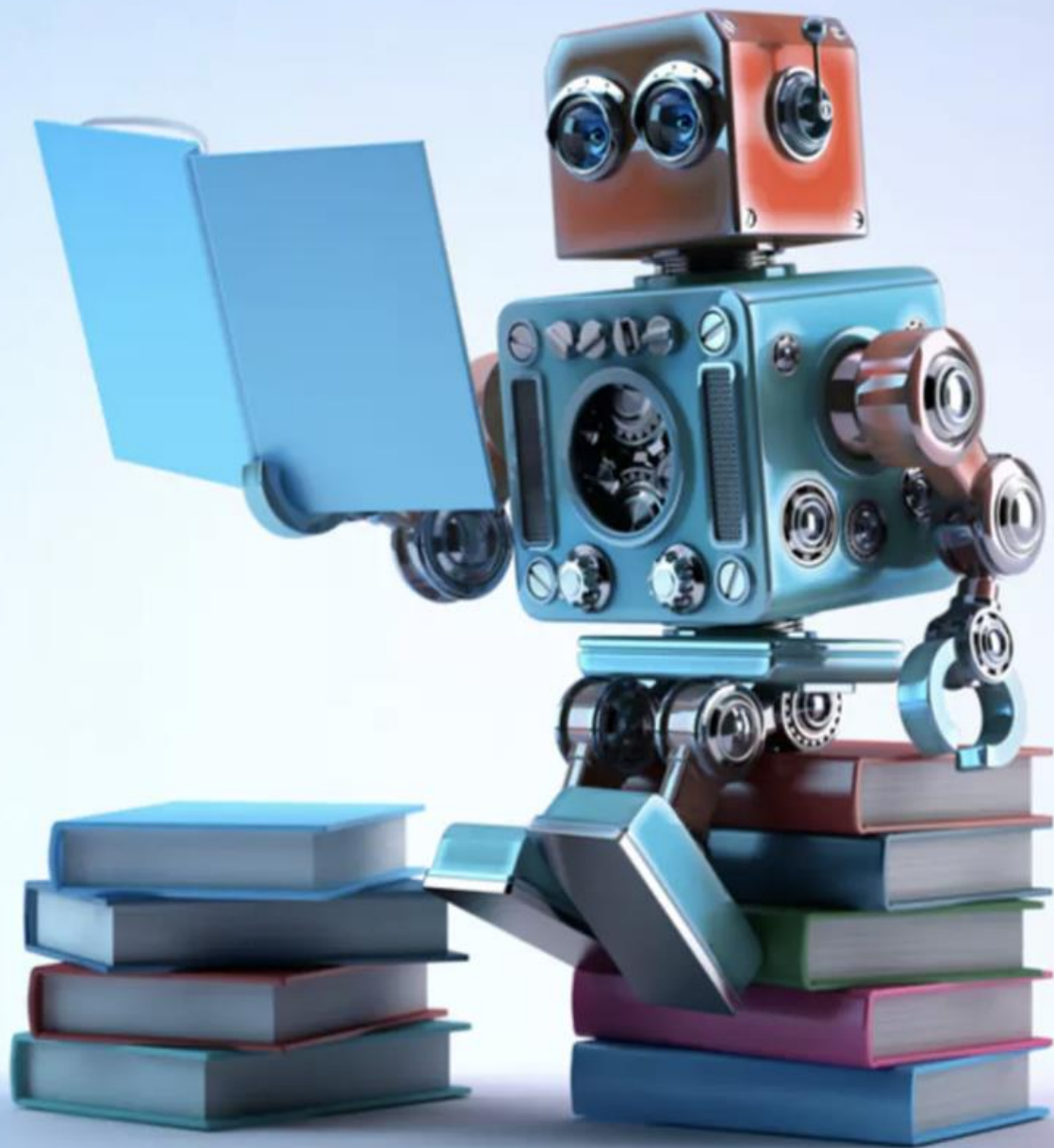


- Computers and Internet
- Artificial intelligence
- Virtual Reality / Augmented Reality
- Collaborative Platforms
- 3-D Printing
- Big Data
- Blockchain



Artificial
intelligence













- Architecture
- Art History
- Computer Science
- Design
- Engineering
- Film
- Information Services
- Tourism



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Olin College of Engineering

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- Design-based learning (as teams)
- No academic departments / no tenure
- Integration of engineering, entrepreneurship and humanities
- Expiry principle (Beta mode)

Stimulating learning environment?

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The new model

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- Transfer of knowledge / construction of knowledge
- Follow instructions / follow your passion
- Learn in the classroom / learn 24 x 7
- Learn as an individual / learn in teams

Today

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Postgraduate
studies

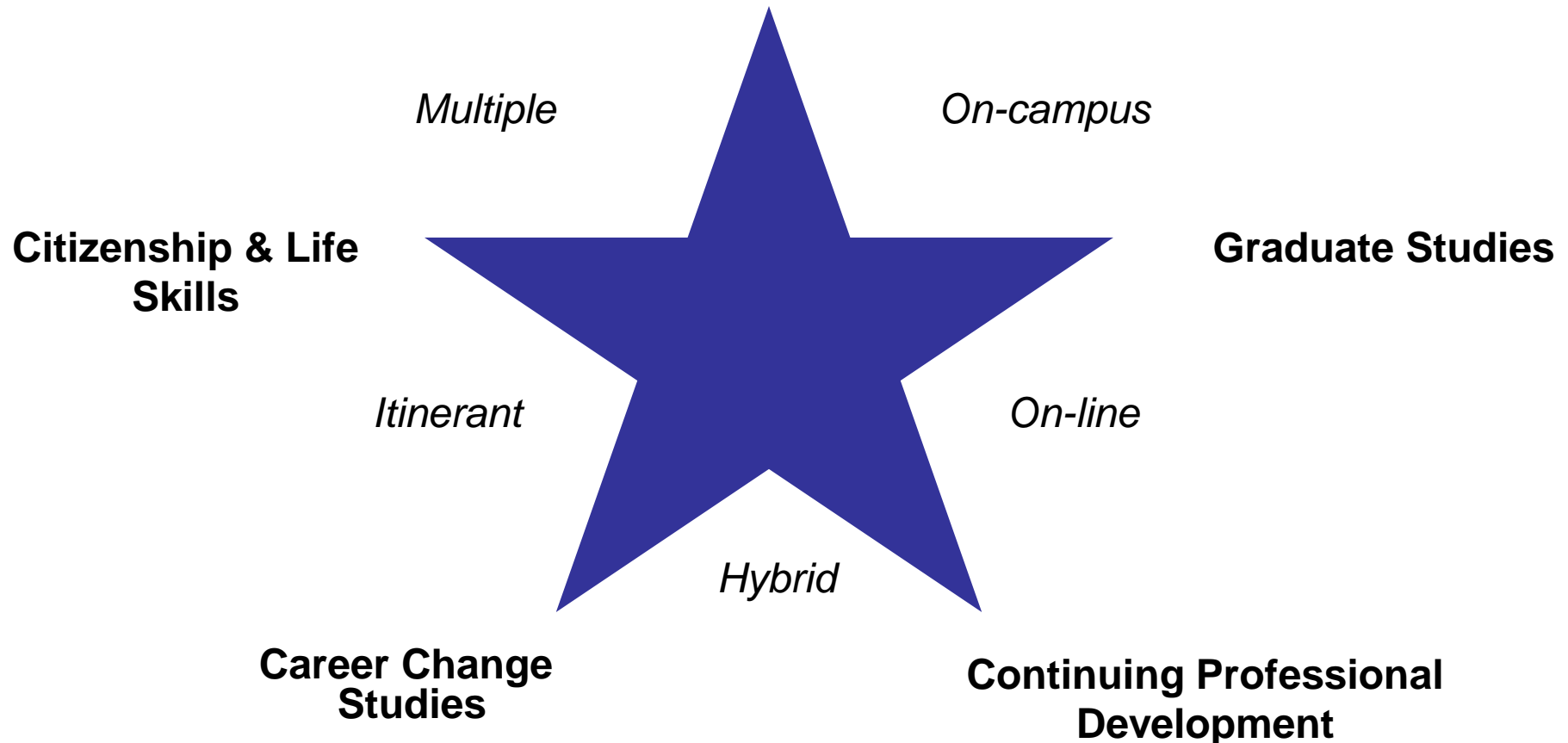
First degree

University of the future?

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Undergraduate Studies





conclusion





The Future

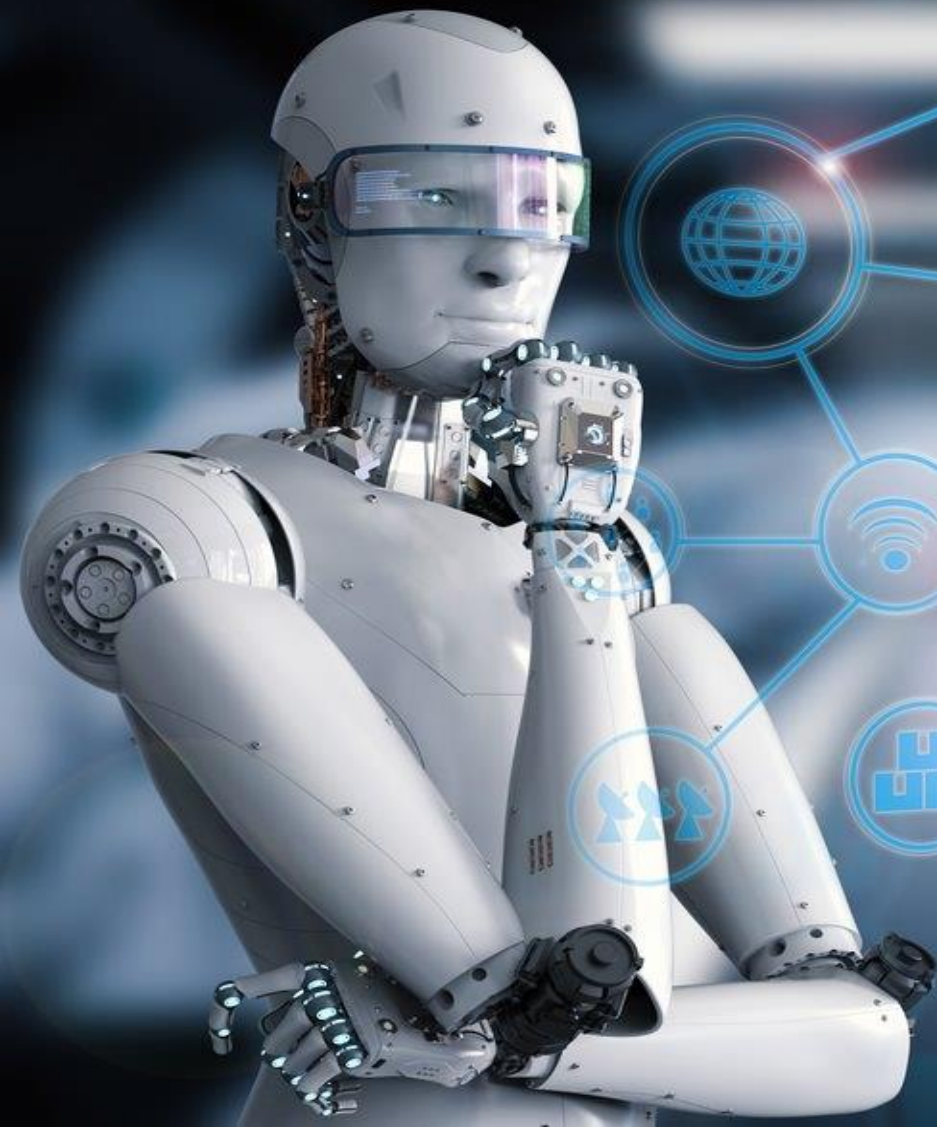
NEXT EXIT

Un vieillard qui meurt
est une bibliothèque qui... brule...



A brave new world?

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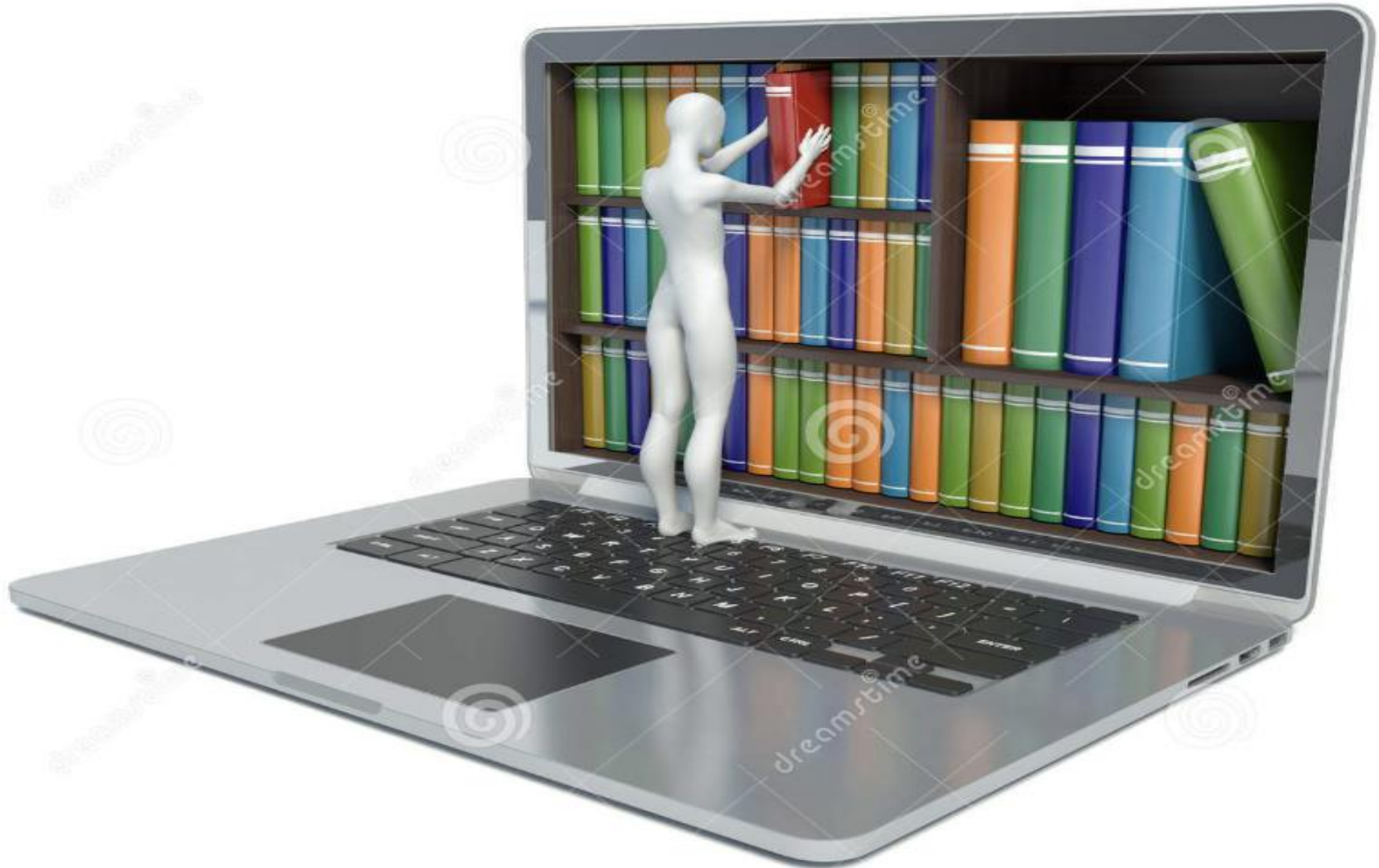
Library of retired humanities professor in Maryland

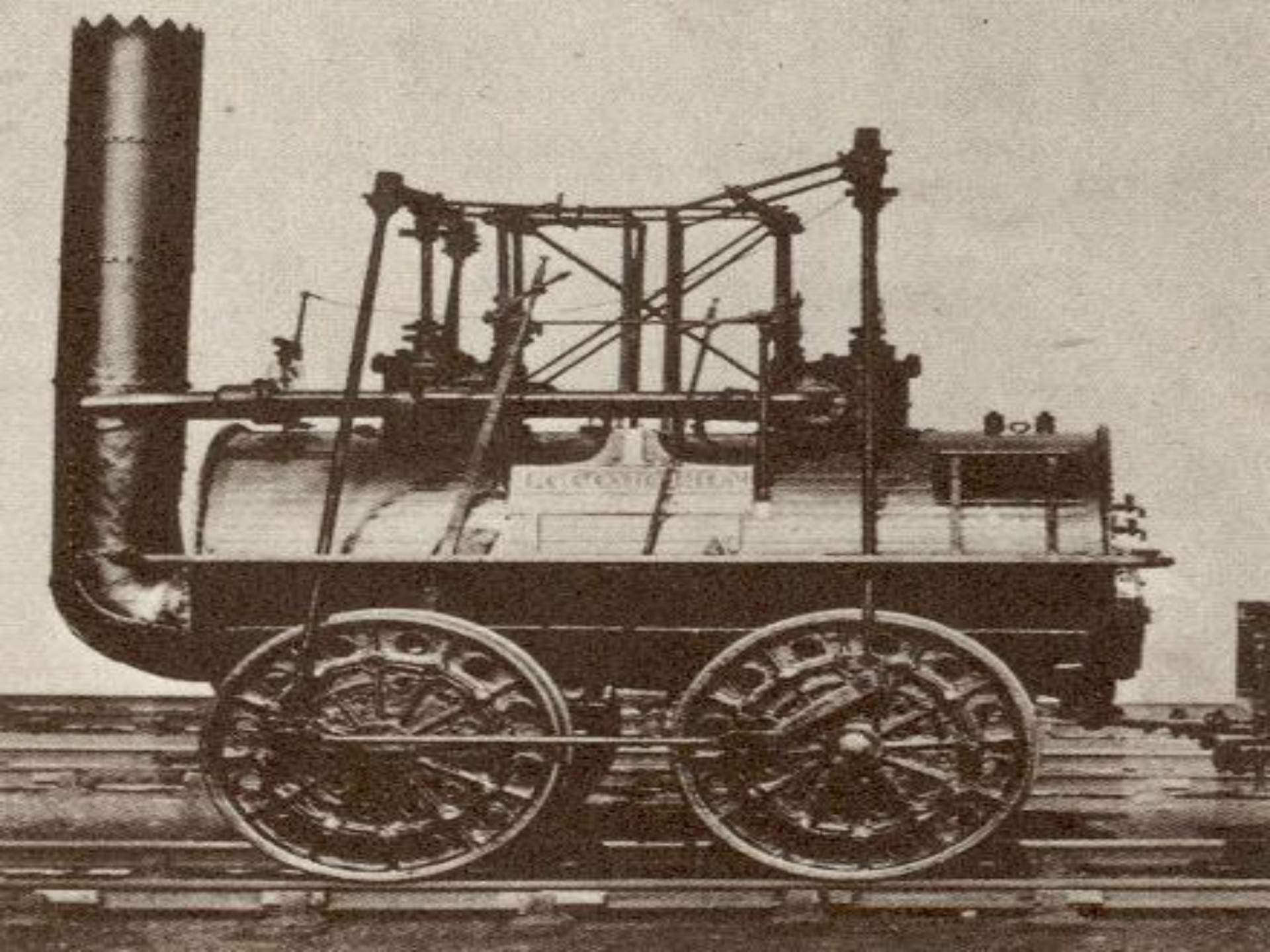
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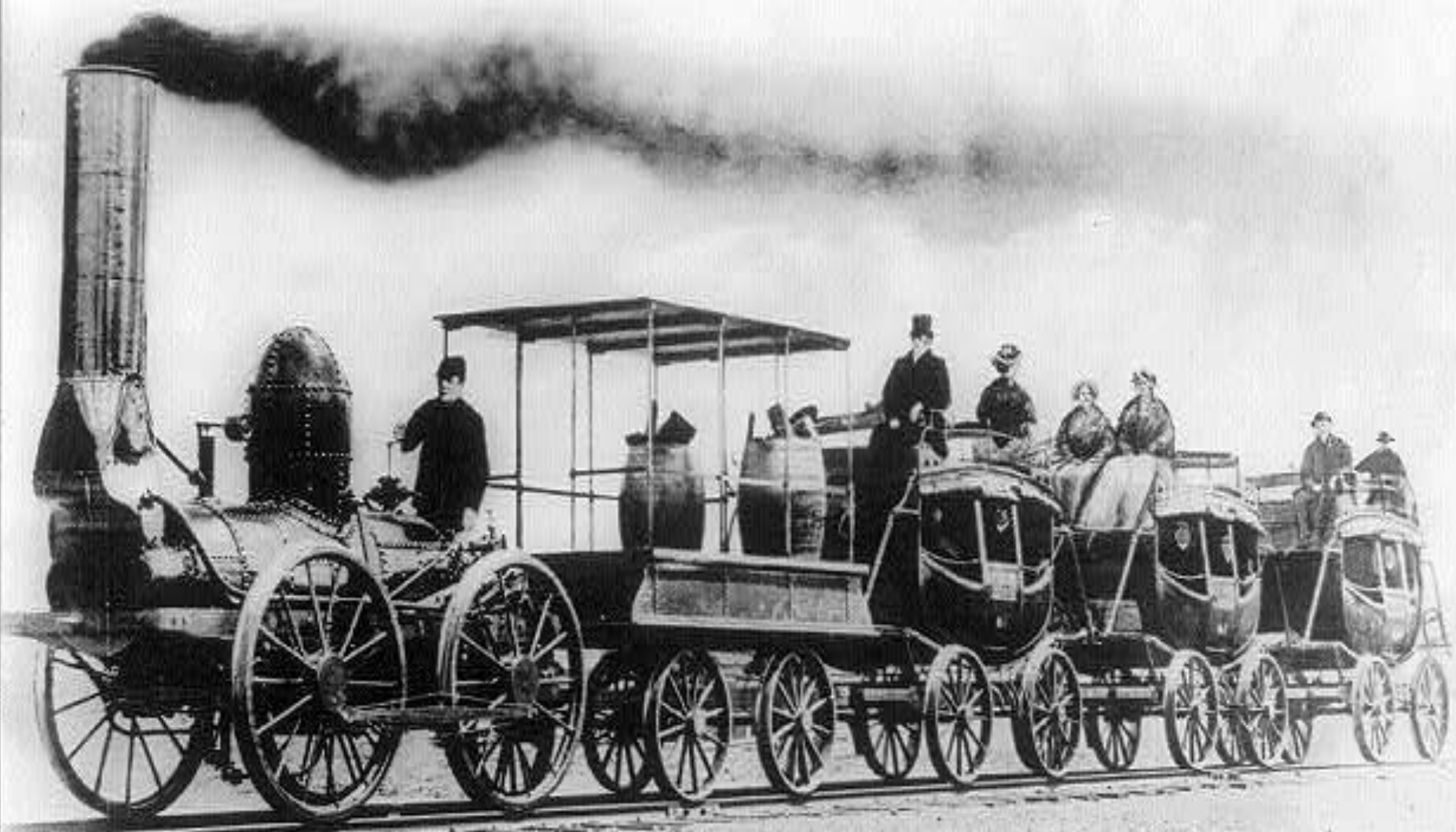


Library of 21st century professor

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Learning is not a spectator sport

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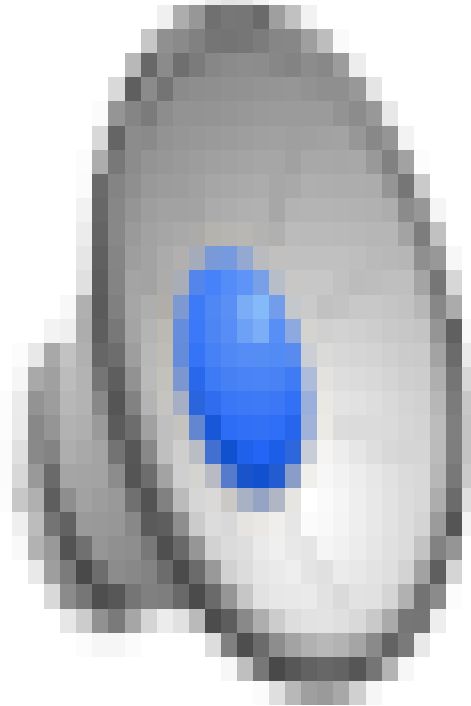
Student-Centered Learning

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- **Sparking Curiosity**
- **Igniting Passion**
- **Unleashing Genius**



The digital gap

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The digital gap

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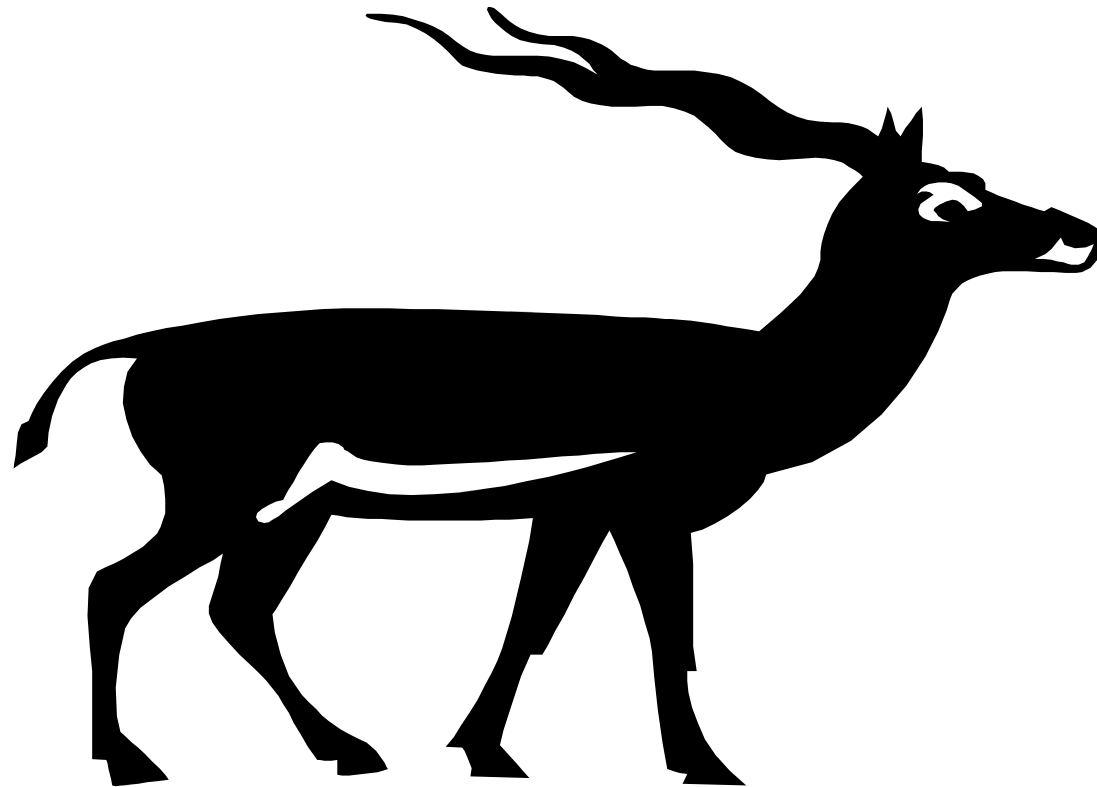
The digital gap

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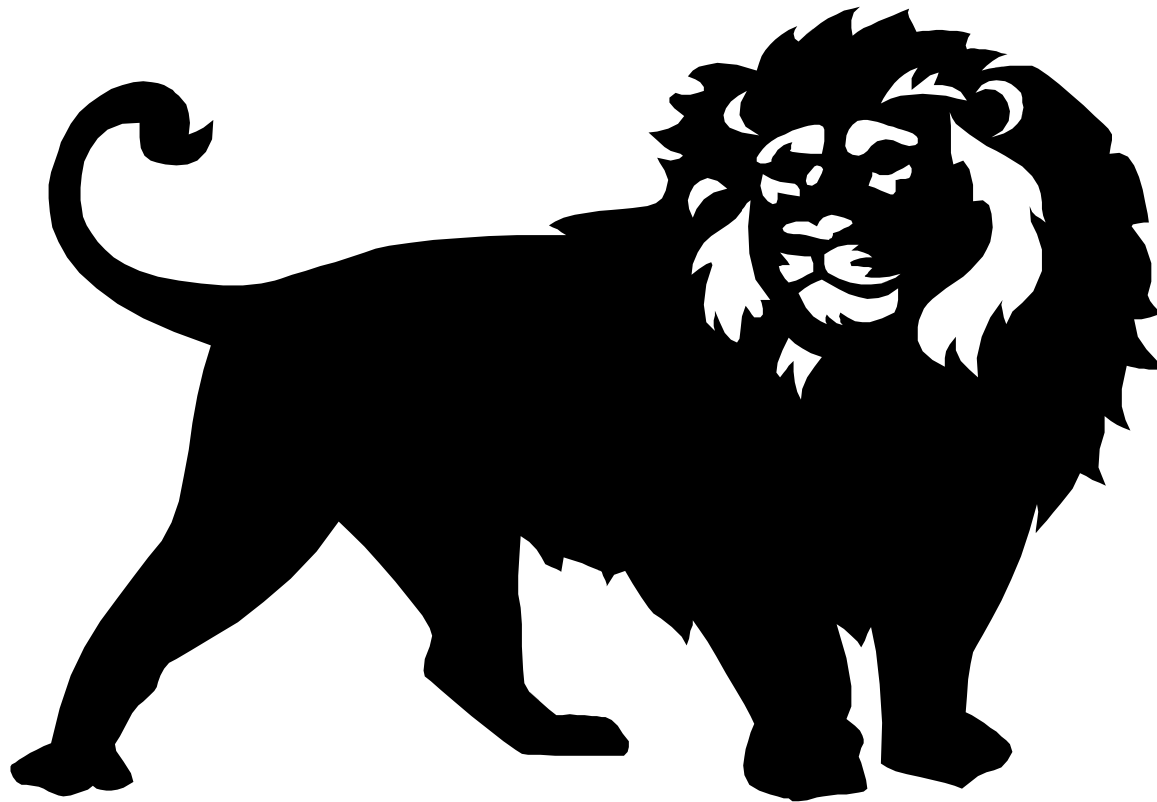
Competing in the learning society

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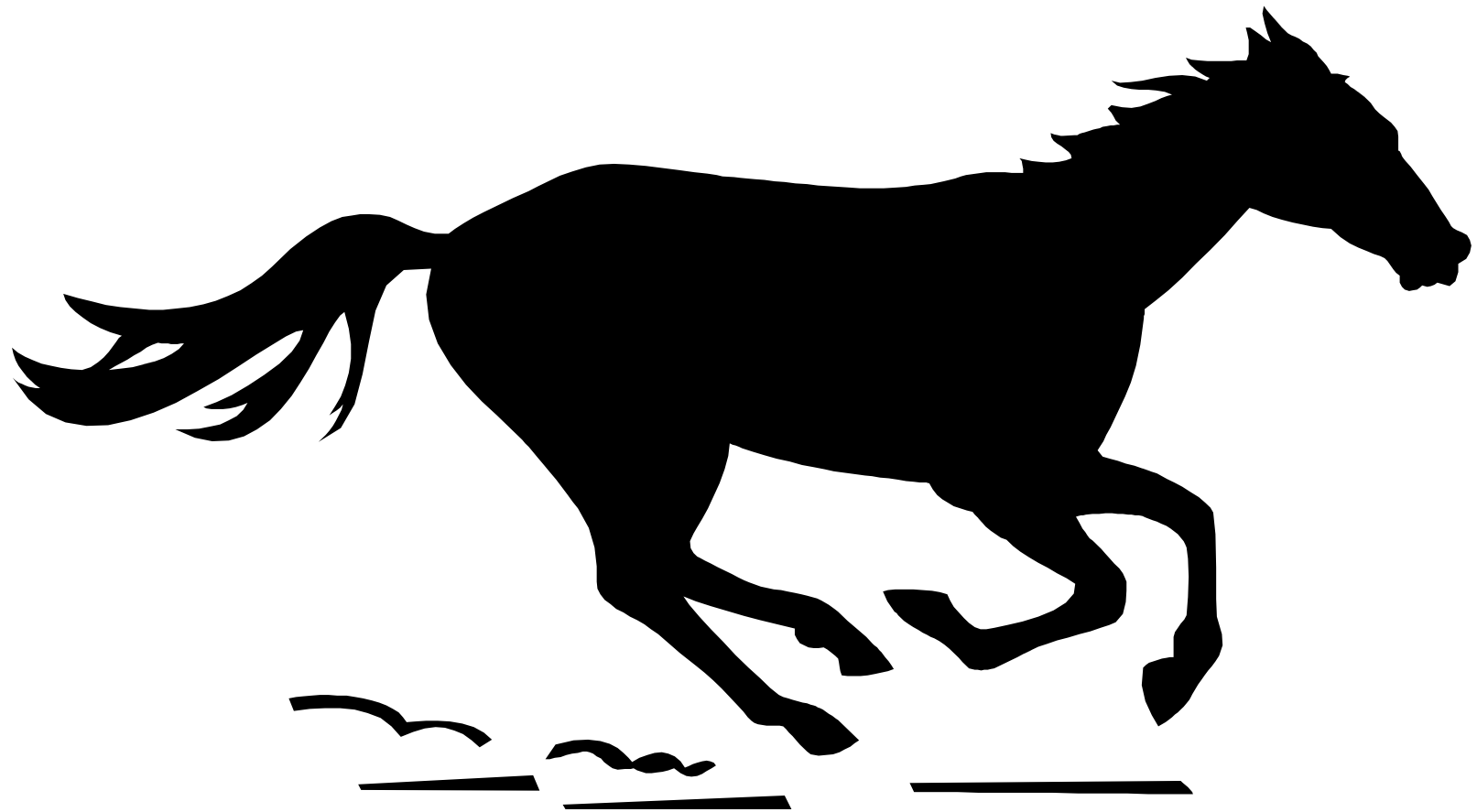
Competing in the learning society

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Competing in the learning society

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Rule of the strongest





ernalisation





What is your vision?

WHAT'S NEXT?





make your own path ...