

WHAT IS A UNIVERSITY ANYWAY?

RUNNING AROUND FOR 40 YEARS, LET ME TELL YOU A BIT
ABOUT IT

JACOB IJN SANDBERG

WHAT I WILL BE TALKING ABOUT

My student life from 1975-1982

The cognitive / AI revolution and its impact on education

What our vision on education says we do and what we really do

What we do mean by “academic” and “research-based”

My vision for the university – your fear and hope for the university

GOOD OLD

DAYS



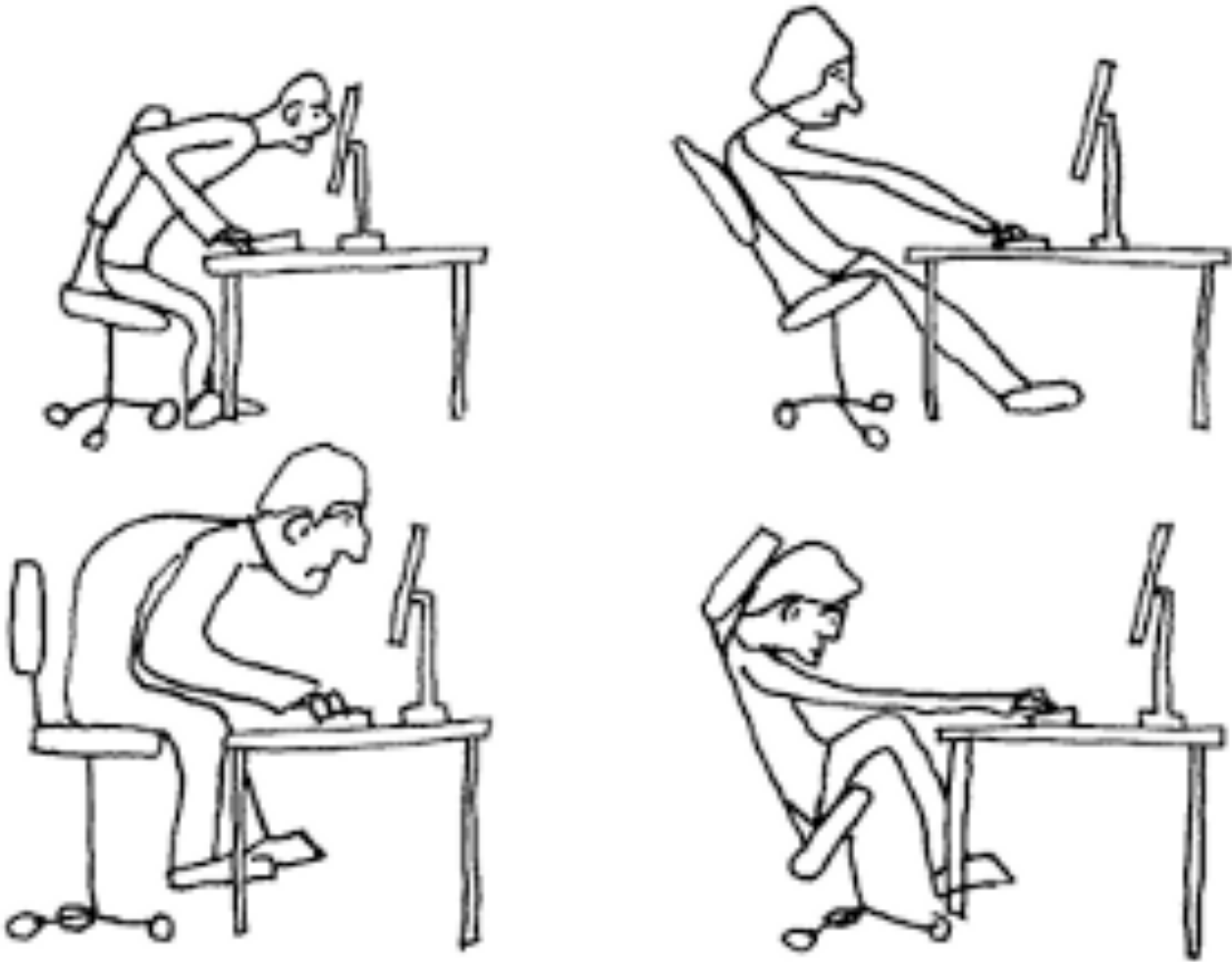
AS A STUDENT (1975-1982) I DID NOT HAVE

THAT MUCH CONTACT

- OBLIGATORY PRACTICAL SESSIONS;
- COMMUNITY BUILDING ACTIVITIES;
- FIRST YEAR TUTORING SESSIONS

THAT MUCH INFORMATION

- INTERNET, DIGITAL
- LEARNING ENVIRONMENT
- PC & WORDPROCESSING



BAD POSTURE (EXAMPLES OF)

THOUGH I DID HAVE

- A professor that told me to sit straight during an exam
- Lots of drinking sessions at the Psychology Department
- The best music ever made
- Smart students to discuss difficult things with
- Reading groups where we discussed literature of our own choosing
- An introduction into all fields of Psychology which set me straight enough: no clinical work for me

TURNING POINT: COGNITIVE PSYCHOLOGY OVERTURNS BEHAVIOURISM

- Paradigm shift from behaviourism to cognitivism
- Modeling human expertise
- Modeling novice behaviour
- From 1970 cognitive psychology dominated
- Taking verbal data seriously: Someren, M. van, Barnard, Y.F., Sandberg, J.A.C. (1994) *The Think Aloud Method: A practical guide to modelling cognitive processes* (2676 citations, ~80 in 2024)

WHAT DID WE LEARN



- Learning is an active process (learning by **construction** and not just by being told)
- A beginner (let's say student) is not just someone who doesn't know
- What we learn and how fast heavily depends on previously acquired knowledge

**JUMPING TO 1989:
WELCOME WORLD
WIDE WEB
HELLO AI (be it
symbolic)**

SYMBOLIC AI

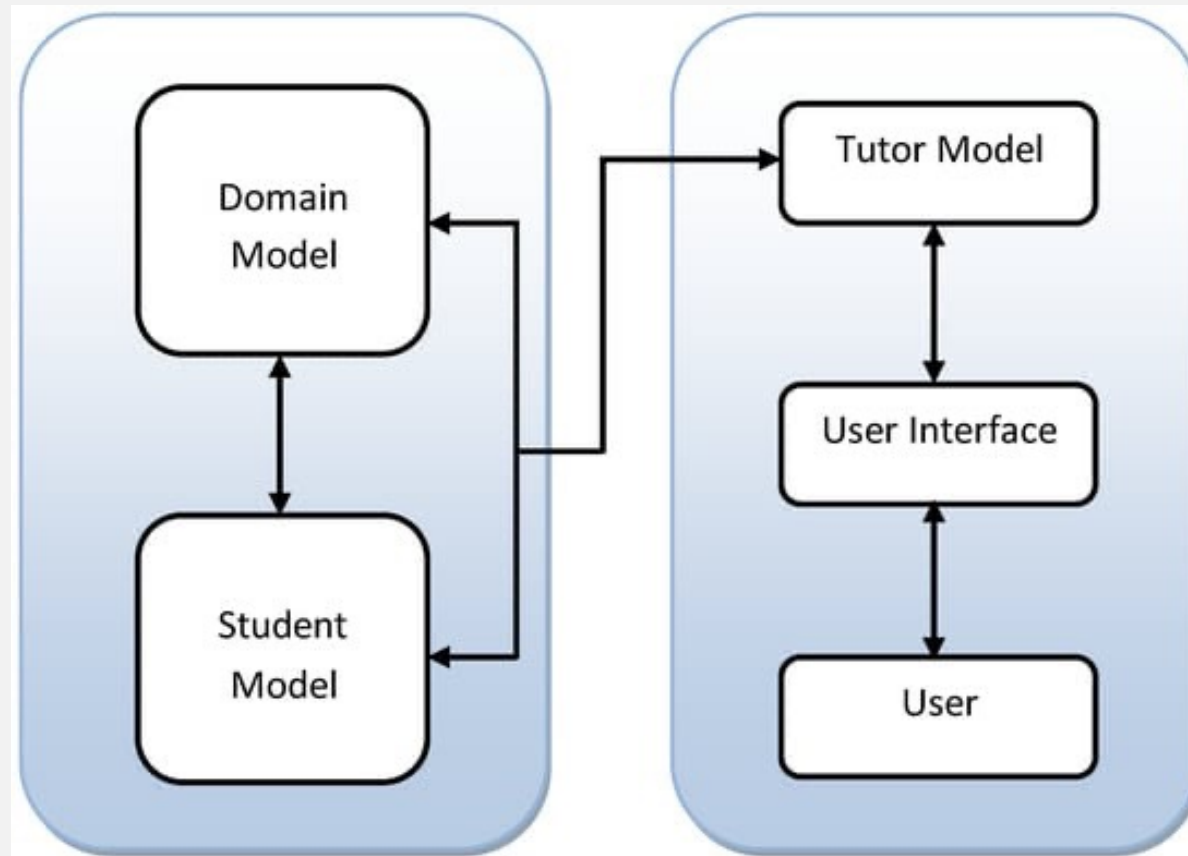
Symbolic AI, also known as rule-based AI, uses explicit rules and logic to represent knowledge and solve problems.

The rules and logic used are often **understandable** by humans, making it easier to see how conclusions are reached.

Example: An expert system that diagnoses diseases based on a set of predefined medical rules.



EXPERT SYSTEMS FOR EDUCATION: INTELLIGENT TUTORING SYSTEMS



WE DID EVERYTHING OF INTEREST TO AI RESEARCH

- Knowledge representation (domain representation)
- User Modeling (what does the student know)
- Reasoning (inferring misconceptions)
- Planning (what to offer the student next)
- Dialogue (how to present text and image by system and user)



Conferences

Artificial Intelligence in Education 1989

Conference Information

D. Bierman, J. A. Breuker, and J. A. C. Sandberg (eds)

Proceedings of the 4th International Conference on Artificial Intelligence and Education. IOS, Amsterdam

Location:

- Amsterdam

When:

- 24 May - 26 May 1989

ARE THEY STILL BEING RESEARCHED?

YOU'RE KIDDING!

Google Scholar

intelligent tutoring systems

INLOGGEN

Artikelen

Ongeveer 1.310 resultaten (0,10 sec)

Mijn profiel

Mijn bibliotheek

Elke periode

Sinds 2024

Sinds 2023

Sinds 2020

Aangepast bereik...

Sorteren op relevantie

Sorteren op datum

Elke taal

Zoeken in pagina's in het Nederlands

Elk type

Reviewartikelen

inclusief patenten

inclusief citaten

An Intelligent Tutoring System for Learning Computer Network CCNA [PDF] universalconference.us
IA Alshawwa, M Al-Shawwa... - INTERNATIONAL ..., 2024 - universalconference.us
... **SYSTEM ARCHITECTURE** In this research we used a tool to build a **intelligent tutoring system**
... the form of the network, this **intelligent tutoring system** consists of four main components: ...
☆ Opslaan Citeren Geciteerd door 24 Verwante artikelen Alle 3 versies

Cognitive system design for motivation and self-regulation-A proposed theoretical framework for intelligent tutoring systems
A Tsiridis - 2024 - kypseli.ouc.ac.cy
... The development of **Intelligent Tutoring Systems** has been a sought-after and rapidly ...
Generative Artificial **Intelligence**. This study aspires to contribute to the topic of cognitive **systems** for ...
☆ Opslaan Citeren Verwante artikelen

Metacognitive Tutoring Systems (MTS)
JN Perales, LDF Valentín, FC Pérez - Encyclopedia of Information ..., 2025 - igi-global.com
... **Intelligent tutoring systems** (ITSs) are computational learning support **systems** based on the
use of artificial **intelligence**. ... We also propose those **systems** to be grouped under the term ...
☆ Opslaan Citeren Verwante artikelen Alle 2 versies

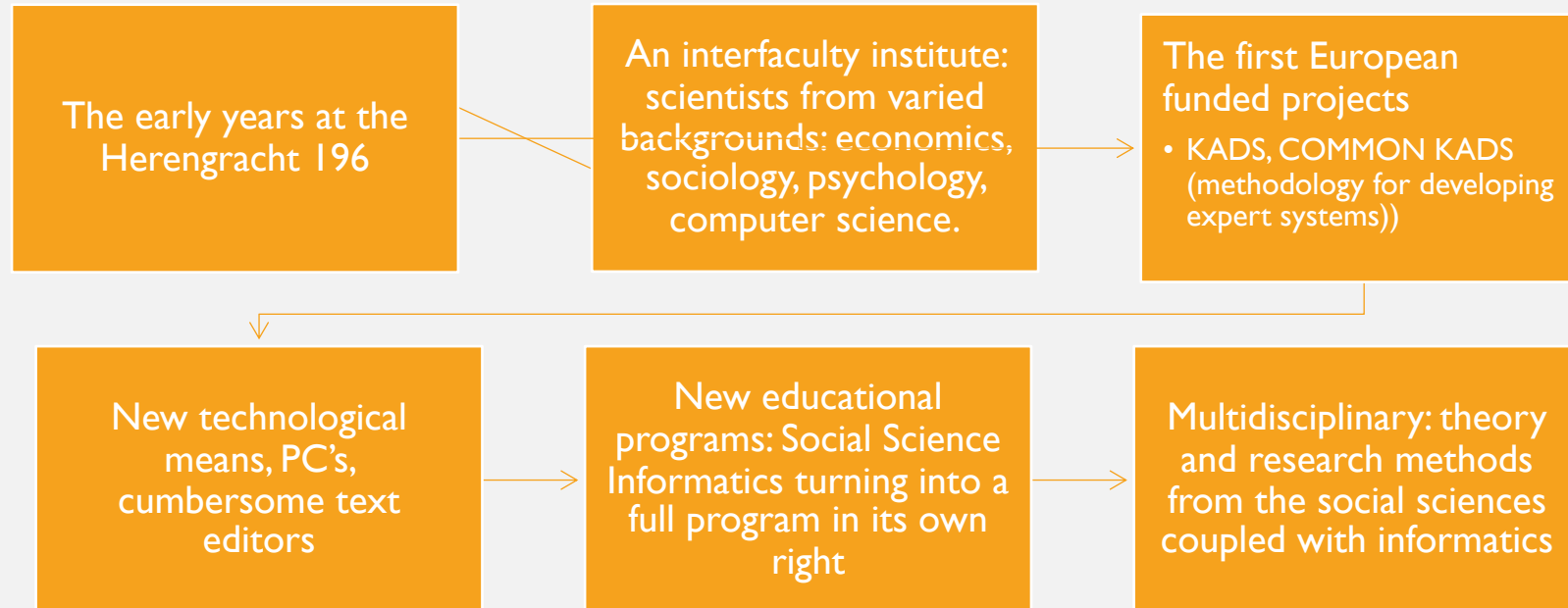
AI-based language tutoring systems with end-to-end automatic speech recognition and proficiency evaluation [PDF] wiley.com

WE RARELY SEE SUCH SYSTEMS AT UNIVERSITY LEVEL – WHY?

- They are very hard and expensive to build
- For such systems the domain knowledge should be such that it can be formalised (expressed symbolically)
- It is easier to formulate rules for procedural skills (how to do things)
- Many domains are conceptual (not procedural) and harder to formalise (history or ethics)

**DEPARTMENT
OF SOCIAL
SCIENCE
INFORMATICS**

MY TIME AT THE DEPARTMENT OF SOCIAL SCIENCE INFORMATICS (1986-2000)



BLOOMING, THRIVING, BUSTLING

- We had lots of money – so did the EU and NATO (organising scientific workshops)
- So we traveled (did not consider the environment those days)
- We formed a community where students and staff shared the same fascination for the rapid developments in the field
- Initiative was valued, plans were supported, time was taken for discussion and feedback
- We had big parties in our garden and our own band

ANDROID

EPISTEMOLOGY

**(one of the NATO workshops, May
1991)**

ANDROID EPISTEMOLOGY (NATO WORKSHOP, 1991)

What do androids know, and when do they know it?

Who were there, besides the organisers Pat Hayes and Ken Ford?

John McCarthy

Margaret Boden

Zenon Pylyshyn

Bob Wielinga

Jacobijn Sandberg

(How Android Can Situated Automata Be?)



HEYDAYS OF THE DISPUTE ON SITUATED COGNITION

- Cognition is not just in the individual's mind but embedded in and inseparable from the context
- Understanding cognition requires considering the real-world contexts in which it occurs, rather than studying isolated cognitive processes in laboratory settings
- Cognition is embodied, meaning that the way an organism is shaped with its sensory and motor system mediates its potential interactions with the world

WHY AM I TELLING YOU ALL THIS?

- Because it relates to education and the way we view students as learners: you learn in the context of real world experience
- Good teachers model their own cognitive processes to make explicit how they approach learning and problem solving
- Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning: You are part of a learning culture and adopt unwritten rules and patterns of behaviour – enculturation
- Bereiter, C. (1997): Situated cognition and how to overcome it: Abstraction is key to learning transfer (also: Kahneman, D. (2012): Thinking, fast and slow)

SITUATED COGNITION AND CONSTRUCTIVISM MEET UP

- Constructivism stresses learners as being actively constructing knowledge, including abstractions
- Constructivism states we use prior knowledge to make sense of new information
- Situated cognition stresses the interactive nature of such processes of construction

And to allow for this combination of construction and interaction we need campus life or life on campus

An abstract geometric artwork featuring overlapping shapes in red, blue, black, and white. The composition is dense and layered, with various geometric forms like circles, rectangles, and triangles. A central white rectangular box with a thin black border contains the text.

SITUATED COGNITION AND
CONSTRUCTIVISM MEET UP

**2017: UVA
VISION ON
EDUCATION**

CORE ELEMENTS

1. Our educational programs are **research-based**
Driven by research, provided by researchers (some say) or learning to act as a researcher (I say)
2. Developing motivated and ambitious students by offering high-quality, **innovative** education
Active learning, flipped classroom, timely feedback, formative assessment (in line with the constructivist view), including personalisation
3. We are an open and diverse community with **an international orientation (at least we were)**
Science breaks borders, perspectives from different (cultural) angles are indispensable, and our companies need these talented internationals

BUT IT ALSO SAYS

“Developments in the field of information technology are viewed as the key to building a new world of higher education.”

....

“Such a world of higher education must make a fundamental shift, from an institution-centred model to a mobile, flexible, technologically solid and more student-centred model.”

....

“This will involve a process whereby education that was previously packaged in coherent curricula is now unbundled and potentially offered through multiple providers.”

CAN WE STILL BE A CAMPUS UNIVERSITY – WHAT'S AT STAKE?

- Next to the **formal curriculum** there is a **hidden curriculum (enculturation)** (Jackson, 1968)
- **Forming years:** learning with and from one another
- Not just shaping up academically, but **becoming a person** with norms, values, and beliefs
- **Community of learners**, sense of belonging and engagement
- Students that **spend time** on campus do better
- But: they have jobs, they cannot live in Amsterdam, they do not see the **intrinsic value of campus life**

**BACK TO THE QUESTION:
WHAT IS A UNIVERSITY
ANYWAY?**

ACCORDING TO SOME OF OUR PROSPECTIVE GOVERNMENT PARTIES

- MONEY SPENDING, LEFT-WING, ACTIVIST ORGANISATIONS
- SCIENCE IS JUST AN OPINION
- HIGHER EDUCATION SHOULD BE IN DUTCH FOR THE DUTCH
- ONLY FINANCE RESEARCH THAT IS ECONOMICALLY RELEVANT
- ONLY FINANCE BETA/INNOVATION RESEARCH

LET'S TRY SOME DATA-DRIVEN AI (MODERN)

Based on Data and Learning:

Data-driven AI, often referred to as machine learning or statistical AI, learns patterns and relationships directly from data

It uses algorithms to find patterns and make predictions or decisions based on input data

The models created by data-driven AI can be complex and **not easily interpretable by humans**

Example: A neural network that identifies objects in images by learning from thousands of labeled examples

To be effective, data-driven AI needs a lot of data to learn from. The more data it has, the better it can generalize and make accurate predictions

CHATGPT IS SUCH A DATA-DRIVEN AI SYSTEM

Prompt: What's a university anyway?

Answer: Overall, the purpose of a modern university is to empower individuals intellectually, socially, and professionally, while also contributing to the betterment of society through education, research, and community engagement.



MY VIEW ON UNIVERSITY EDUCATION REFLECTED IN THREE MAIN THINGS

- Bringing the Teaching and Learning Centre(s) to life – together with my colleagues from “Educational Leadership” 2017; bundling of knowledge on teaching for and by teachers: Education practice can only be informed by science
- Co-developing the Bachelor of Computational Social Science: a bachelor which is founded on constructivist principles and societal relevance, and internationally oriented
- Advising on the Bachelor of Science, Technology and Innovation, also with a strong emphasis on project-based learning, making stuff and innovation



MY VIEW ON WHAT A UNIVERSITY SHOULD BE

A place where research and education go hand-in-hand

A place where staff and students form a community of practitioners

A place where students and staff are having some “empty” periods

A place where diversity is cherished and an international orientation is a necessity

A place where different types of programs co-exist: disciplinary, multidisciplinary

A place where students can express their concerns and challenge university policies

**AND FOREMOST A PHYSICAL MEETING PLACE –
CAMPUS IS KEY**

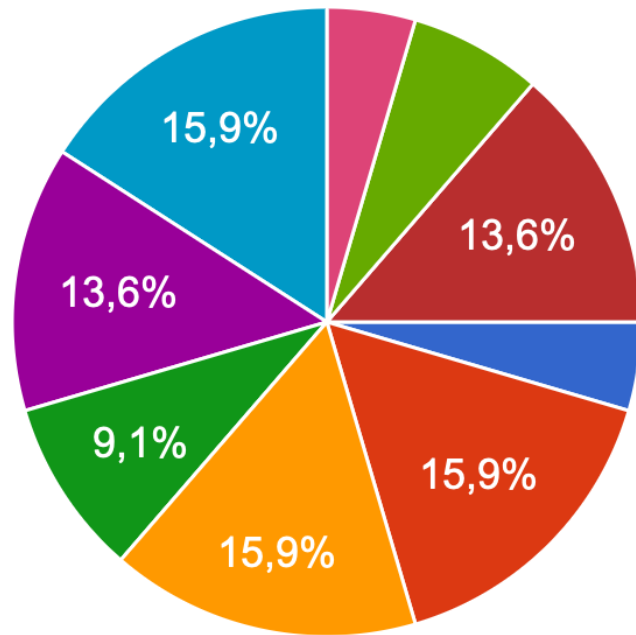


AND WHAT DO WE NEED?

- Less testing for grades – more formative assessment
- Closer contact between students and staff members – let students see what staff is doing
- Involve students in academic practice
- Get rid of the over-hierarchical structure – science is team effort
- Reduce the amount of obligatory bachelor courses, and give space to individual choice
- Shorten the academic year
- **AND FOREMOST A GOVERNMENT THAT ACKNOWLEDGES THE VALUE OF OUR UNIVERSITIES**

Which scenario do you consider the most probable in 5-10 years' time?

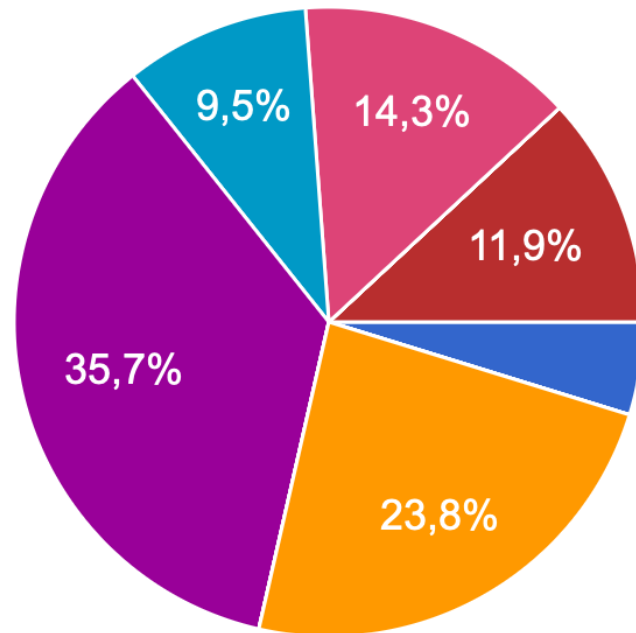
44 antwoorden



- Scenario #1: Extinction-era universities
- Scenario #2: AI academy
- Scenario #3: The universal university
- Scenario #4: Extreme unbundling
- Scenario #5: Justice driven innovation
- Scenario #6: Return to the ivory tower
- Scenario #7: The university of ennui
- Scenario #8: Enhanced 'enhancement'
- Other

Which scenario do you consider the most desirable in 5-10 years' time?

42 antwoorden



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THANKS