

Chapter 1:

Introduction to digital education

Digital education

MED21124 CS-411 Cours

Digital education

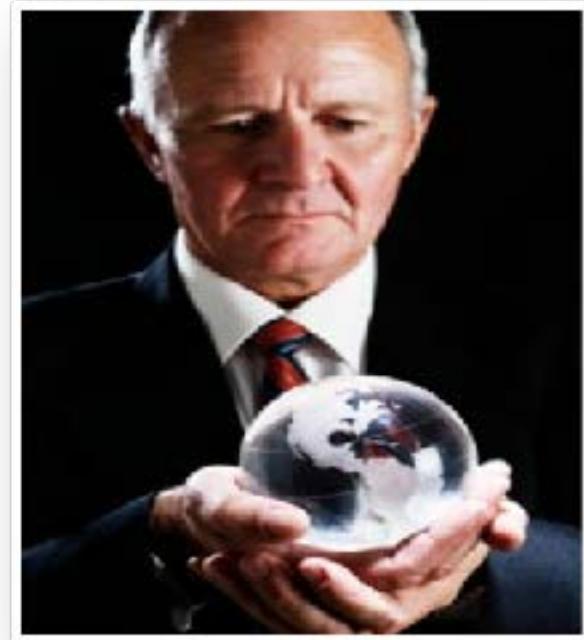
MED21124 CS-411 Cours

Digital education

INF119 CS-411 Projet

Digital education

INF119 CS-411 Projet



what learners learn
does not depend on right specific technology
but on the cognitive activity they do
(with this technology)

Drill & Practice

Online education platforms

Learning Management System

Classroom participation systems

Simulations

Microworlds

Teamwork support

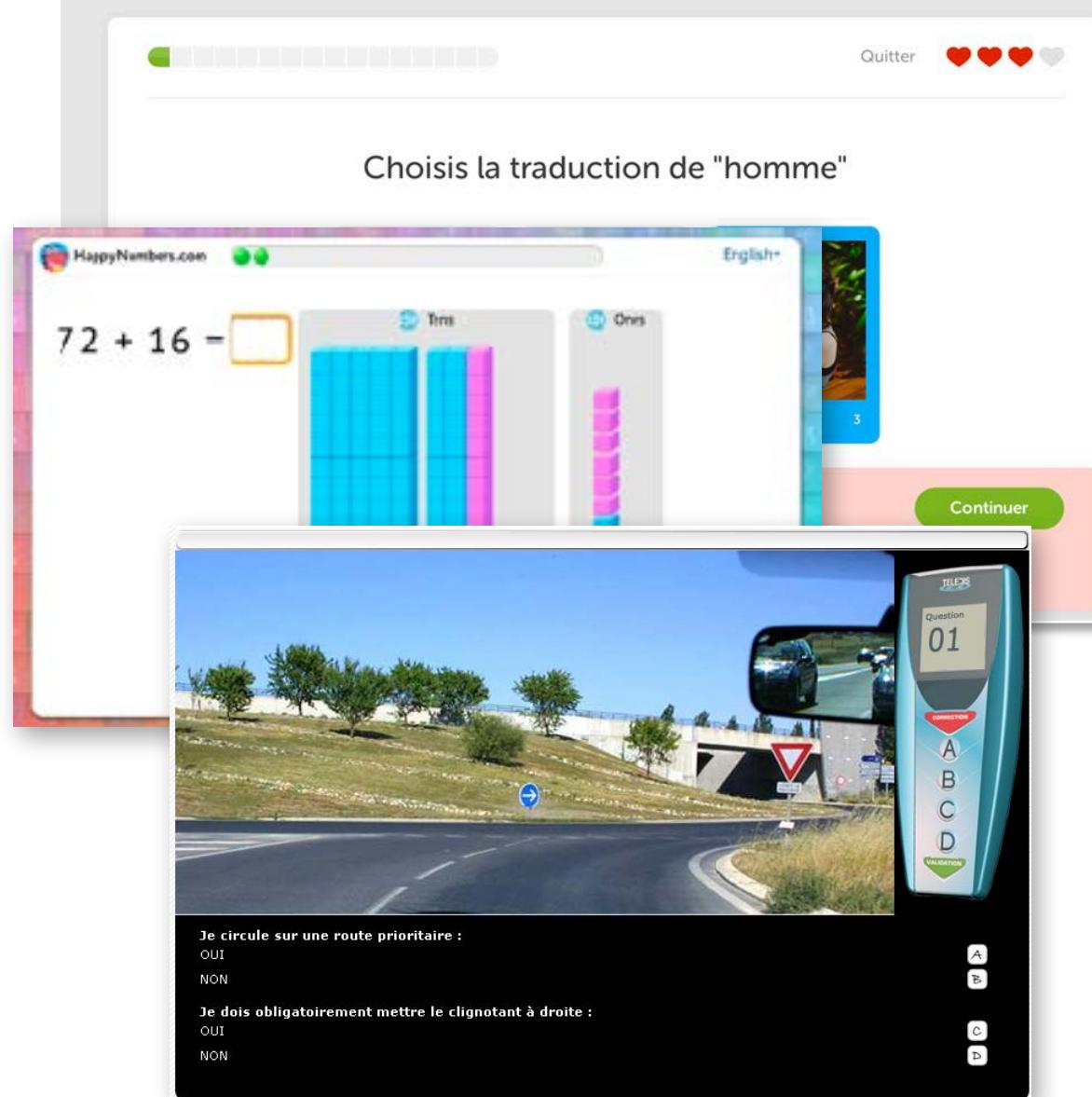
Augmented reality

Virtual reality

Serious Games

Education Robotics

Choisis la traduction de "homme"



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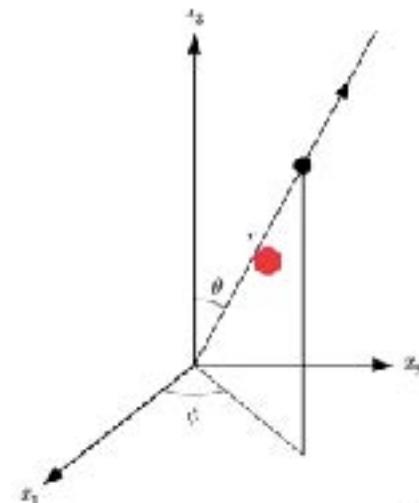
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Définition : lignes de coordonnées (c. sphériques)



EdX

Coursera

<https://www.epfl.ch/education/continuing-education/moocscatalogue/>

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Mathrix



Matériaux avec des électrons libres



Professor Anna Fontcuberta i Morral (EPFL)

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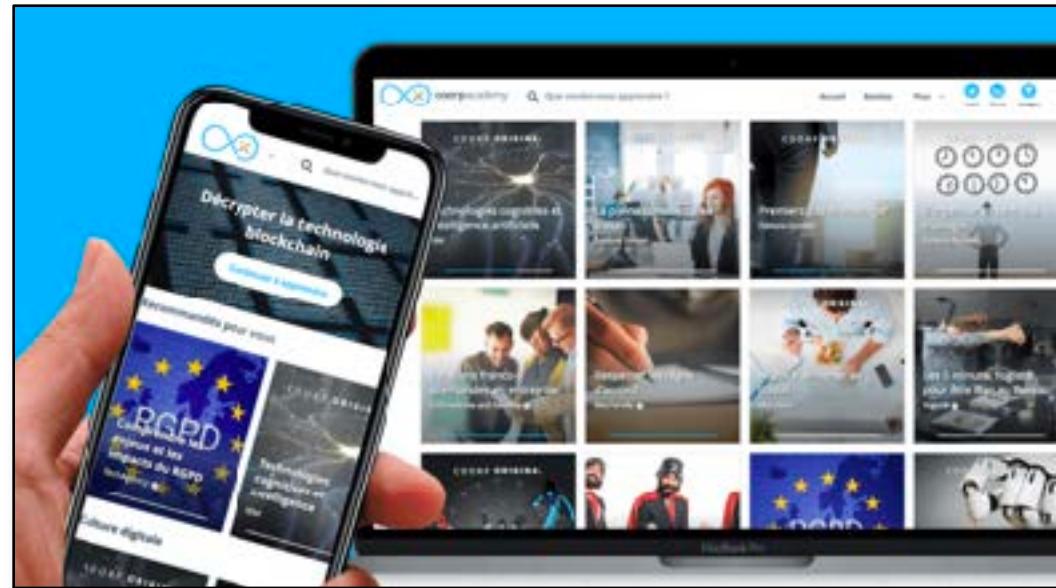
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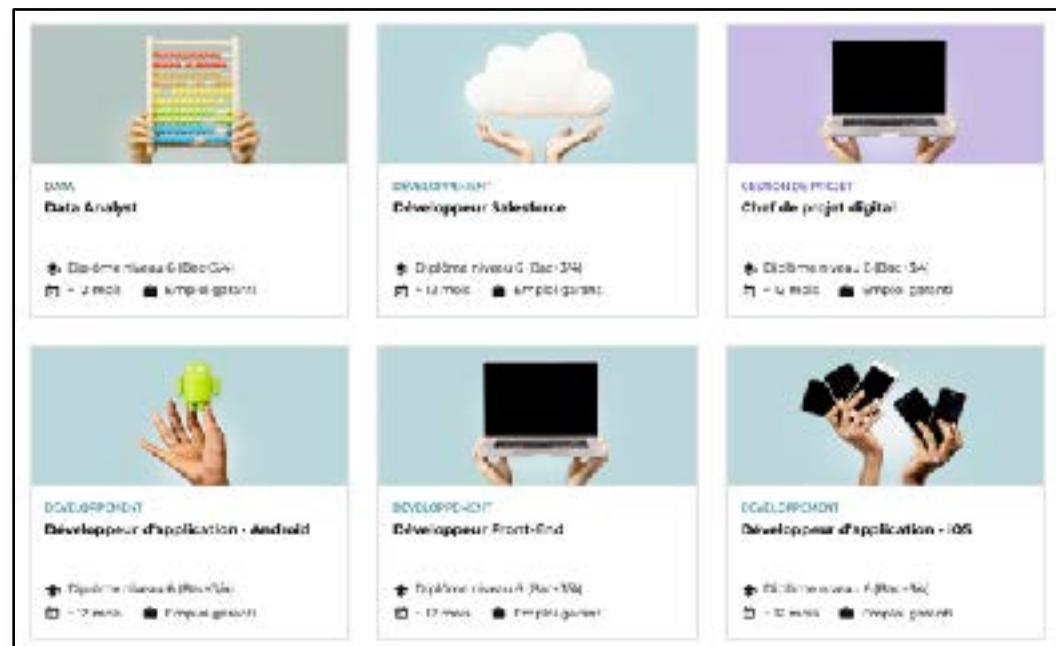
Serious Games

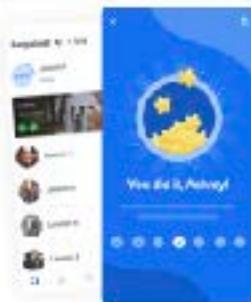
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CoorpAcademy

OpenClassroom





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DuoLingo, 110 million users



Busuu, 120 million users



Severin Hacker, ETH graduate 2006

Adrian Hilti, EPFL graduate 2001

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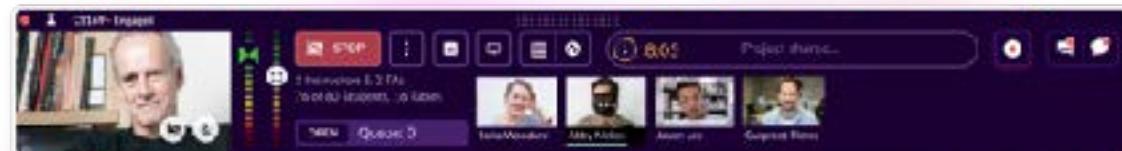
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$$\mathcal{L}\{f'(t)\} = p\mathcal{L}\{f(t)\} - f(0)$$

$$\mathcal{L}\{\sin(at)\} = \frac{a}{p^2 + a^2}$$

$$\mathcal{L}\{\cos(at)\} = p\mathcal{L}\left\{\frac{1}{a}\sin(at)\right\} - \frac{1}{a}\sin(0)$$

$$= \frac{p}{a} \mathcal{L}\{\sin(at)\} =$$

▶ 2:40 / 8:51

Khan Academy

[Vidéo suivante](#)

Comparer des fractions qui n'ont ni le même numérateur ni le même dénominateur.

Compare les fractions suivantes en utilisant les symboles $>$, $<$, ou $=$.

$\frac{5}{3} \quad > \quad \frac{10}{8}$

Bravo ! Pour aller plus loin.

Signaler un problème

Excellent travail !

Continuez. [Voyez comment nous avons répondu.](#)

Réussissez 5 questions sur 7 pour passer à Familiar.

Question suivante...

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EPFL MOODLE

CS-411

Participants

Grades

General

20 September - 26 September

27 September - 3 October

4 October - 10 October

ZOOM link for the WEBINAR

Zoom link for Exercise Session

All CS-411 recorded videos are here

News forum

Q&A Forum

CS-411 Fall 2020 Schedule

Course Contacts

Professor

Pierre Dillenbourg

Patrick Jermann

Ingrid Le

Course book

EPFL IS-ACADEMIA

DUTÉ DE GESTION ACADEMIQUE

Support request

FAQ

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My Courses

Section Course

Period: 2021-2022

My Courses

My delegations

Period: 2021-2022

CS-411: Digital education & learning analytics

Dillenbourg, Pierre, Jermann, Patrick

Current	Sem.	Type	Language	English
Computer science	MA1, MA3	Oct.	Oral	4
Cybersecurity	MA1, MA3	Oct.	Written	4
Data Science	MA1, MA3	Oct.	Written	120%
Digital education	MA1, MA3	Oct.	Workshop	14
SC-411 EPFL	MA1, MA3	Oct.	Hours	4 weeks
			Lecture	2 weeks
			Project	2 weeks

List of verbs with cognitive level

Advertise, Argue, Assess / Evaluate, Choose [in appropriate method], Compose, Construct, Contextualize, Coordinate, Create, Critique, Decide, Defend, Design, Develop [a rule, model or system], Elaborate, Estimate, Explain, Formulate, Formulate, Generalize, Hypothesize, Infer, Integrate, Interpret, Judge, Justify, Manage, Negotiate, Optimize, Plan, Produce, Promote, Propose, Prove, Synthesize, Summarize [a rule, a formula], Synthesize, Systematize, Theorize, Transpose

Skills

Project management

Assists progress against the plan, and adapt the plan to circumstances

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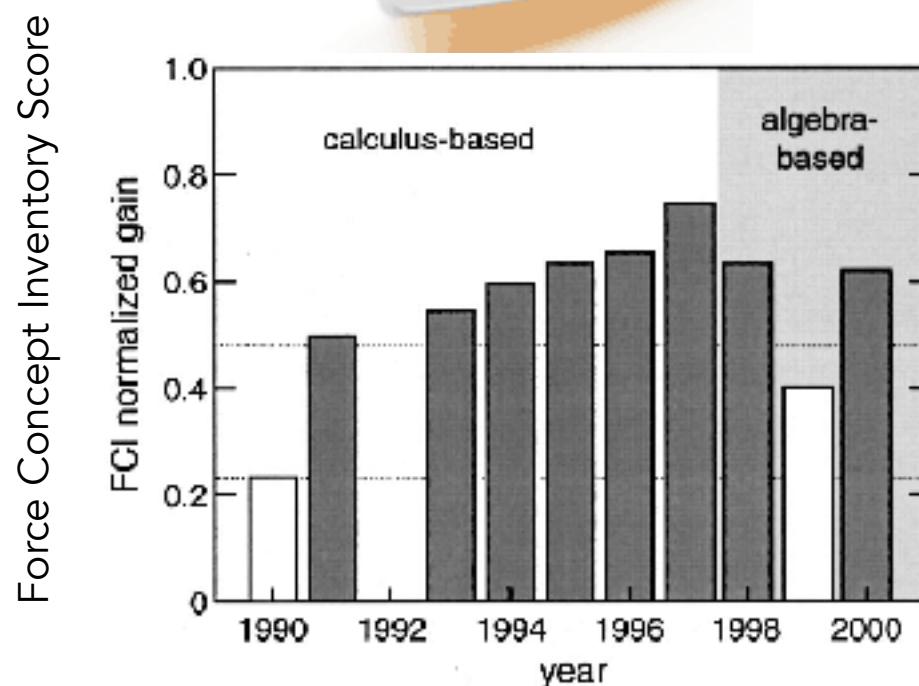
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Crouch, C.H., & Mazur, E. (2001). Peer Instruction: Ten years of experience and results. *American Journal of Physics*, 69, 970-977.

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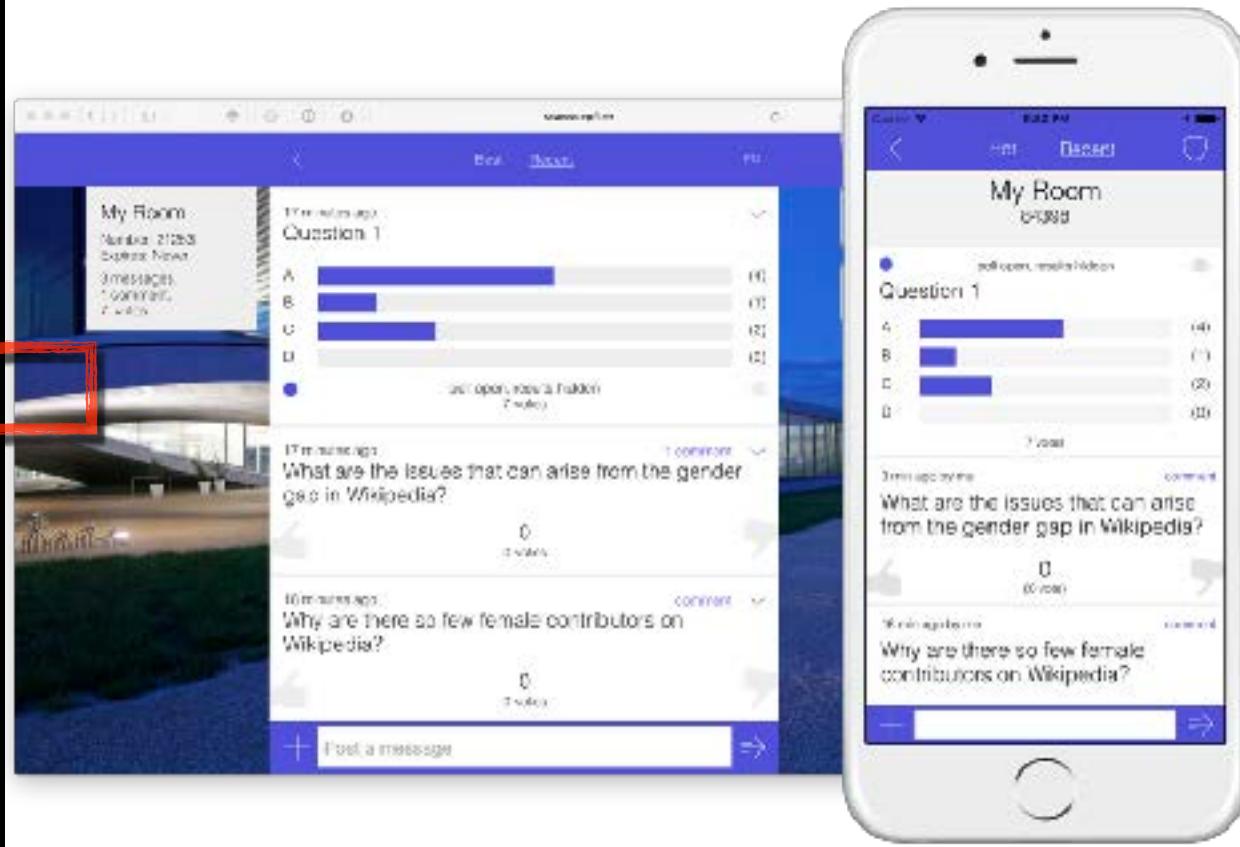
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Speak Up

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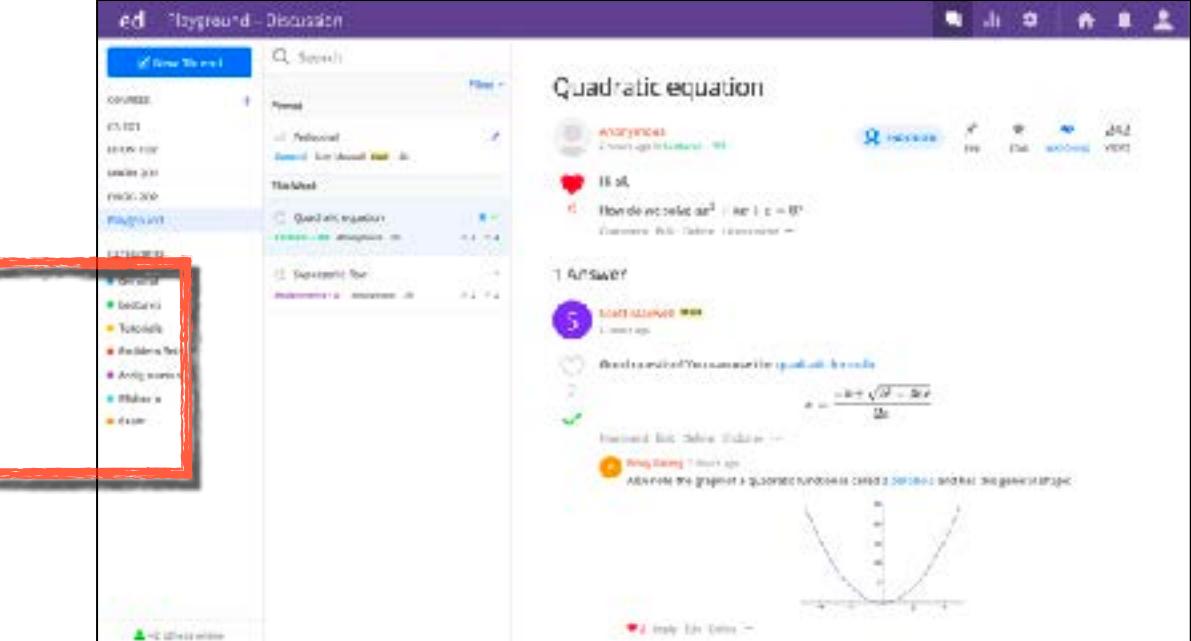
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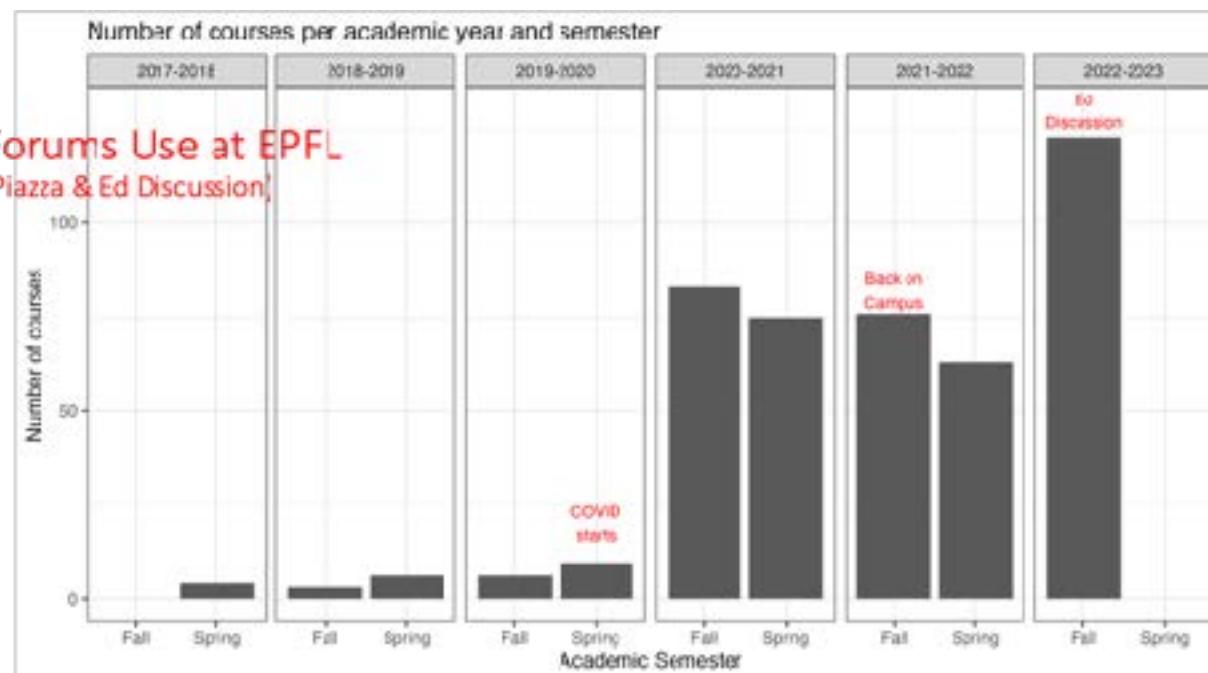
Virtual reality

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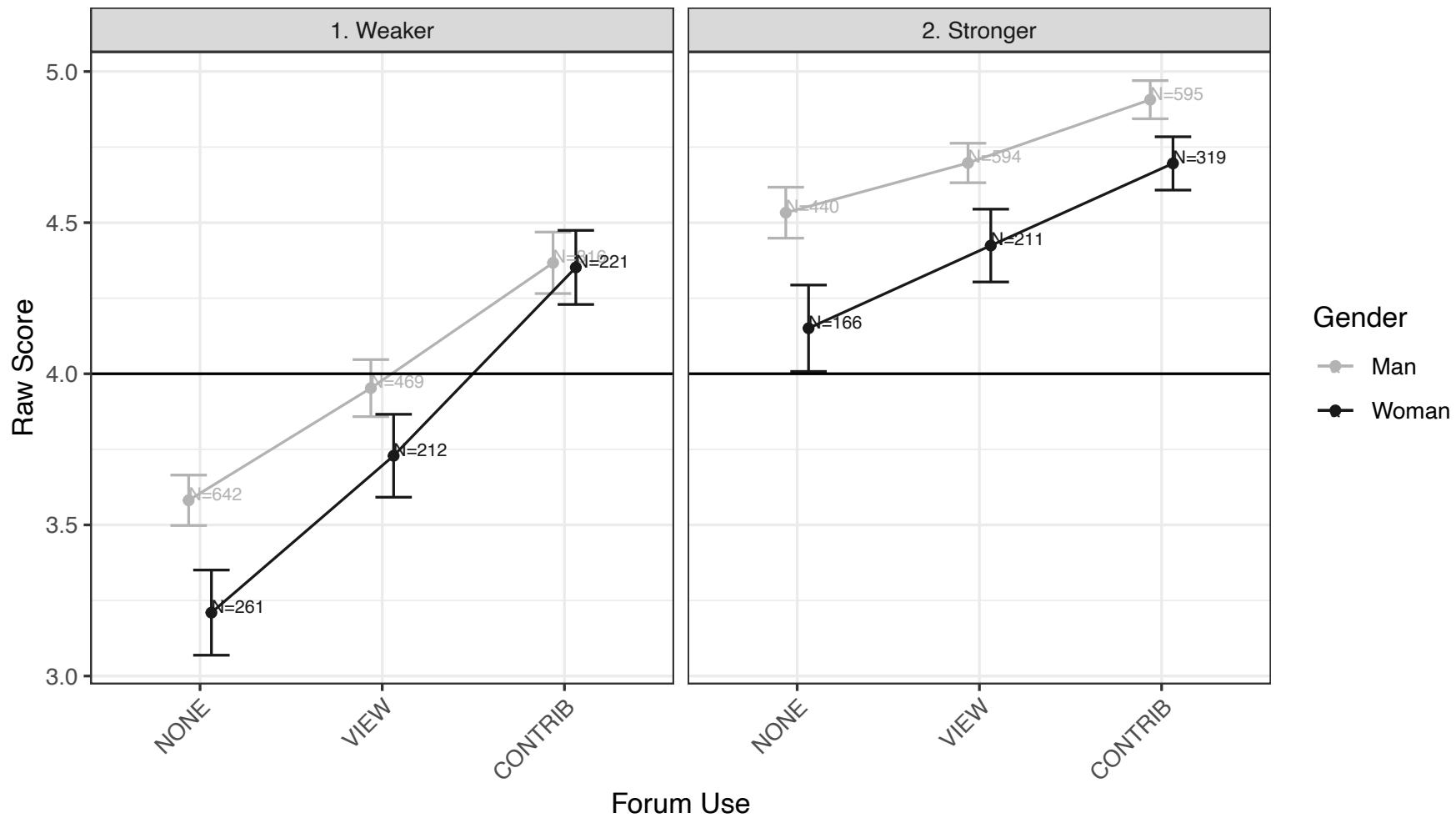


The screenshot shows the Ed Discussion platform interface. On the left, there's a sidebar with course and discussion filters. A red box highlights the 'Discussions' section, which lists a post about a quadratic equation. The main content area shows a post by 'Anonymous' with 18 likes. The post contains the equation $ax^2 + bx + c = 0$ and the formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$. Below the formula, there's a graph of a parabola opening upwards. The post has 1 answer and 2 comments.



Means and CI for exam grades

(N=4'446 observations, N=2'940 students, N=19 Courses)



Education is a data science

Drill & Practice

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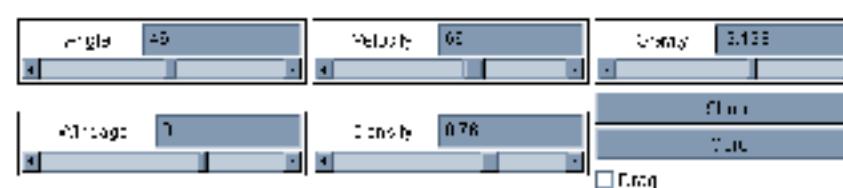
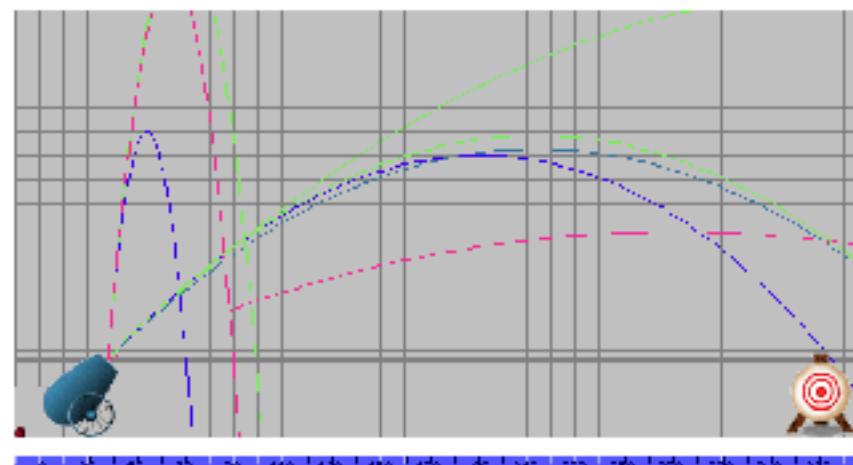
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Jupyter Notebook



Prof. Cecile Hebert, EPFL

<https://www.epfl.ch/education/educational-initiatives/jupyter-notebooks-for-education/>

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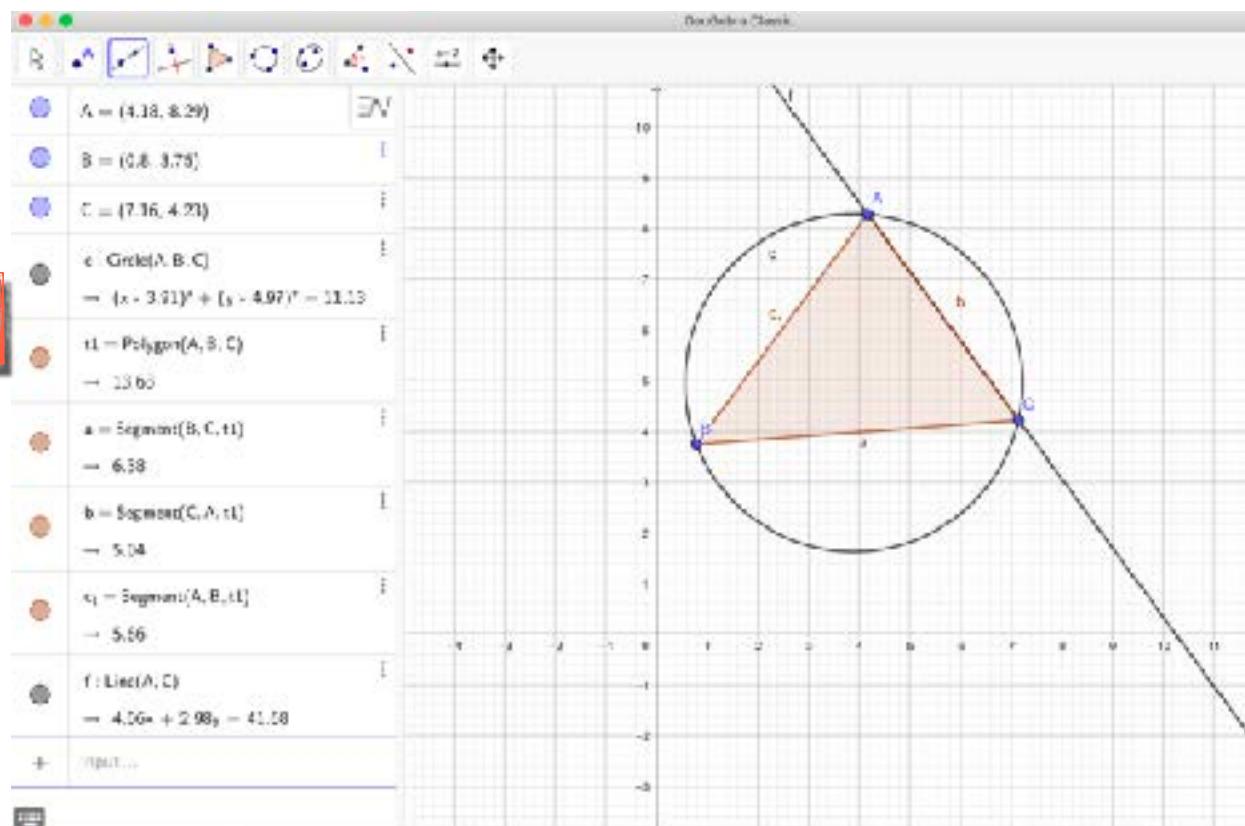
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Geogebra

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Minecraft

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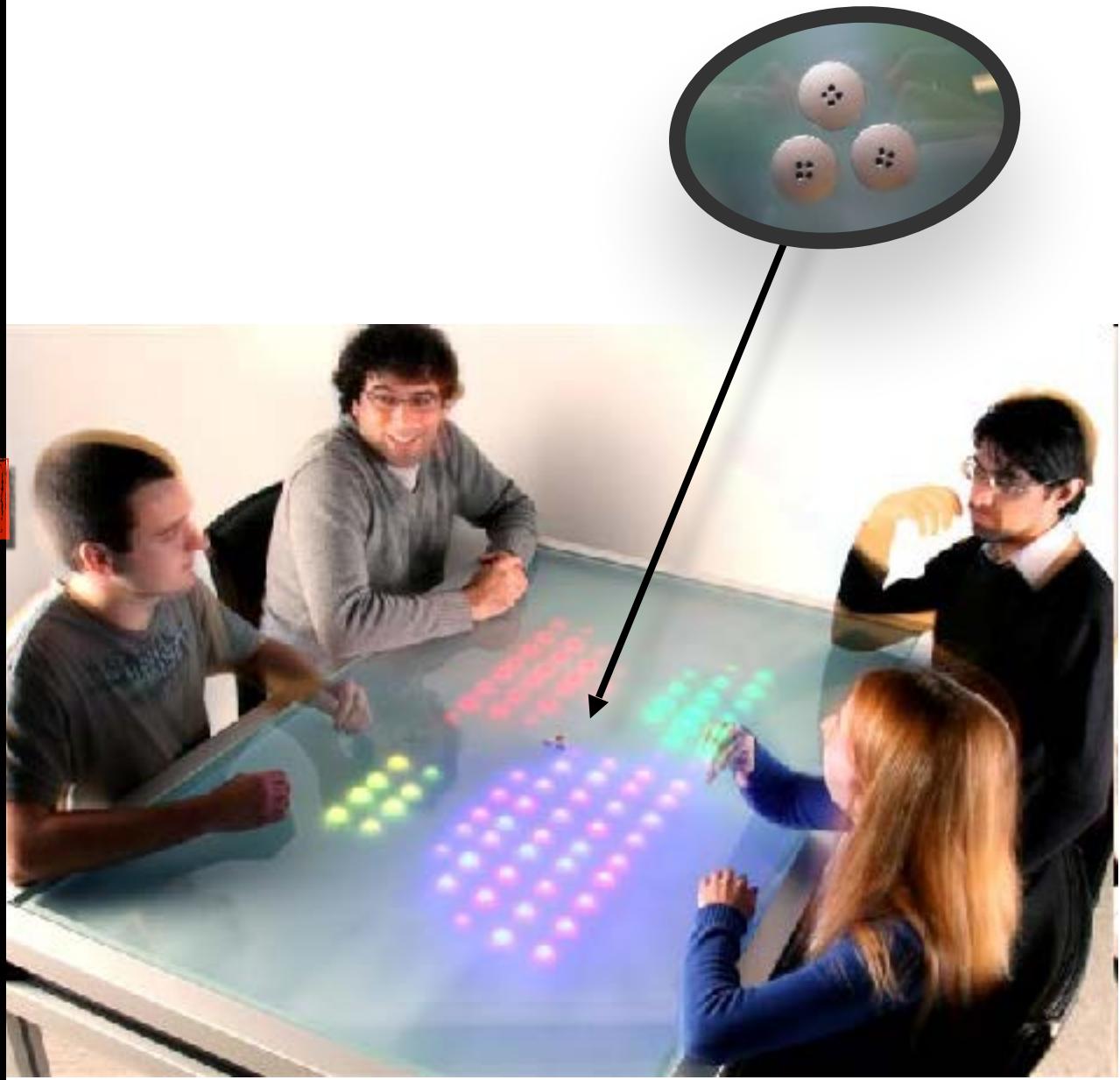
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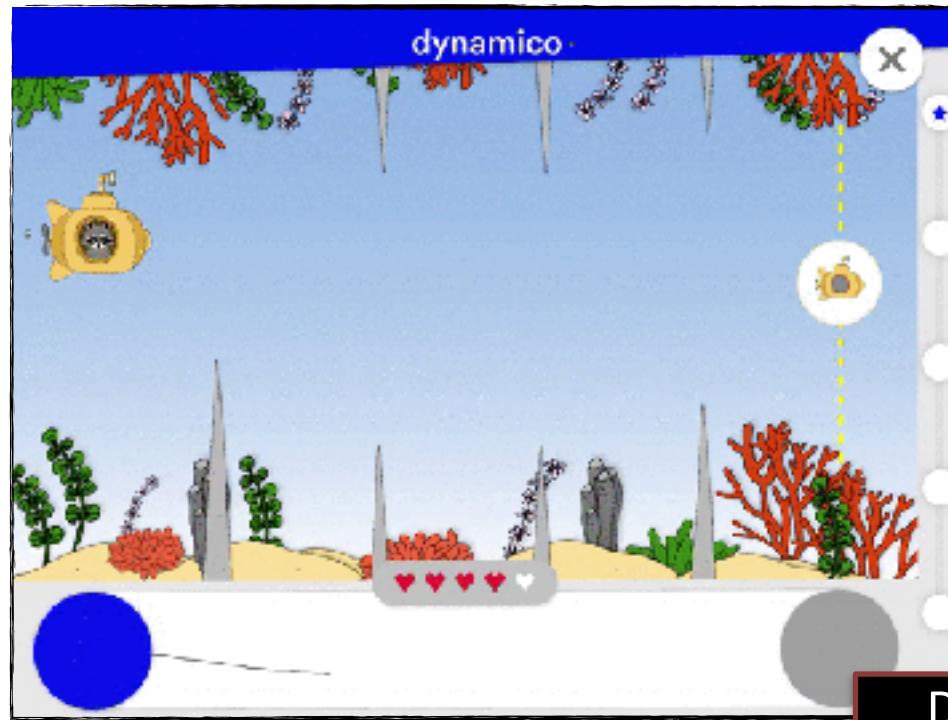
Virtual reality

Serious Games

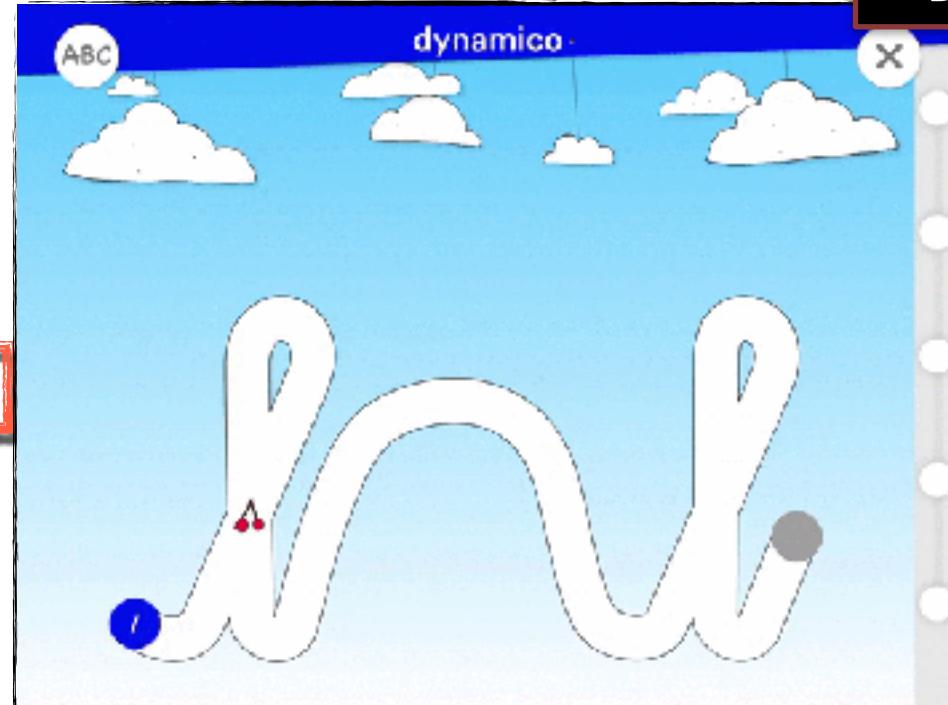
Education Robotics



- Drill & Practice
- Online education platforms
- Learning Management System
- Simulations
- Microworlds
- Classroom participation systems
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- Virtual reality
- Serious Games**
- Education Robotics



Dynamico



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Cellulo



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many technologies !

how do they support learning ?

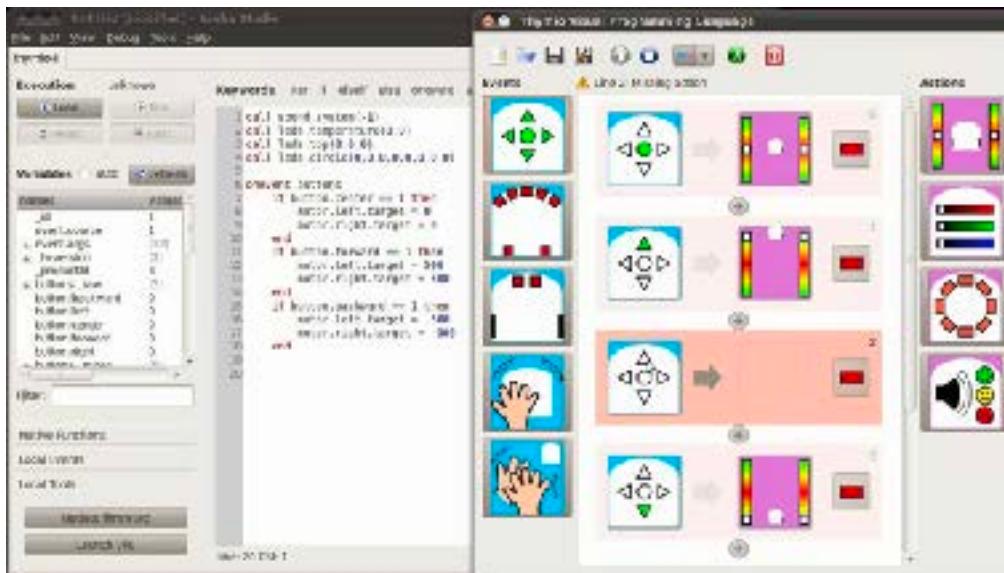
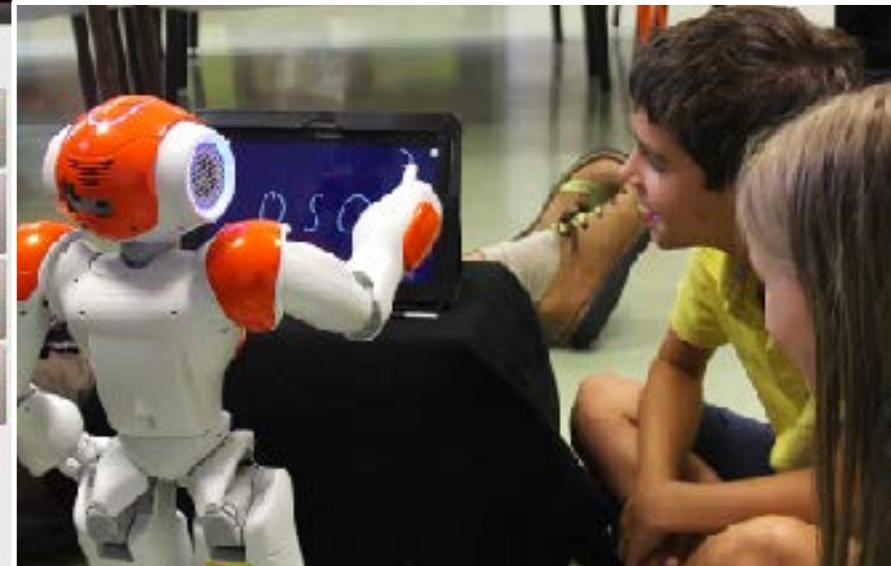
how do we learn ?

Education Content

Digital Skills

Education method

Digital Tools



Education Content

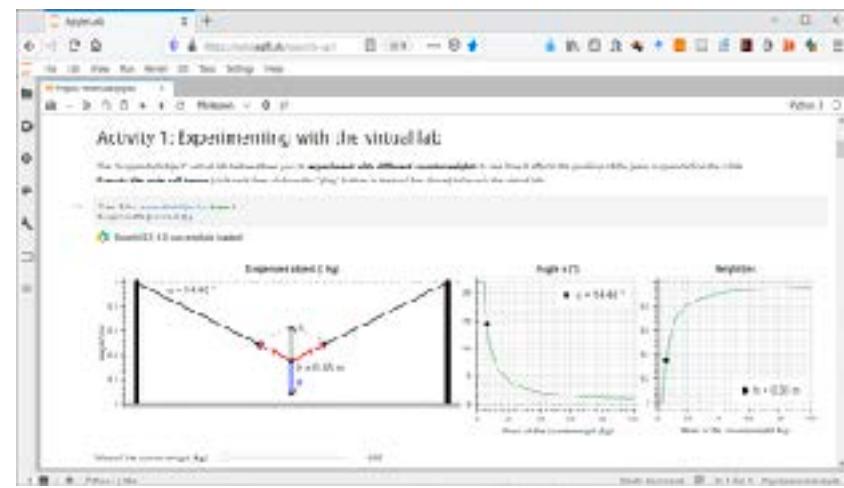
Digital Skills: Data Sciences

Education method

Digital Tools: Physics



A screenshot of a Jupyter Notebook interface. The left pane shows a list of files and a code cell with Python code. The right pane displays a 3D surface plot of a mathematical function, likely a paraboloid, with axes labeled 'x', 'y', and 'z'. The plot shows a smooth, downward-opening surface.



Digital Tools

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Digital Skills

Computational thinking

Coding

Data analyses

Makers spaces

Additive manufacturing

Sensors

IOT

Networks



Digital Kills

Computational thinking

Coding

Data analyses

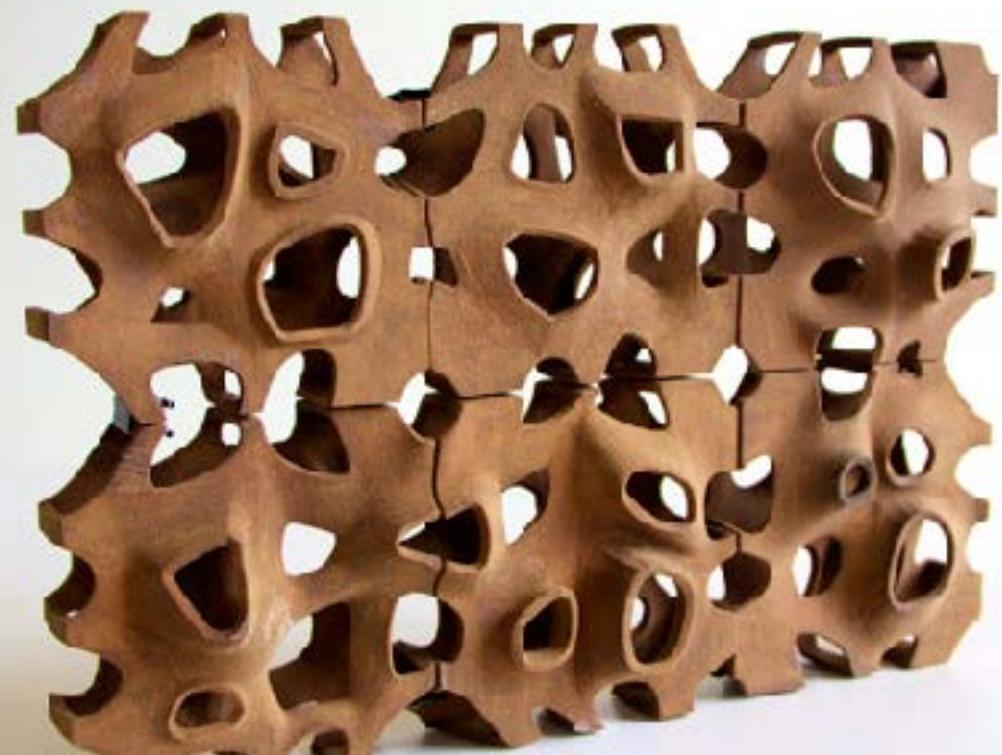
Makers spaces

Additive manufacturing

Sensors

IOT

Networks



How people Learn

- Drill & Practice
- Online education platforms
- Learning Management System
- Simulations
- Micro-worlds
- Classroom participation systems
- Teamwork support
- Augmented reality
- Virtual reality
- Serious Games
- Education Robotics

what learners learn
does not depend on right specific technology
but on the cognitive **activity** they do
(with this technology)

Week	CS-411	
	Course (Friday 10 :15 – 10 :00 in COViZ)	Project (Friday 12 :15 -14 :00 in INF 119)
W1 21/02	Chapter 1: Learning technologies	Experience a PS-I approach (form groups, share all resources)
W2 28/02	Chapter 2: Memory & Learning	Decide project idea
W3 07/03	Chapter 3: Mastery Learning	Analyze the learning tasks (identify learning goals, tasks, interventions, blah)
W4 14/03	Chapter 4: Discovery learning	Design scenario
W5 21/03	Chapter 5: Designing Experiments	Implement the scenario
W6 28/03	Chapter 6: Social Cognition	Implement the scenario
W7 04/04	Chapter 7: Augmented reality	Implement the scenario
W8 11/04	Chapter 8: Statistical analysis <i>Patrick Jermann</i>	Implement the scenario
18/04 25/04		Easter Break
W9 02/05	Chapter 8: Statistical analysis <i>Patrick Jermann</i>	Run experiments
W10 09/05	<i>Chapter 9: Maker Spaces</i>	Run experiments
W11 16/05	<i>Chapter 10: Computational thinking skills</i>	Analyse Data
W12 23/05	<i>Chapter 11: Generative AI in Education</i>	Support for Statistical analysis <i>Patrick Jermann</i>
W13 30/05		

CS-411 : 6 credits !!!

- Written Exam: see 2023 year exam on Moodle
- Project : Design an I-PS vs PS-I experiments
 - Teams of 3
 - Select a difficult topic to understand
 - Analyse de tasks
 - Design the PS and I learning Activities
 - Run the experiment
 - Run the statistical analysis
 - Write the report

All instructions on Moodle and at 12:30

What will learners learn ?

(not something trivial)

Some of the topics you can choose from include:

1. Bayes' theorem
2. Recursion
3. Entropy in physics
4. Information entropy
5. Gradient Descent
6. Gerrymandering

Other topics are acceptable, but please discuss with one of the TAs first before submitting.



Final Report

(not something trivial)

1. **Introduction (½ page)**
 - a. Introduce the topic
 - b. Introduce the target audience as defined in the tasks
2. **Learning Goals (½ page)**
3. **Task Analysis (1-2 pages)**
4. **Lesson Design and Activities (1-2 pages)**
5. **Experimental Design (1 page)**
6. **Implementation (1-2 pages)**
7. **Participants, Data, and Analysis (1-2 pages)**
8. **Conclusions and Reflection (½-1 page)**