

CS-411 : Digital Education

# Chapter 1:

## Introduction to digital education

## Drill & Practice

Online education platforms

Learning Management System

Classroom participation systems

Simulations

Microworlds

Teamwork support

Augmented reality

Virtual reality

Serious Games

Education Robotics

The image displays three overlapping educational interfaces. The top interface is Duolingo, showing a French lesson titled "Choisis la traduction de 'homme'" with a progress bar and a "Quitter" button. The middle interface is HappyNumbers.com, featuring a math problem  $72 + 16 = \square$  and a visual representation of the sum using blue and pink blocks. The bottom interface is a driving simulation, showing a road scene with a car and a side-view mirror, alongside a question: "Je circule sur une route prioritaire : OUI NON" and "Je dois obligatoirement mettre le clignotant à droite : OUI NON". A digital display on the right shows "Question 01" and options A, B, C, D.

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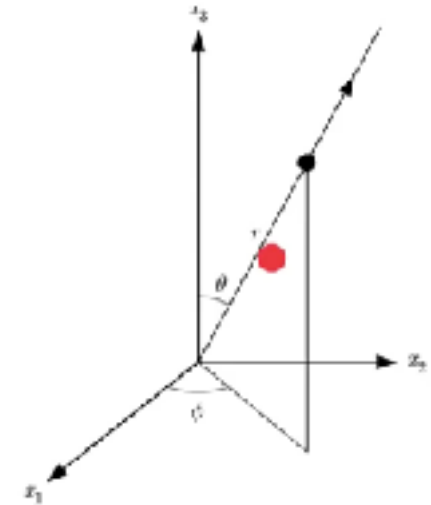
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Virtual reality

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**Définition : lignes de coordonnées (c. sphériques)**



Mechanique I 2019 18

EdX  
Coursera

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

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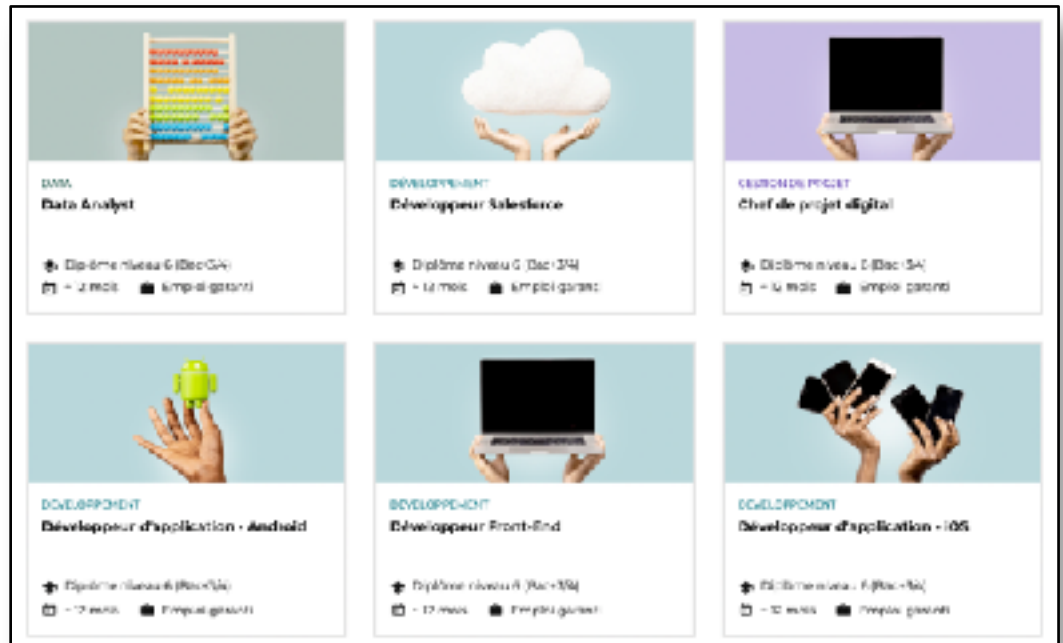
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CoopAcademy

OpenClassroom



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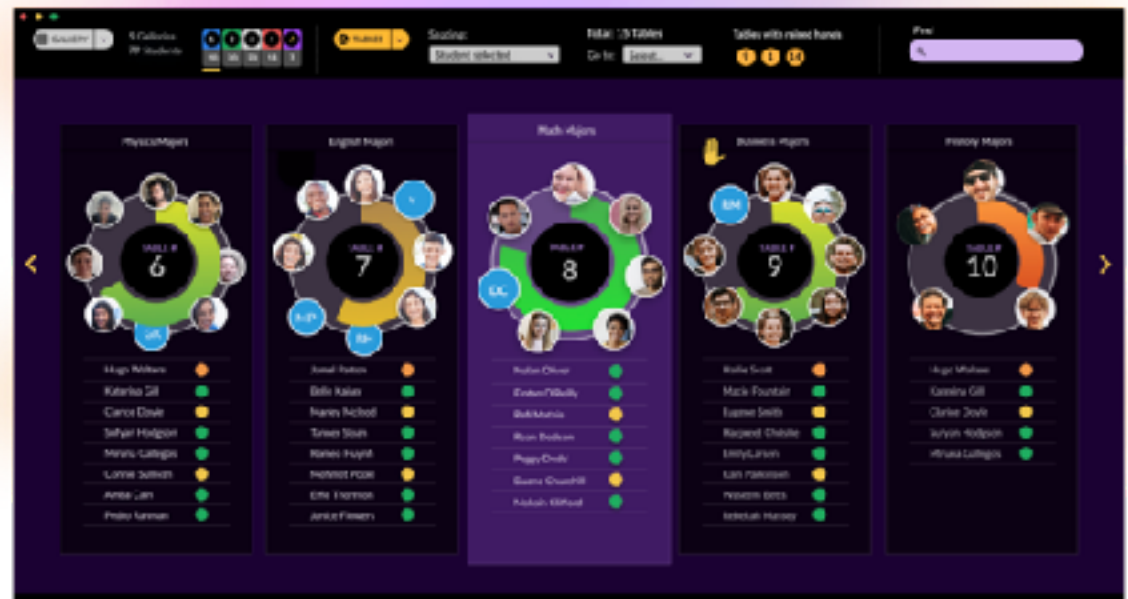
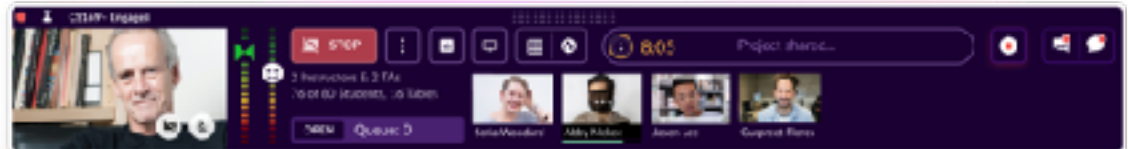
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Transformée de Laplace de  $\cos t$  et polynômes

$$\mathcal{L}\{f'(t)\} = p\mathcal{L}\{f(t)\} - f(0)$$
$$\mathcal{L}\{\sin(at)\} = \frac{a}{p^2 + a^2}$$
$$\mathcal{L}\{\cos(at)\} = p\mathcal{L}\left\{\frac{1}{a}\sin(at)\right\} - \frac{1}{a}\sin 0$$
$$= \frac{p}{a}\mathcal{L}\{\sin(at)\} =$$

$f'(t) = \cos(at)$   
 $f(t) = \frac{1}{a}\sin(at)$

2:30 / 8:57

Khan Academy

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

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

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

Bravo ! Pour aller plus loin.

Signaler un problème

Excellent travail!

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

Réussissez 5 questions sur 7 pour passer à Familier

Question suivante...

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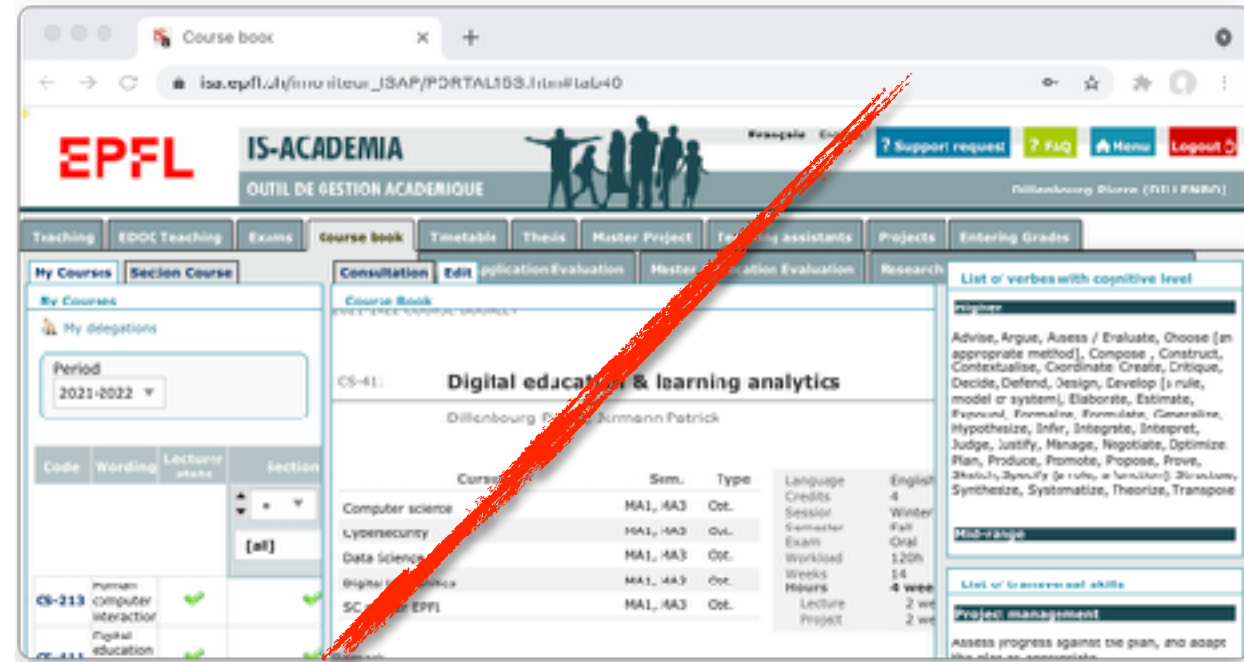
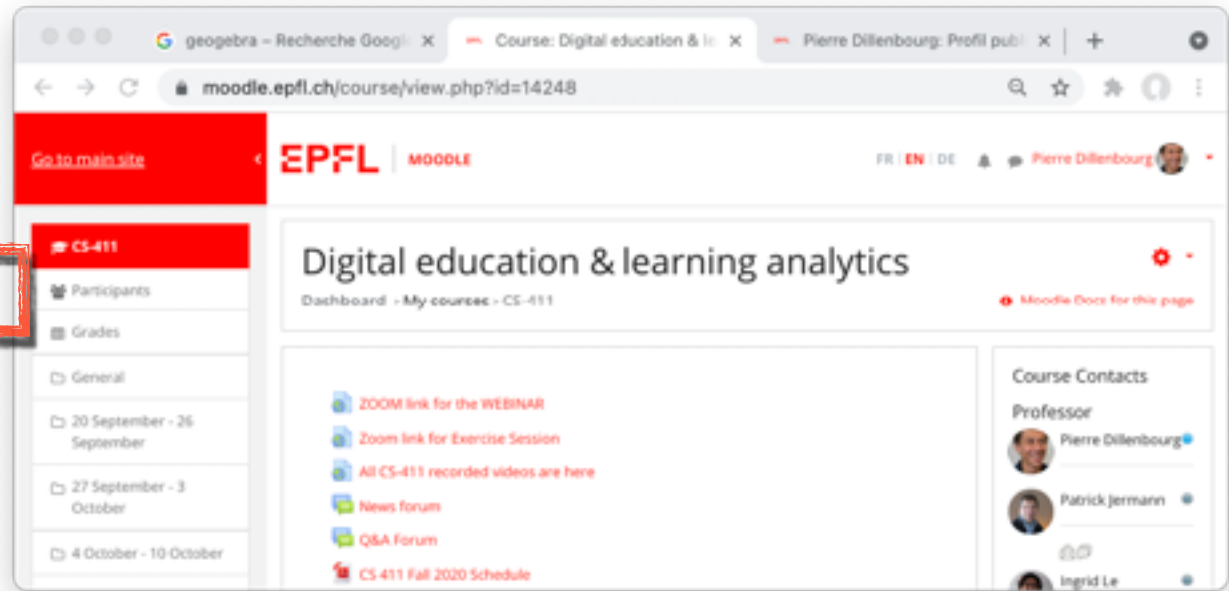
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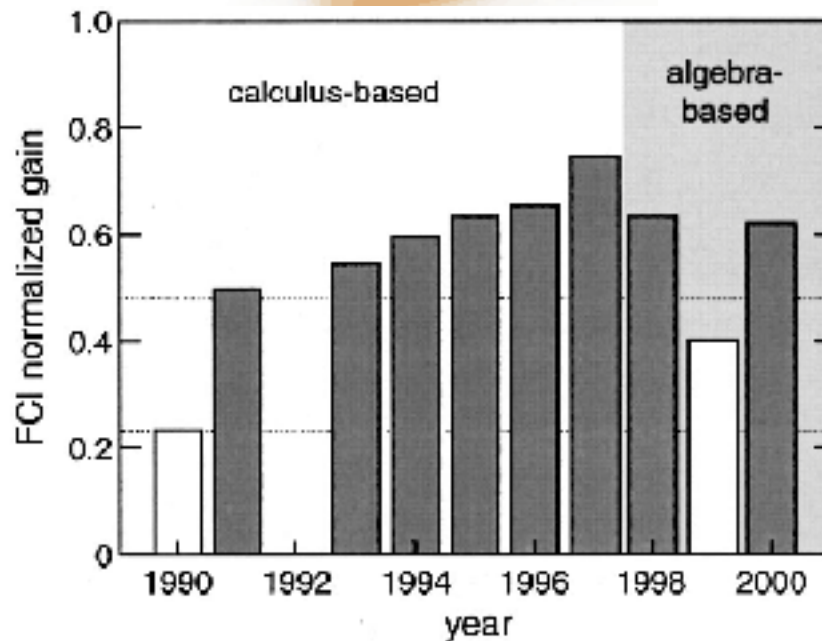
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Force Concept Inventory Score



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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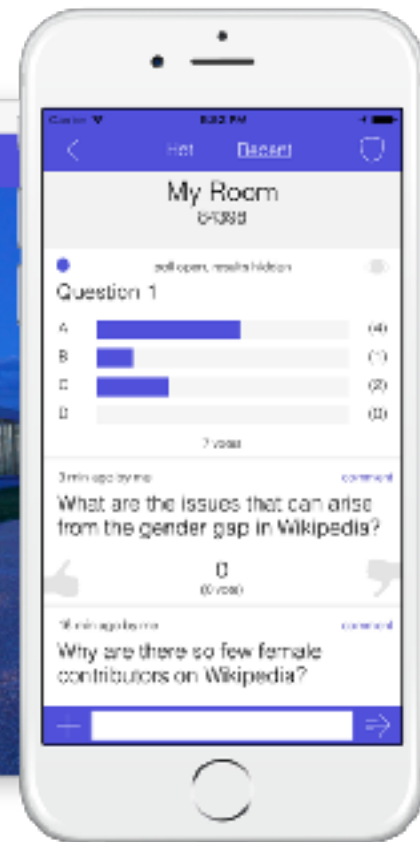
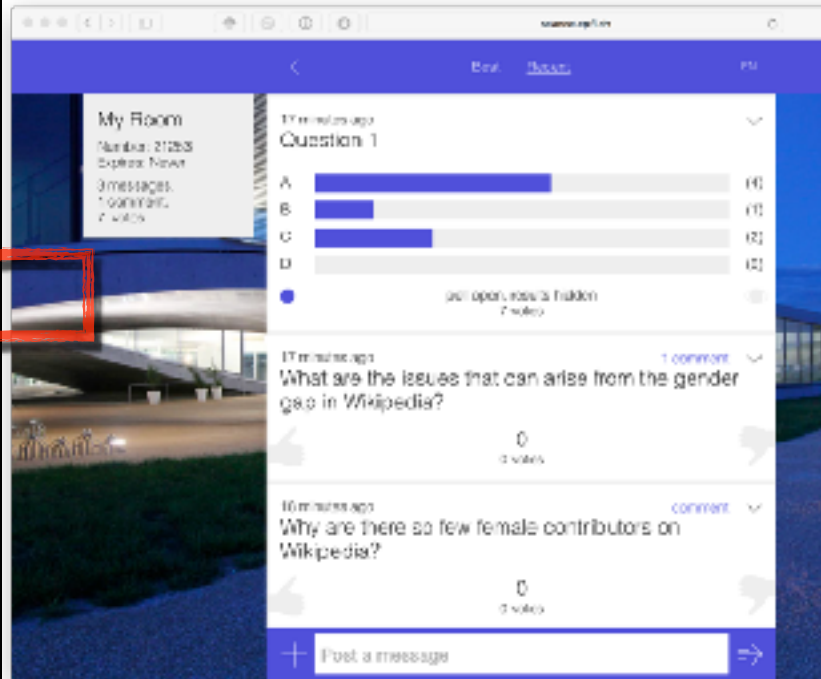
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Speak Up

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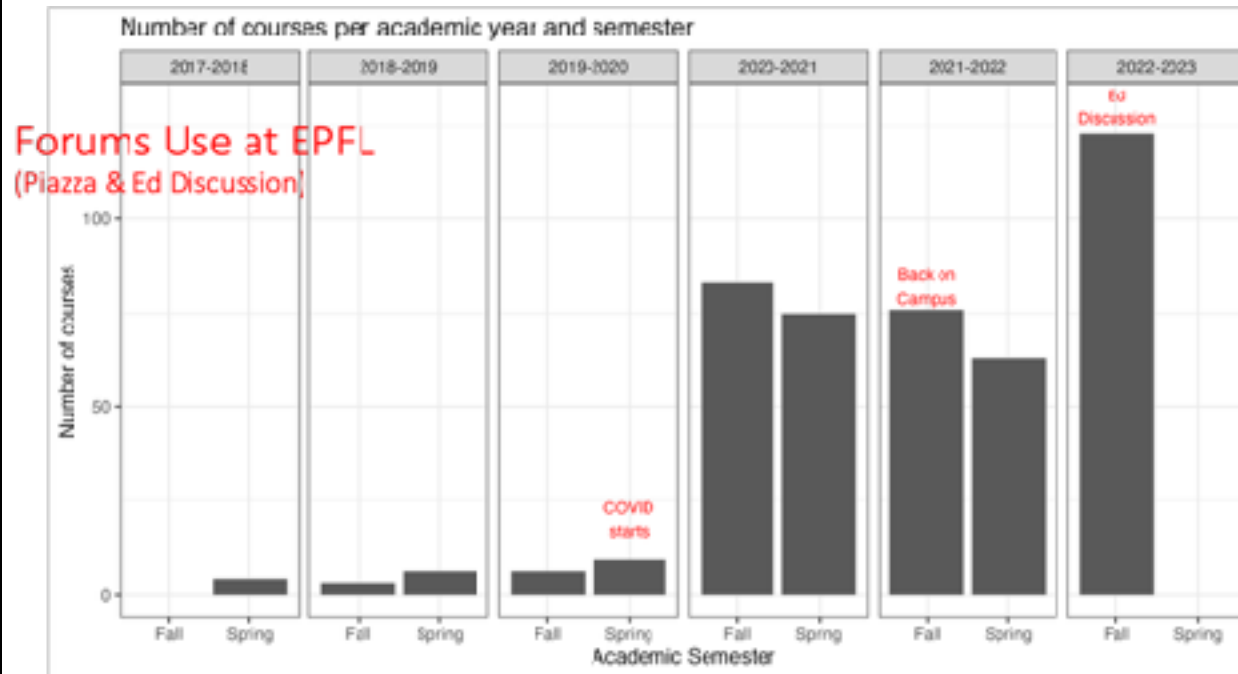
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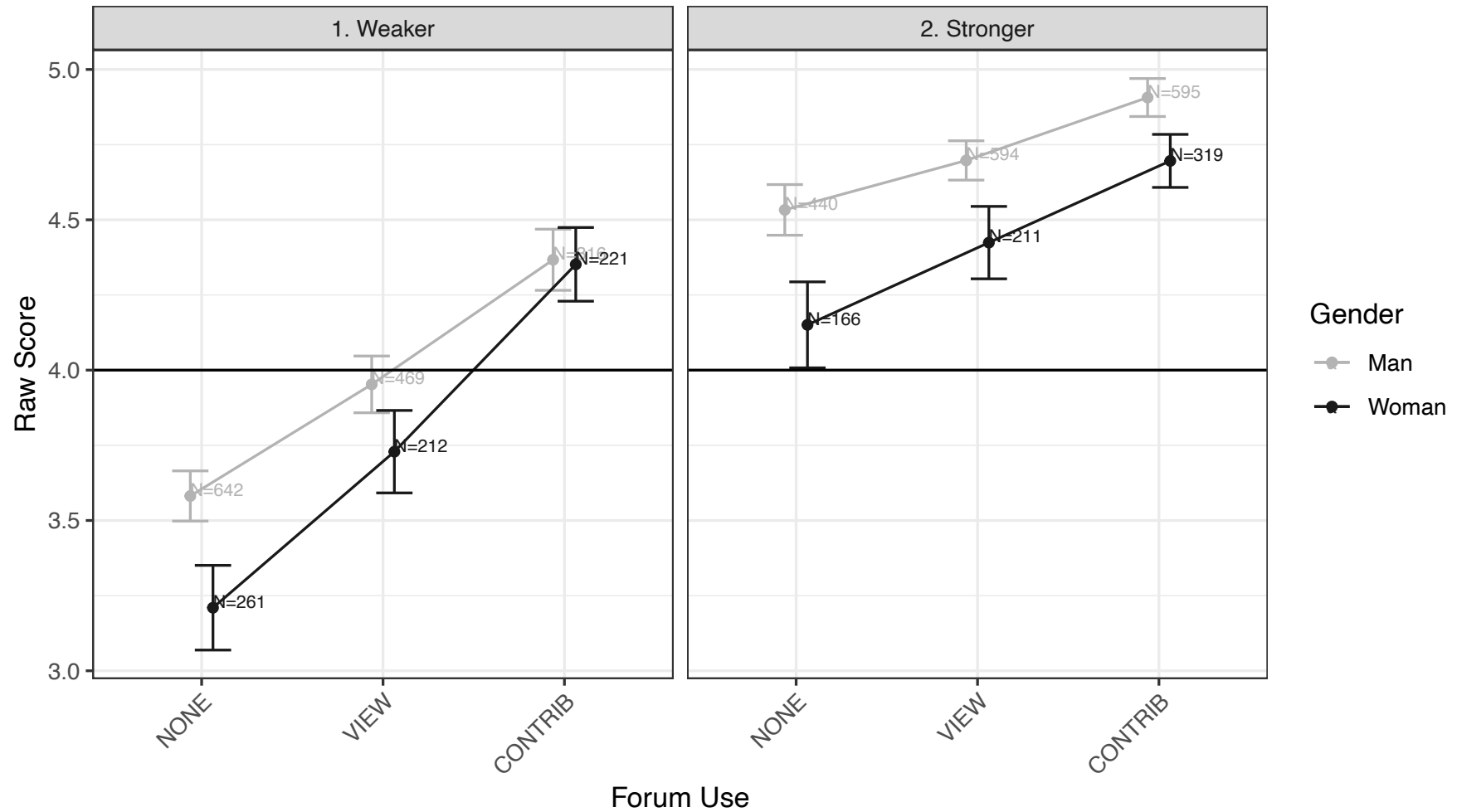
The screenshot shows the 'ed Playground - Discussion' interface. On the left, a sidebar lists various course categories, with 'Quadratic equation' highlighted. The main content area displays a discussion thread titled 'Quadratic equation' by user 'Anonymous'. The thread includes a question about solving a quadratic equation and a single answer provided by user 'Anonymous'. The interface features a search bar, filters, and a list of courses on the left sidebar.





## Means and CI for exam grades

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



Education is a data science

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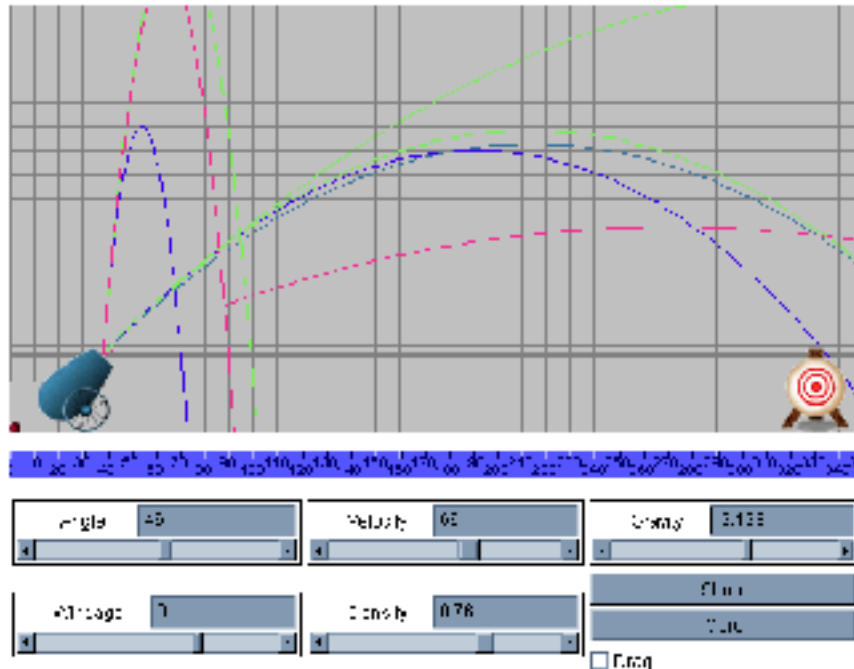
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# Jupyter Notebook



Prof. Cecile Hebert, EPFL

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

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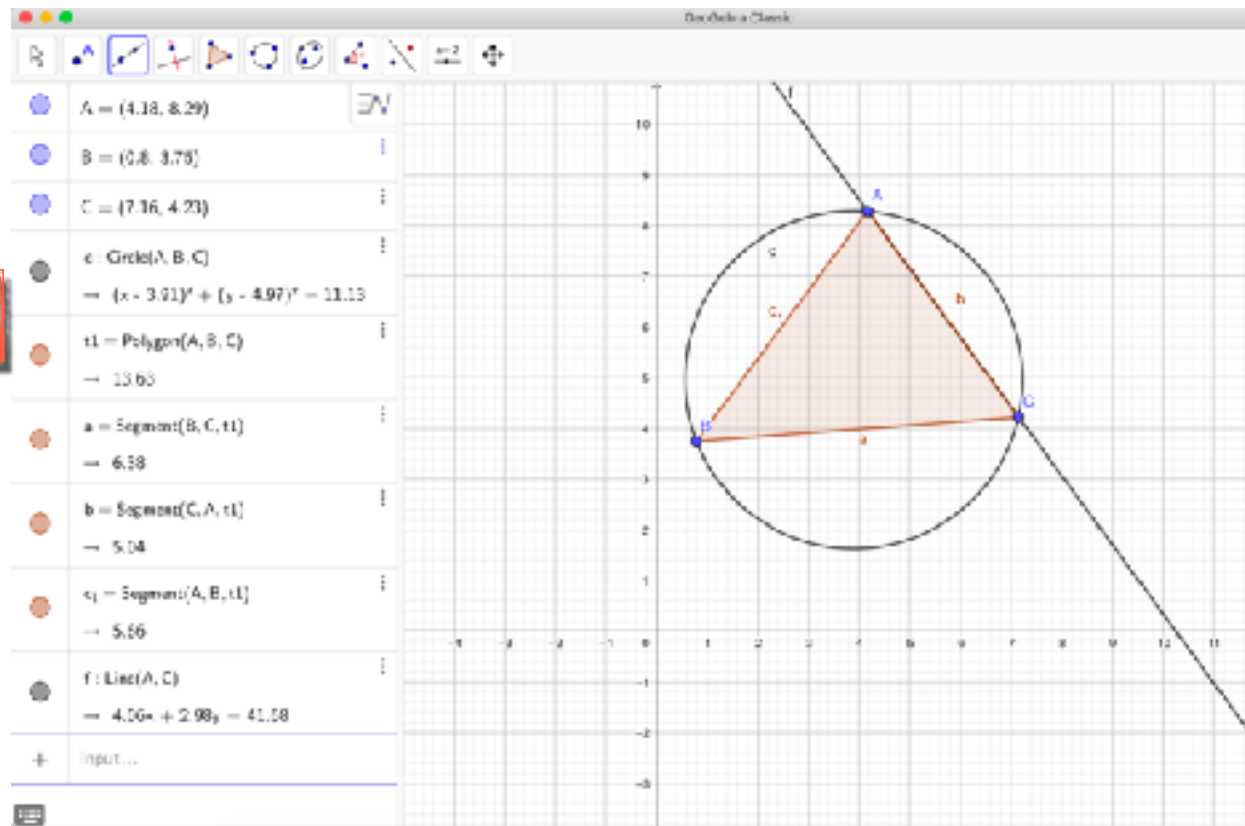
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Geogebra



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Minecraft

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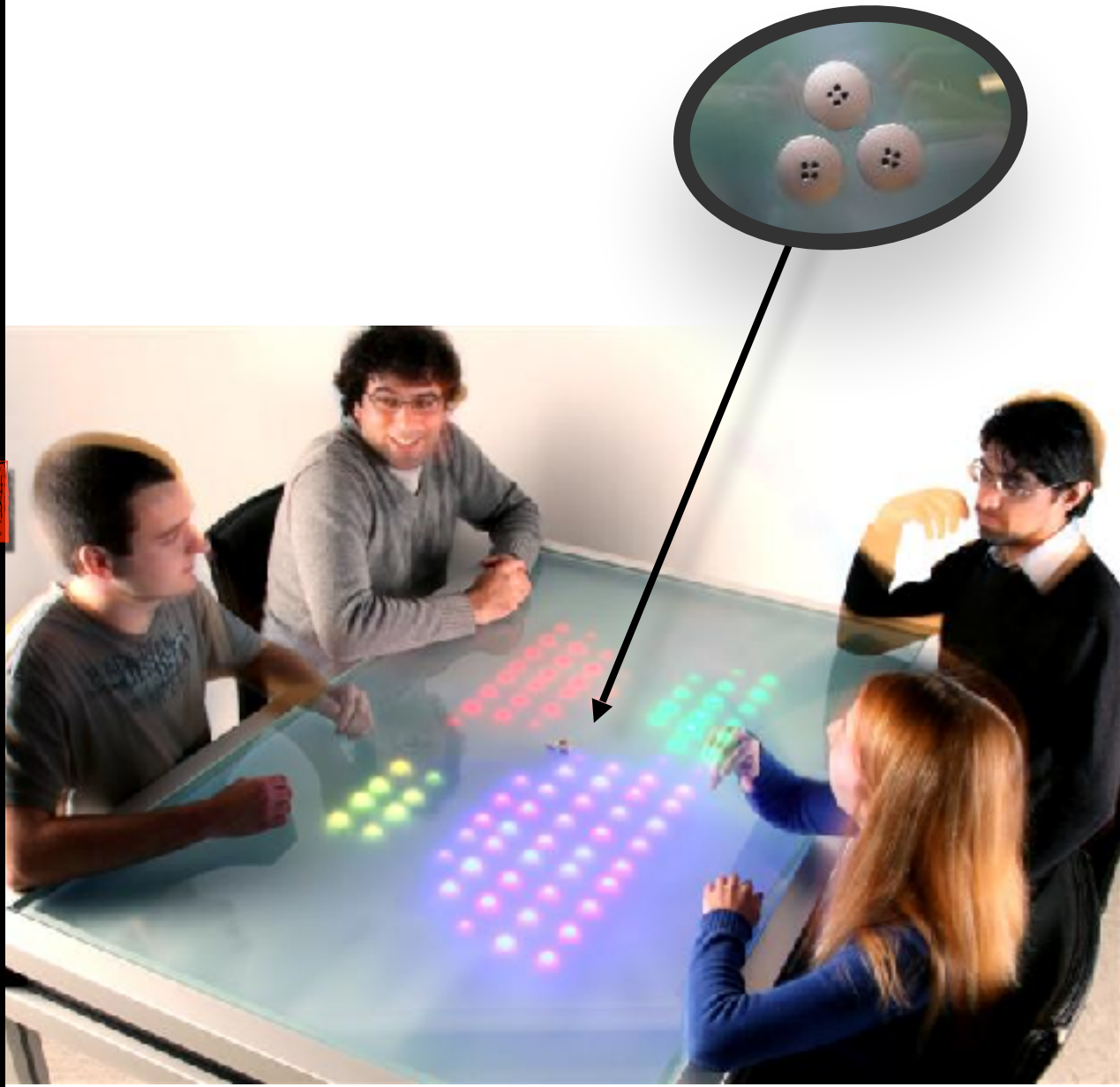
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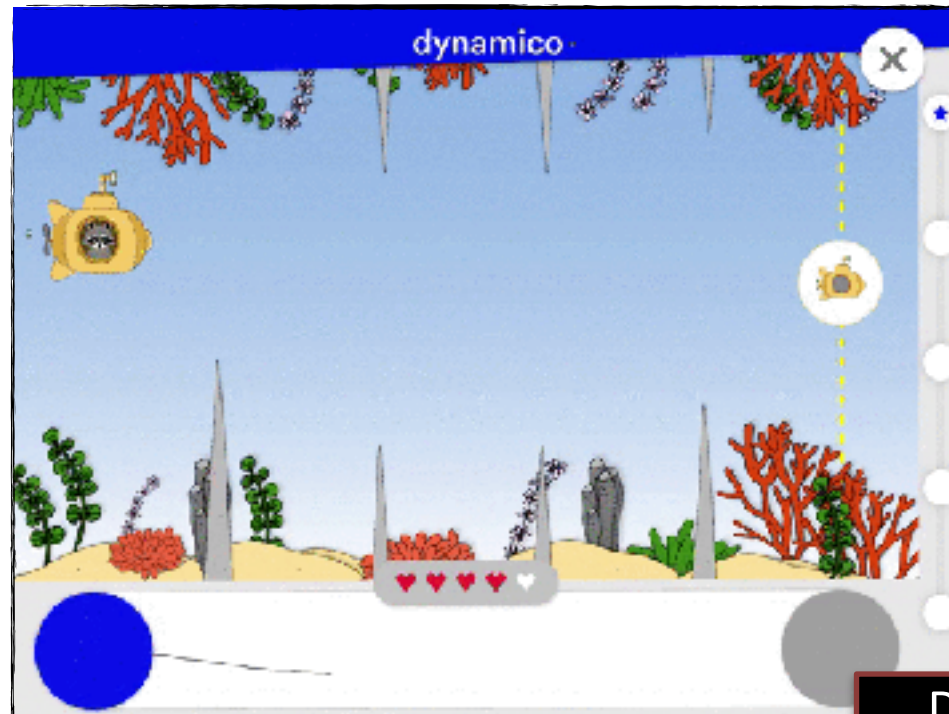
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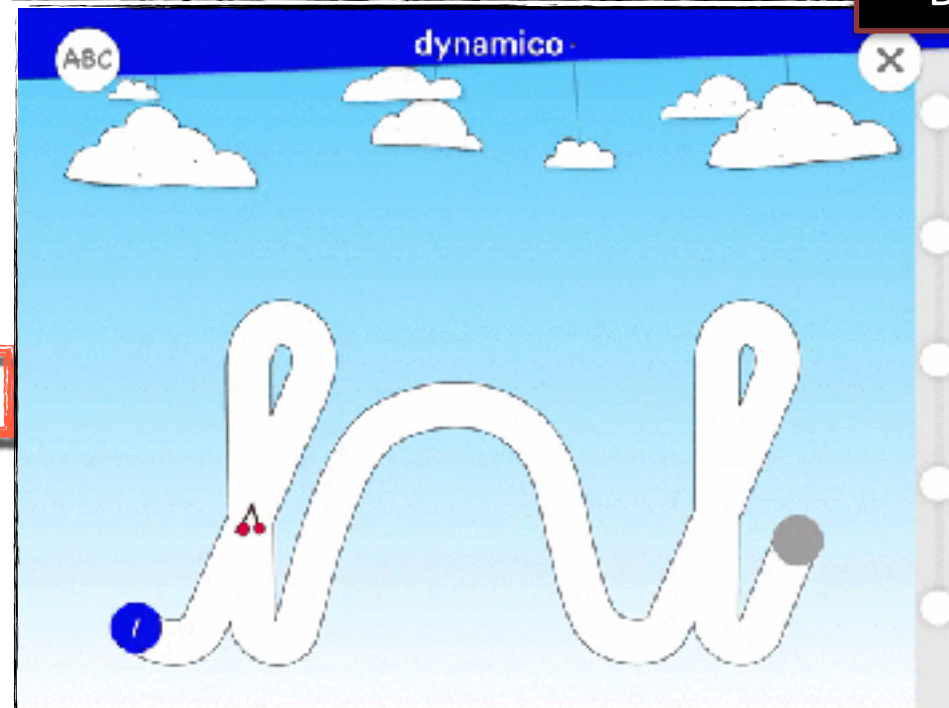
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Dynamico





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Cellulo



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many technologies !

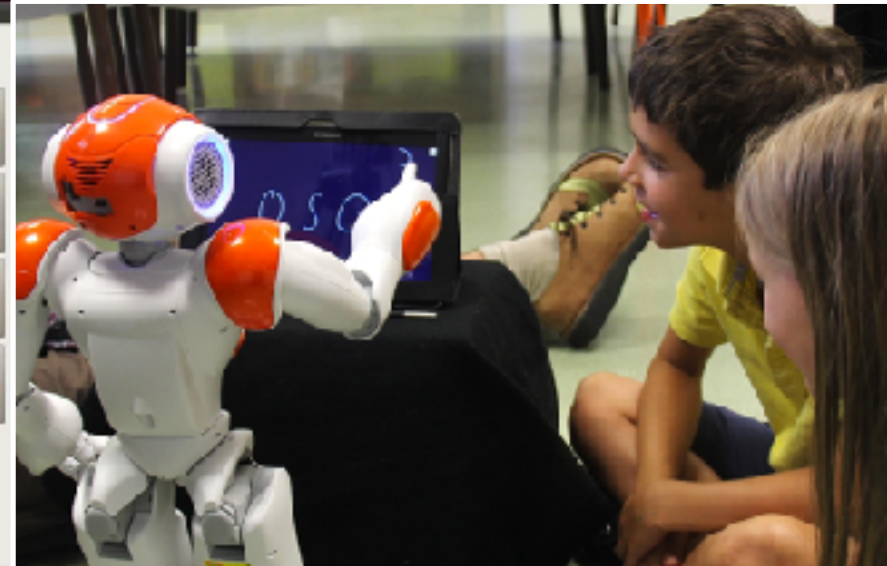
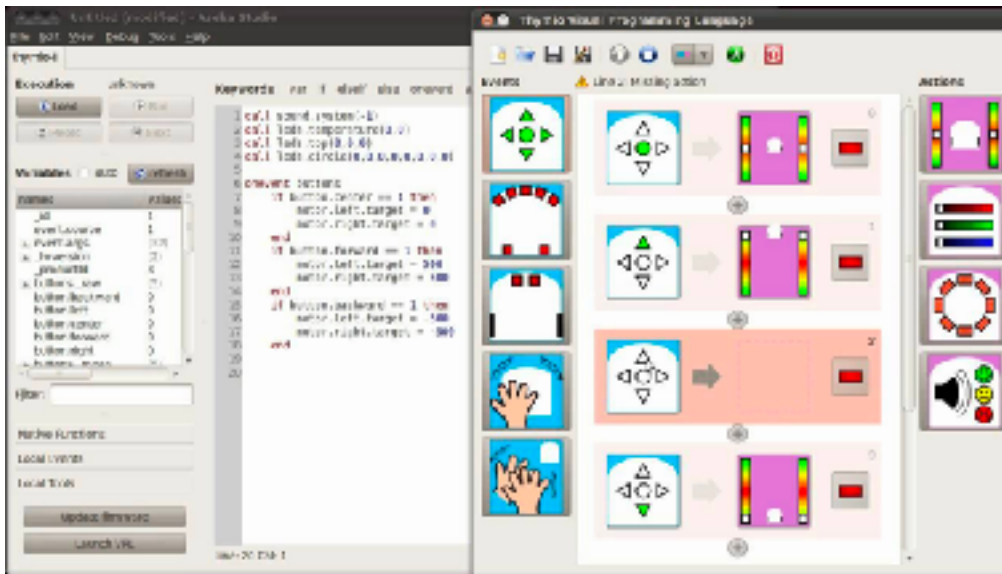
how do they support learning ?

how do we learn ?

Learning **what** ?  
Digital Skills



Learning **how** ?  
Digital Tools

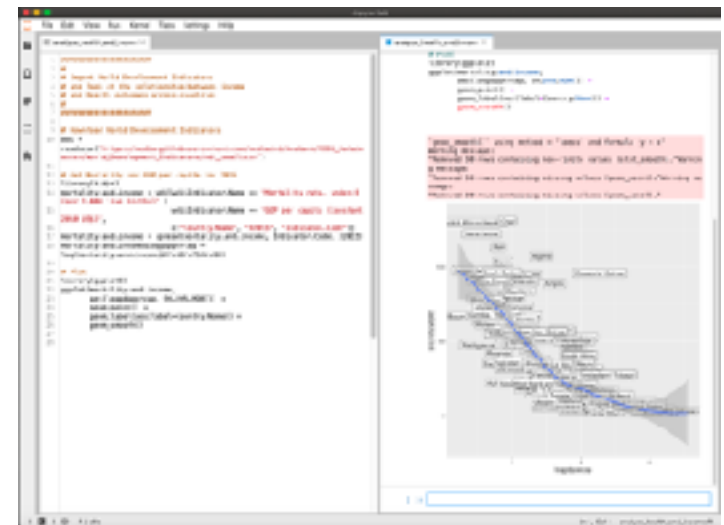
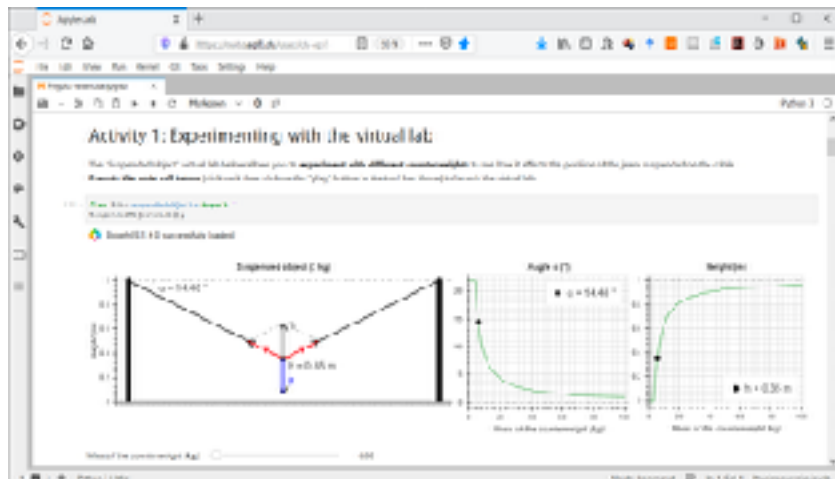




Learning how ?  
Physics



Learning what ?  
Data Sciences



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## Digital Skills

Computational thinking

Coding

Data analyses

Makers spaces

Additive manufacturing

Sensors

IOT

Networks



**Digital Skills**

Computational thinking

Coding

Data analyses

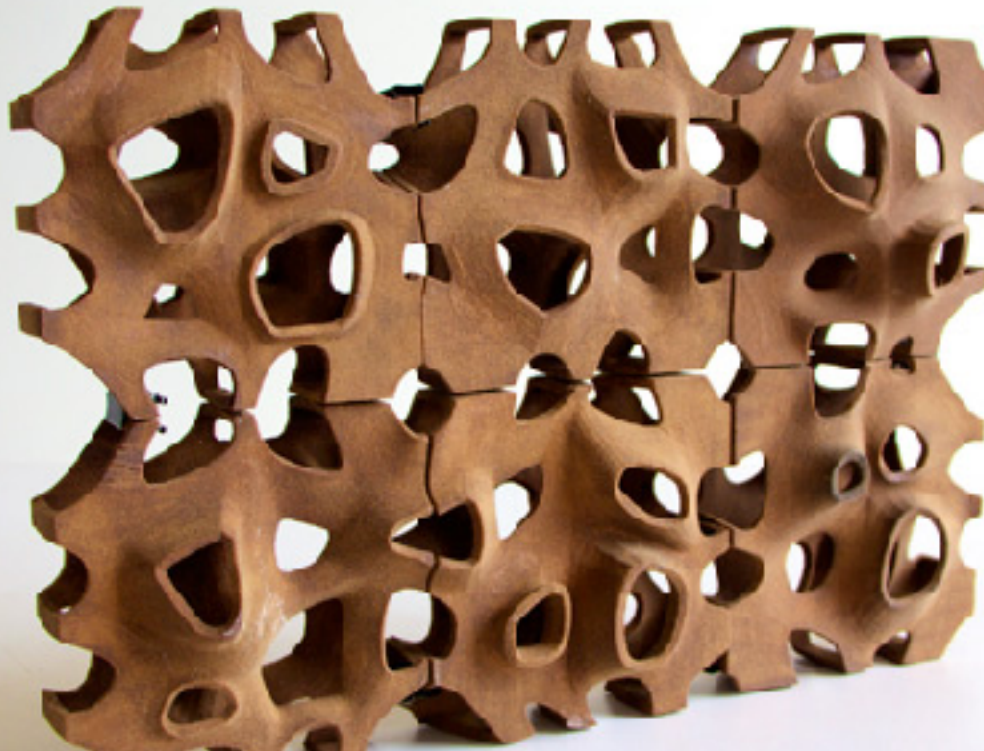
Makers spaces

Additive manufacturing

Sensors

IOT

Networks



Week	CS-411	
	<b>Course</b> (Friday 10 :15 – 10 :00 in COViZ)	<b>Project</b> (Friday 12 :00-14 :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 next 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)