INSTITUT FRANÇAIS DE L'ÉDUCATION

CIDREE
Consortium of Institutions for Development and Research in Education in Europe

UNIVERSITÉ DE LYON

ENS DE LYON

Expert meeting CIDREE

13th & 14th January 2020

Robotics & STEAM education

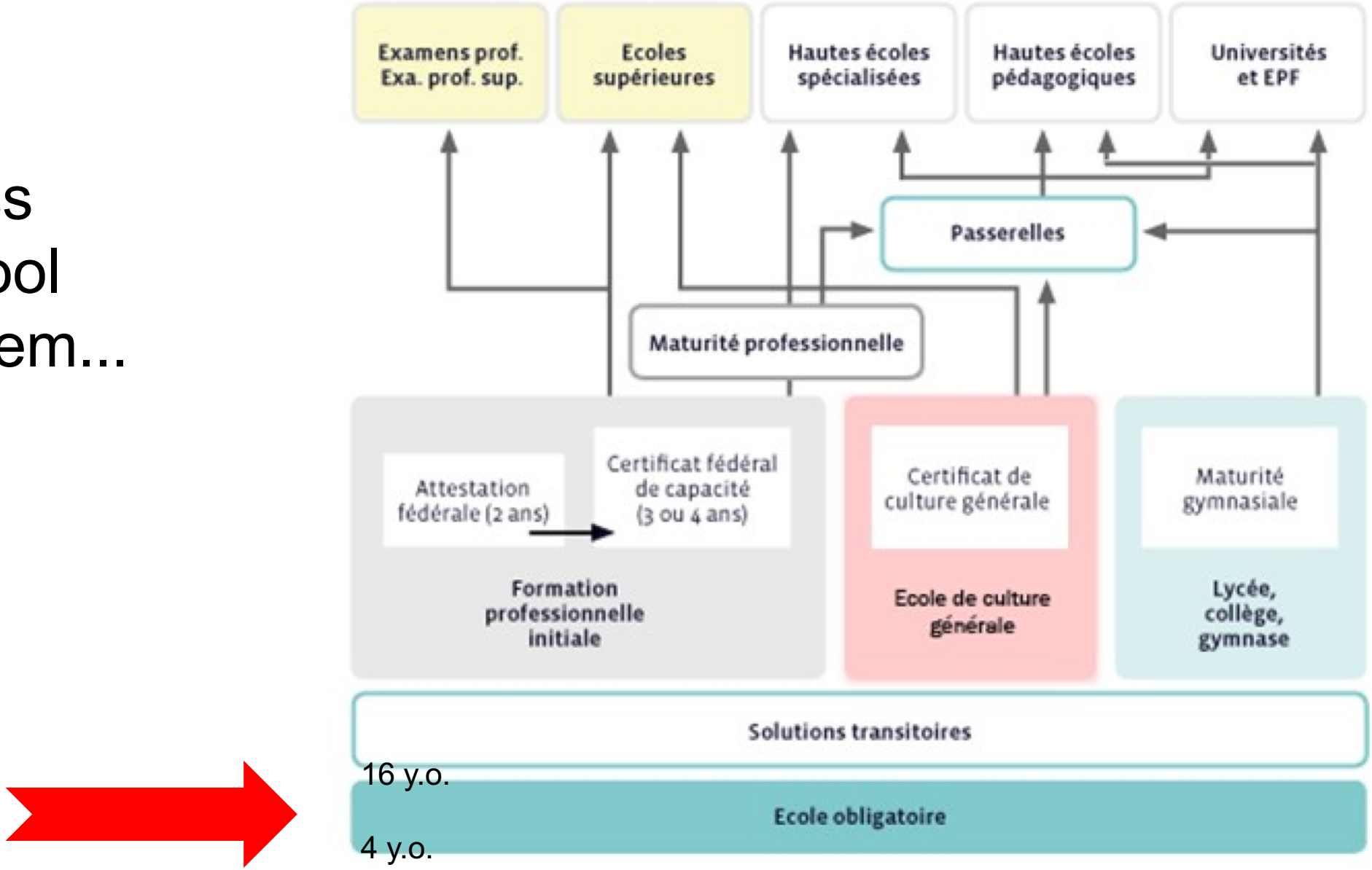
The specific contribution of robotics to the learning and the teaching of STEAM

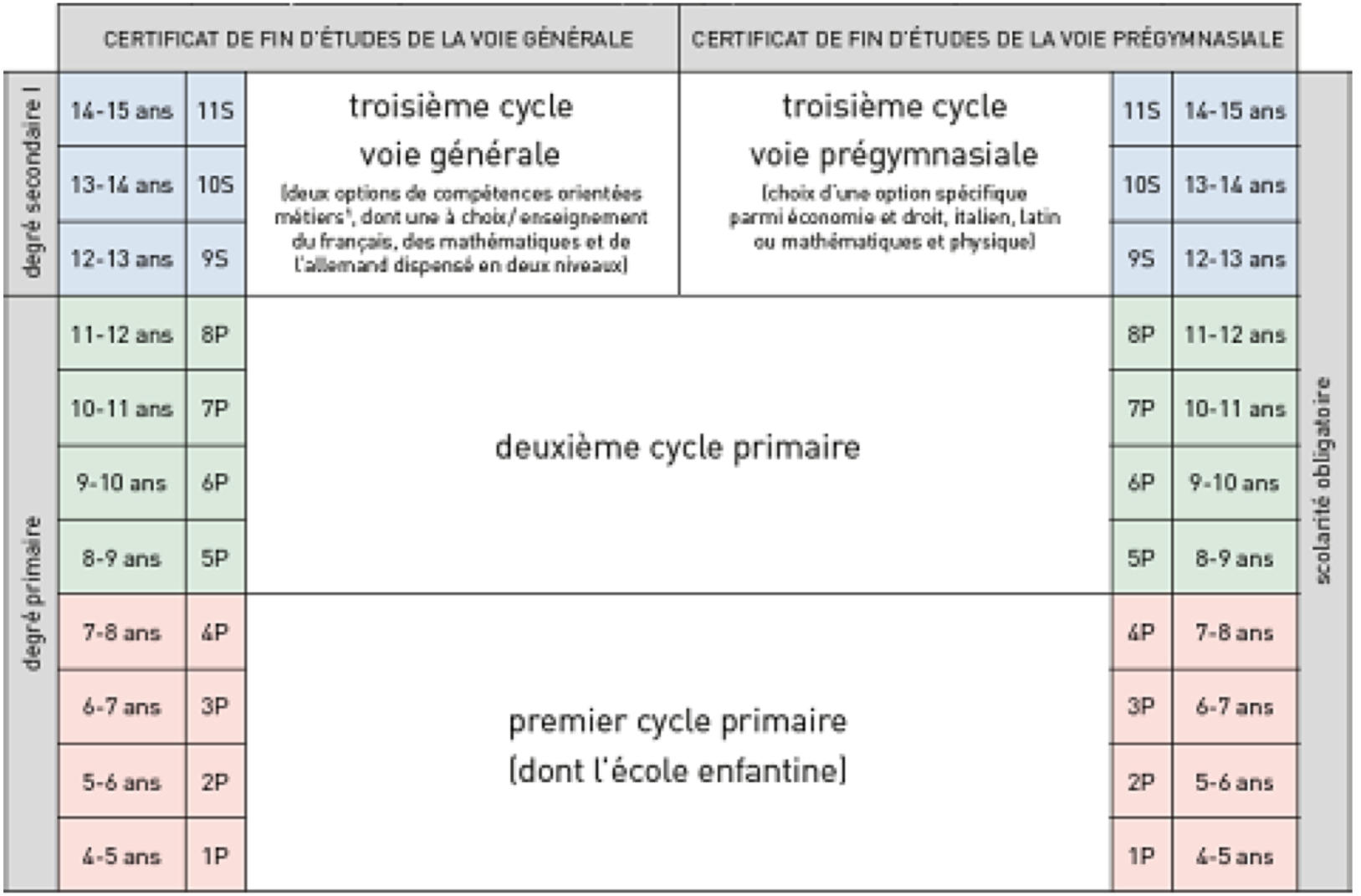
Switzerland contribution

hep/ **Morgane CHEVALIER** & **Didier ROY** EPFL LEARN Center for Learning Sciences

1. Framework regarding the introduction of STEAM and robots in education and training policies in Switzerland.

One Swiss School System...



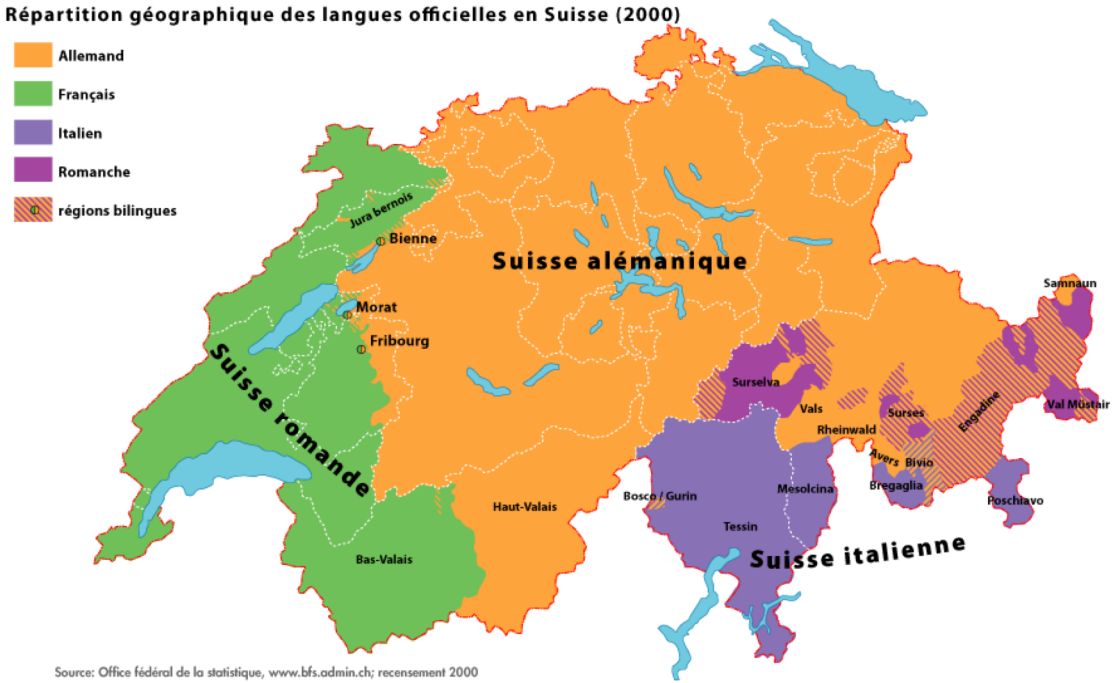


[1] possibilité, à certaines conditions, de choisir une option spécifique

… but a more varied geopolitical organization !

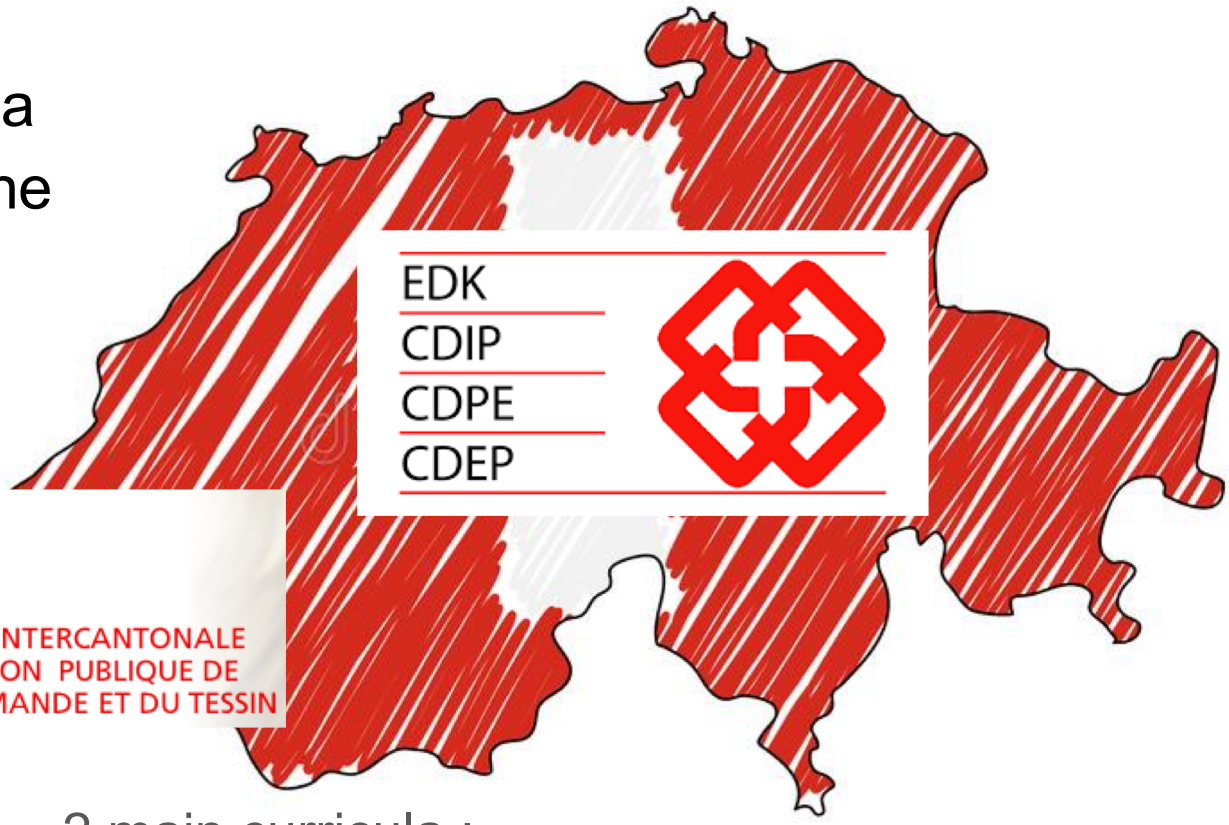
Confederation of 26 cantons…

… so many constitutions and governments !



4 regional languages

No Ministry of Education but a coordinating body between the cantonal governments.



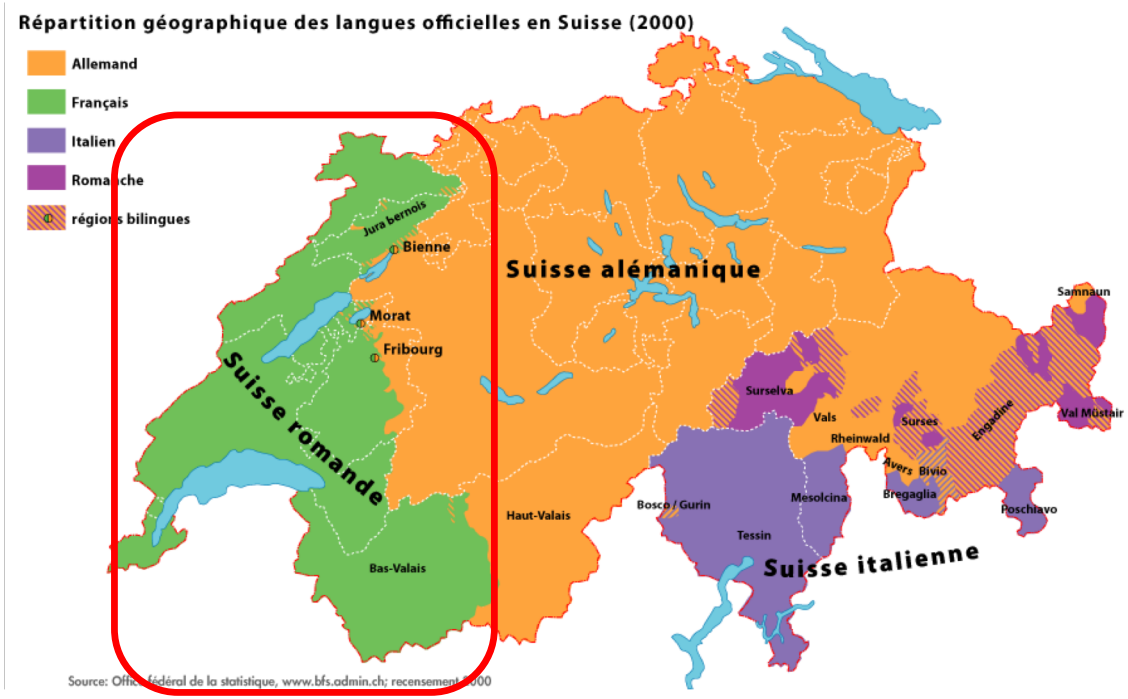
CIIP
CONFÉRENCE INTERCANTONALE
DE L'INSTRUCTION PUBLIQUE DE
LA SUISSE ROMANDE ET DU TESSIN

2 main curricula :

- Lehrplan 21 (with “medien und informatik”)
- Plan d’Etudes Romand

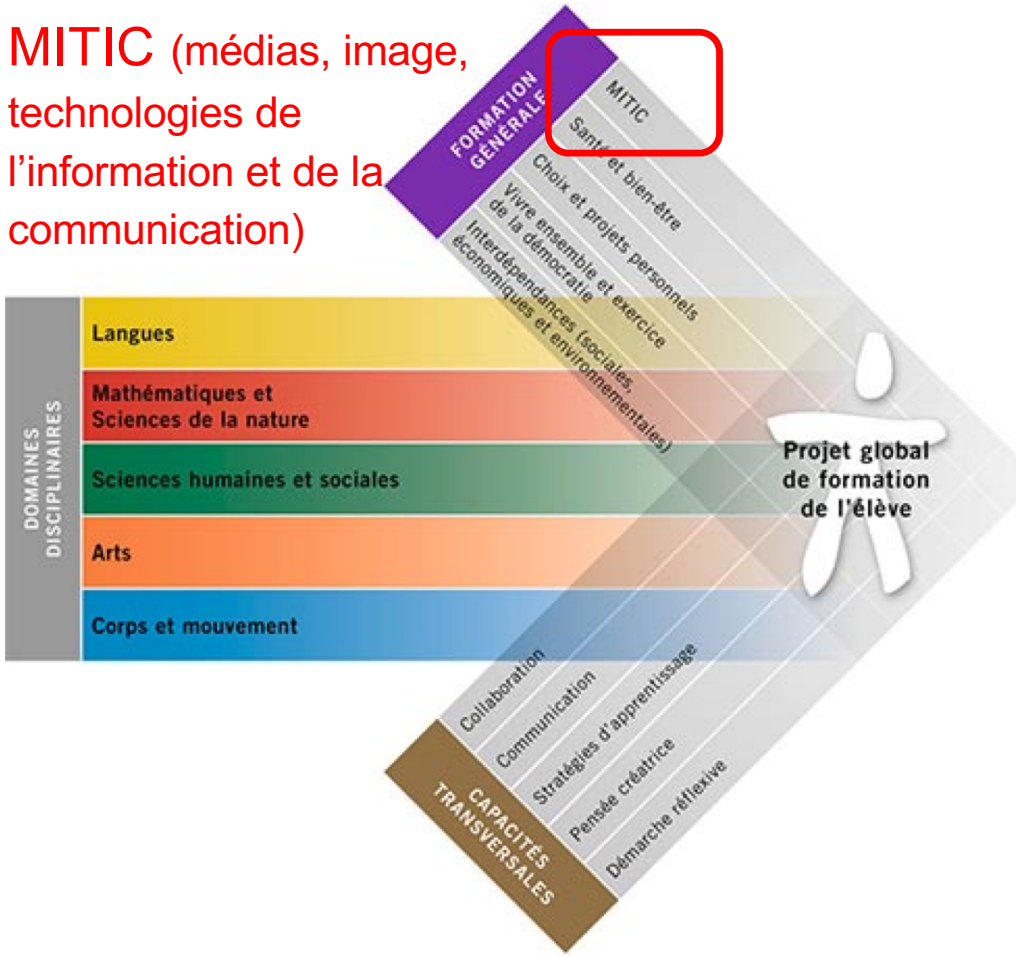
And many cantonal projects...

ICT in the French-speaking curriculum (PER)

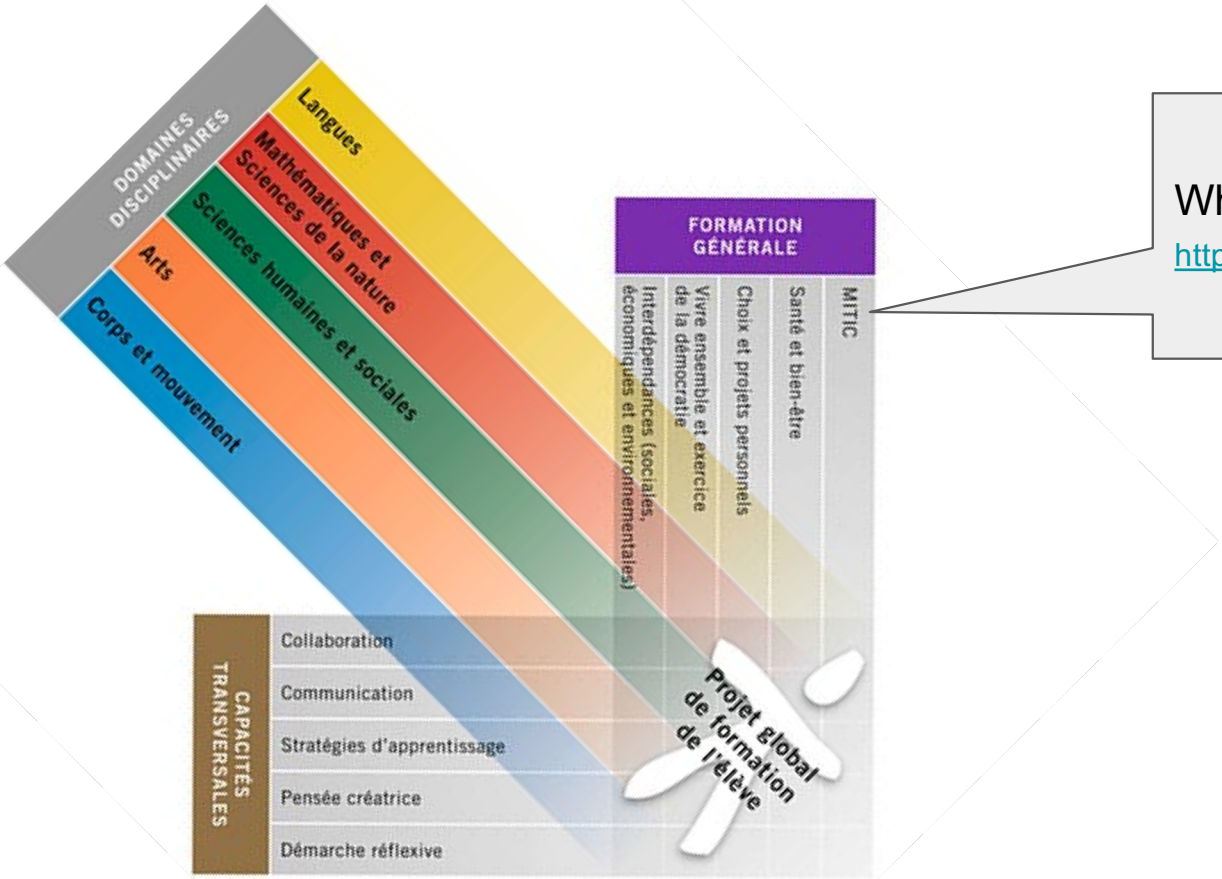


Harmonization of the 8 french speaking cantons adopted in 2010

MITIC (médias, image, technologies de l'information et de la communication)



ICT in the French-speaking curriculum (PER)

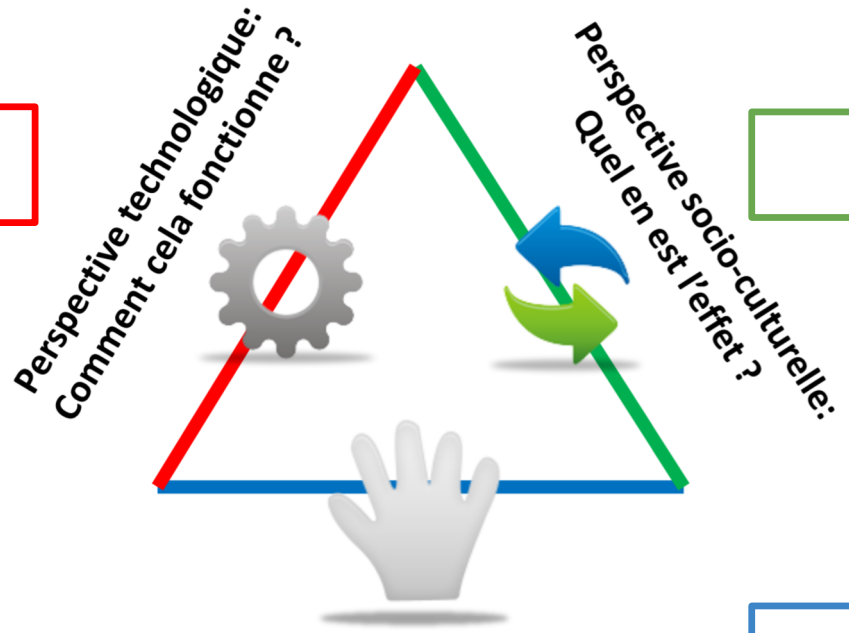


What is it about ?

https://www.plandetudes.ch/per

Impact of the CS introduction into the curriculum

Science informatique



citoyenneté numérique

Intégration numérique

"Triangle de Dagstuhl", adaptation de B. Döbeli, PHSZ

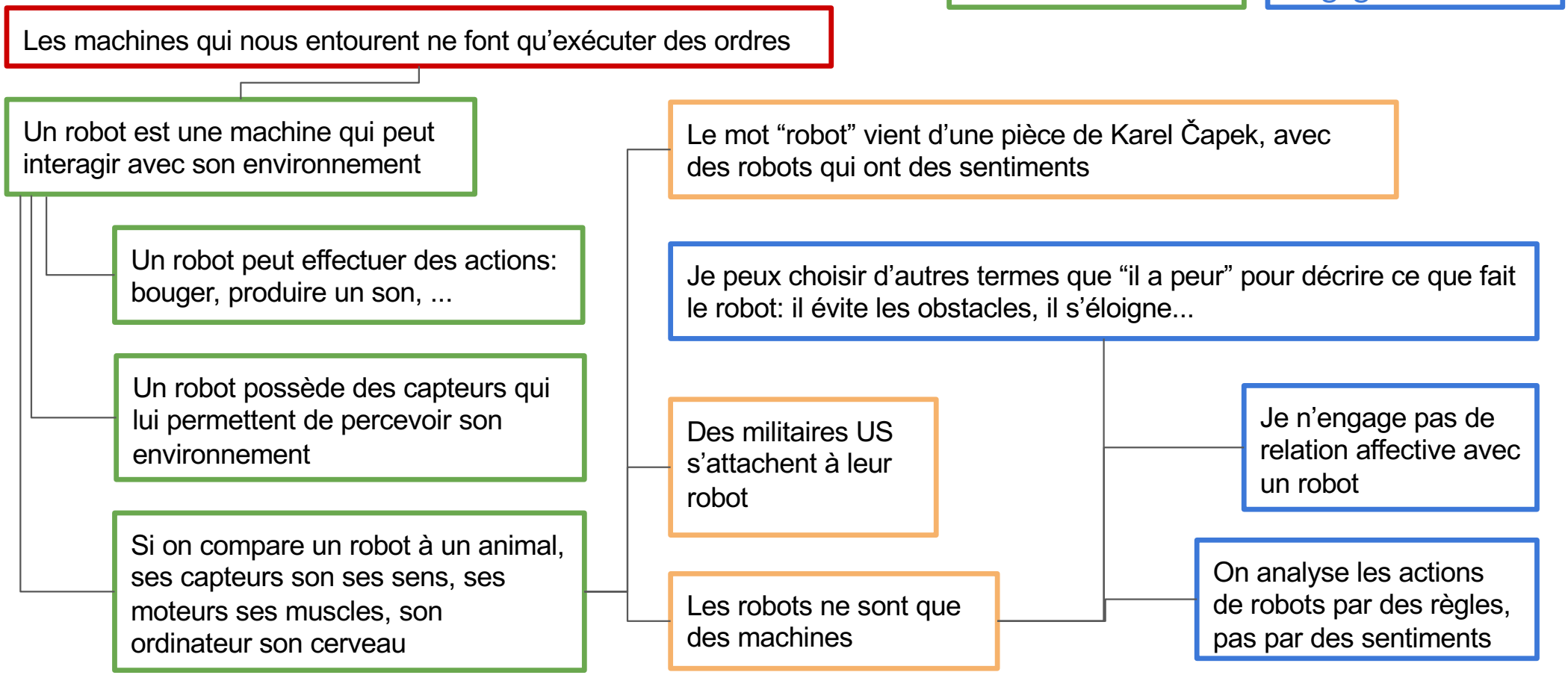
Concept Mapping Approach

Machines

Compréhension

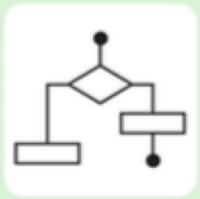
Robots

Engagement

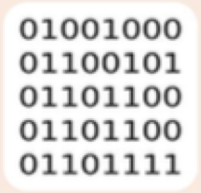


Au cœur de la science informatique

Acquisition de **connaissances scientifiques** donnant accès à la compréhension du fonctionnement du monde de l'information



Algorithmique et programmation



Information et données

Machines, systèmes informatiques et réseaux

Pensée informatique

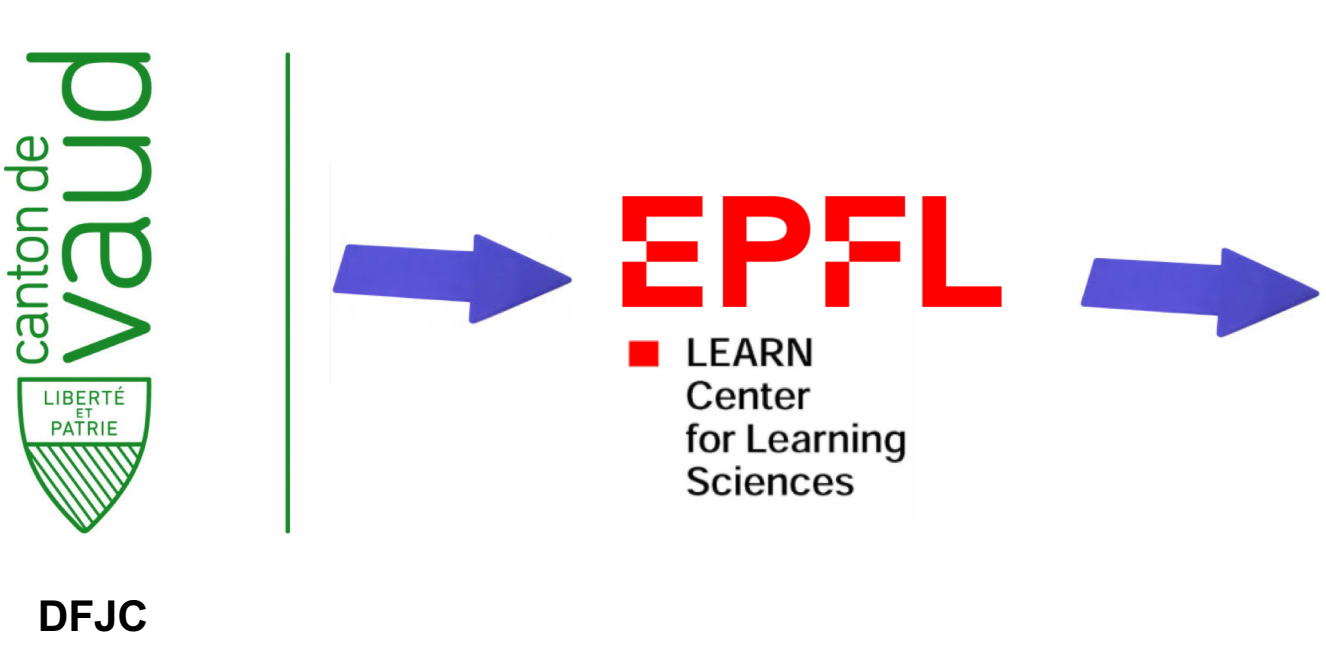
Développement d'un savoir-faire, de méthodes et de stratégies de **résolution de problèmes**

Informatique et société

Capacité d'élaborer, avec un **éclairage scientifique**, un discours instruit concernant le rôle et les enjeux des technologies à l'intérieur de **problématiques sociétales**

2. Key features of actors and stakeholders taking part to the development of educational robotics.

Key features of actors and stakeholders taking part to the development of ER in canton de Vaud :



DFJC

- **Directions des écoles**
- **Communes**

Progress of the pilot phase

Year 1 - 2018/2019

- Cycle 1 (4-7 old)
  - Creation of teaching contents Cycle 1 in computer science (CSUnppluged, 123 Codez from MAP Fondation, Pixees Inria resources, Thymio resources).
  - Training of Cycle 1 teachers in computer science with the activities created.
  - Creation of the Teacher's Manual Cycle 1 Computer Science with pedagogical activities :
    - Scientific lighting
    - Educational lighting
    - Turnkey scenarios (guided use)
    - Thematic activity folders (free use)

Progress of the pilot phase

Year 2 - 2019/2020

- Cycle 1 bis
  - Training of Cycle 1 teachers in computer science, digital tools integration and digital citizenship.
  - Finalization of the Cycle 1 Teacher's Manual Computer Science (300 pages)

- Cycle 2 (8-11 old)
  - Cycle 2 teacher training in computer science.
  - Creation of teaching contents Cycle 2 in computer science.
  - Creation of the Cycle 2 Computer Science teacher's manual.

- Realization of a distance learning device for teachers of Cycles 1 and 2
  (inspired by Classcode, created in France to produce and deploy a massive open blended learning course for professionals of education (and everyone) in teaching Computational Thinking to children).

Progress of the pilot phase

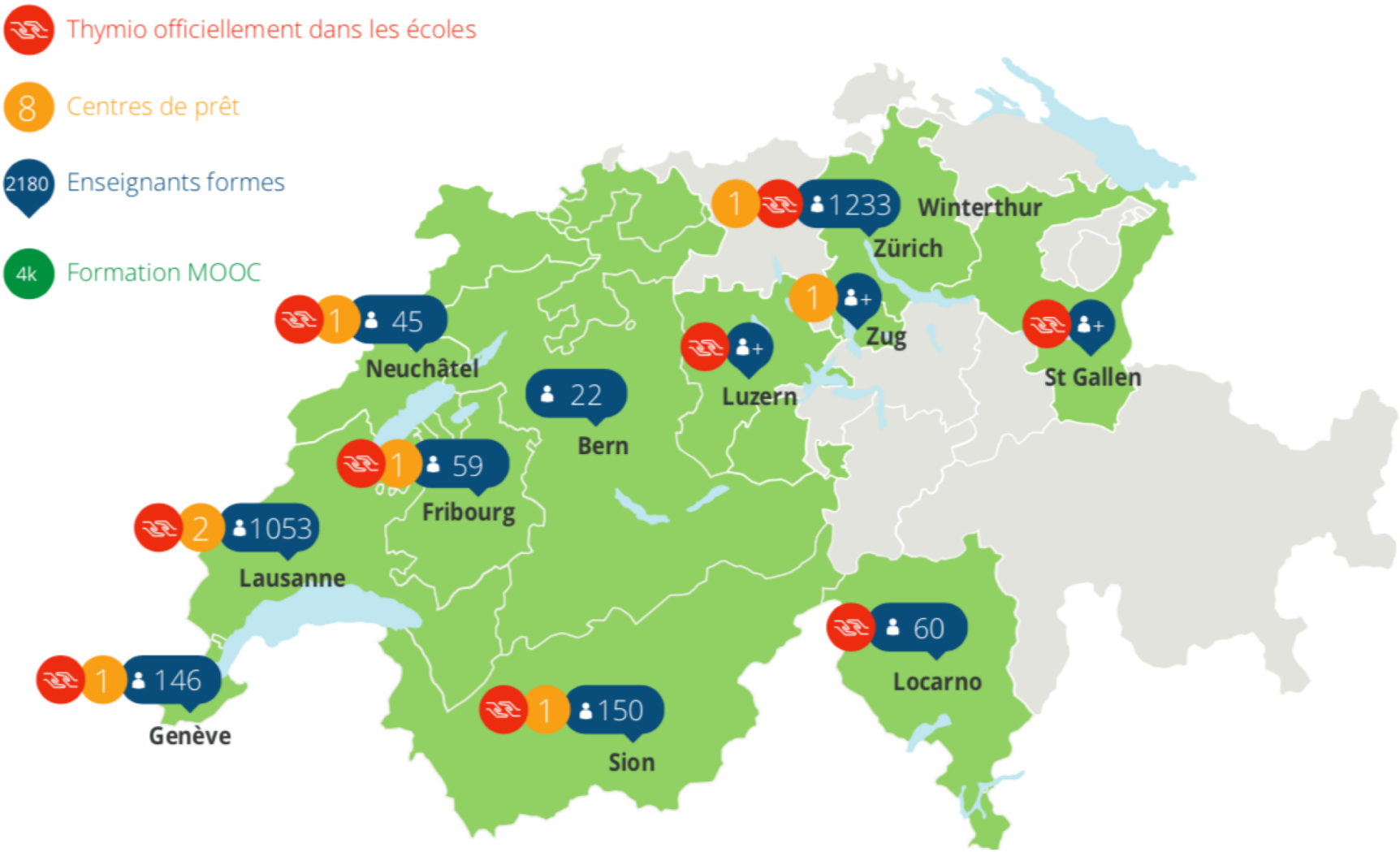
Year 3 - 2020/2021

- Cycle 1 deployment
  - Use of the Cycle 1 Teacher's Manual Computer Science.
  - Finalization of the Cycle 1 Teacher's Manual Computer Science (300 pages)

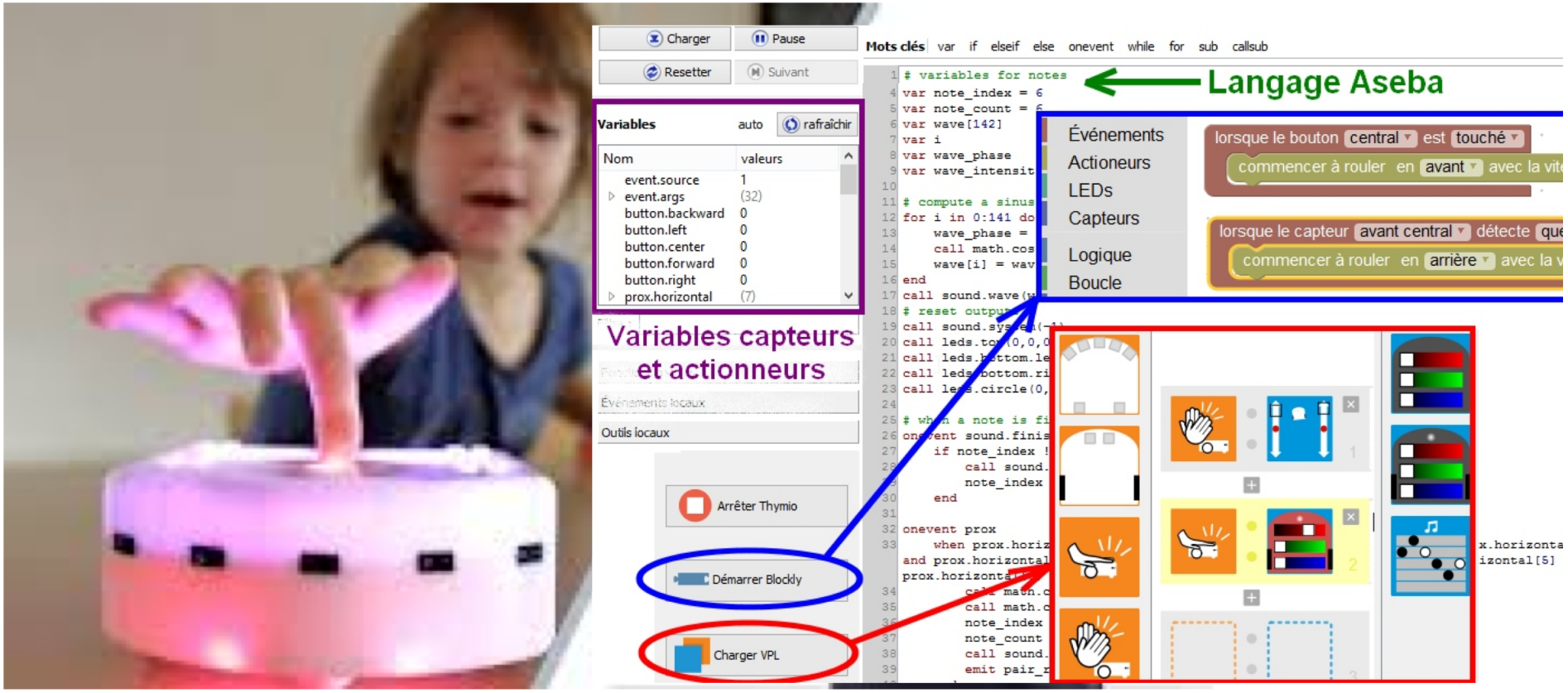
- Cycle 2 bis
  - Training of Cycle 2 teachers in computer science, digital tools integration and digital citizenship.
  - Finalization of the Cycle 2 Teacher's Manual Computer Science

3. Relevant examples of uses of robots for education and specifically for STEAM education in Switzerland.

Overview of the situation throughout Switzerland

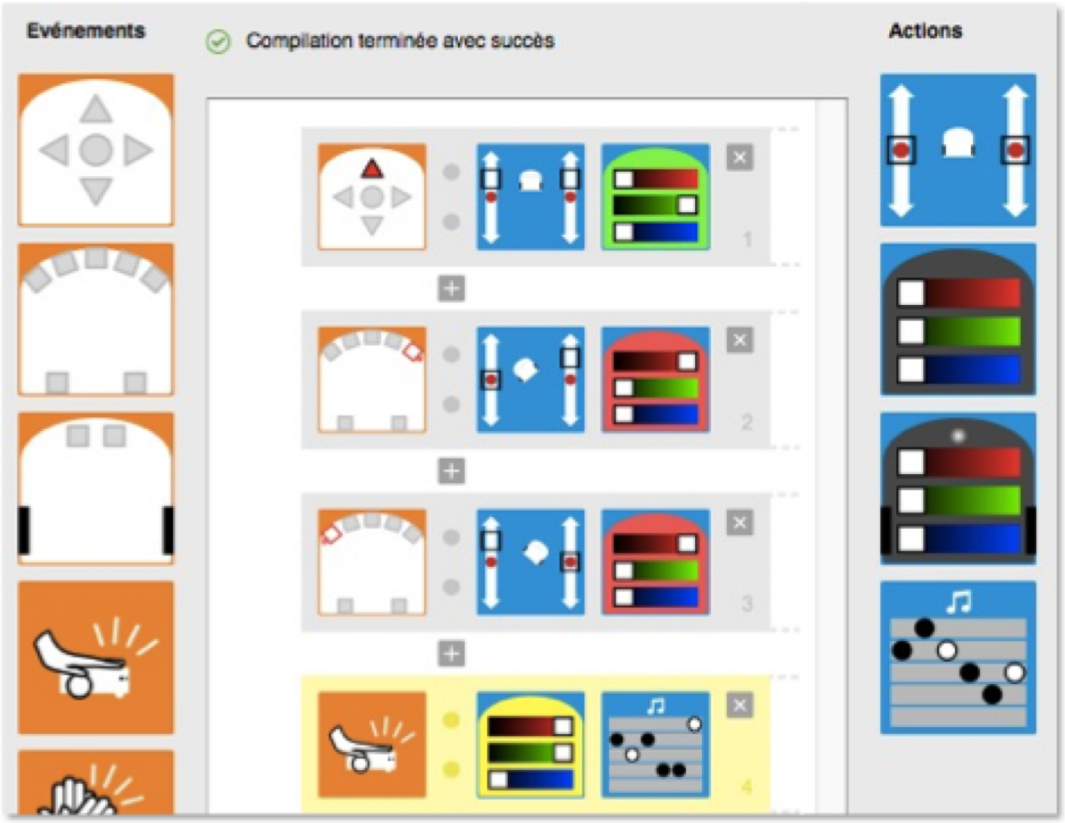


A robotic platform (Thymio robot + different programming languages)



A MOOC platform (EdX + FUN)

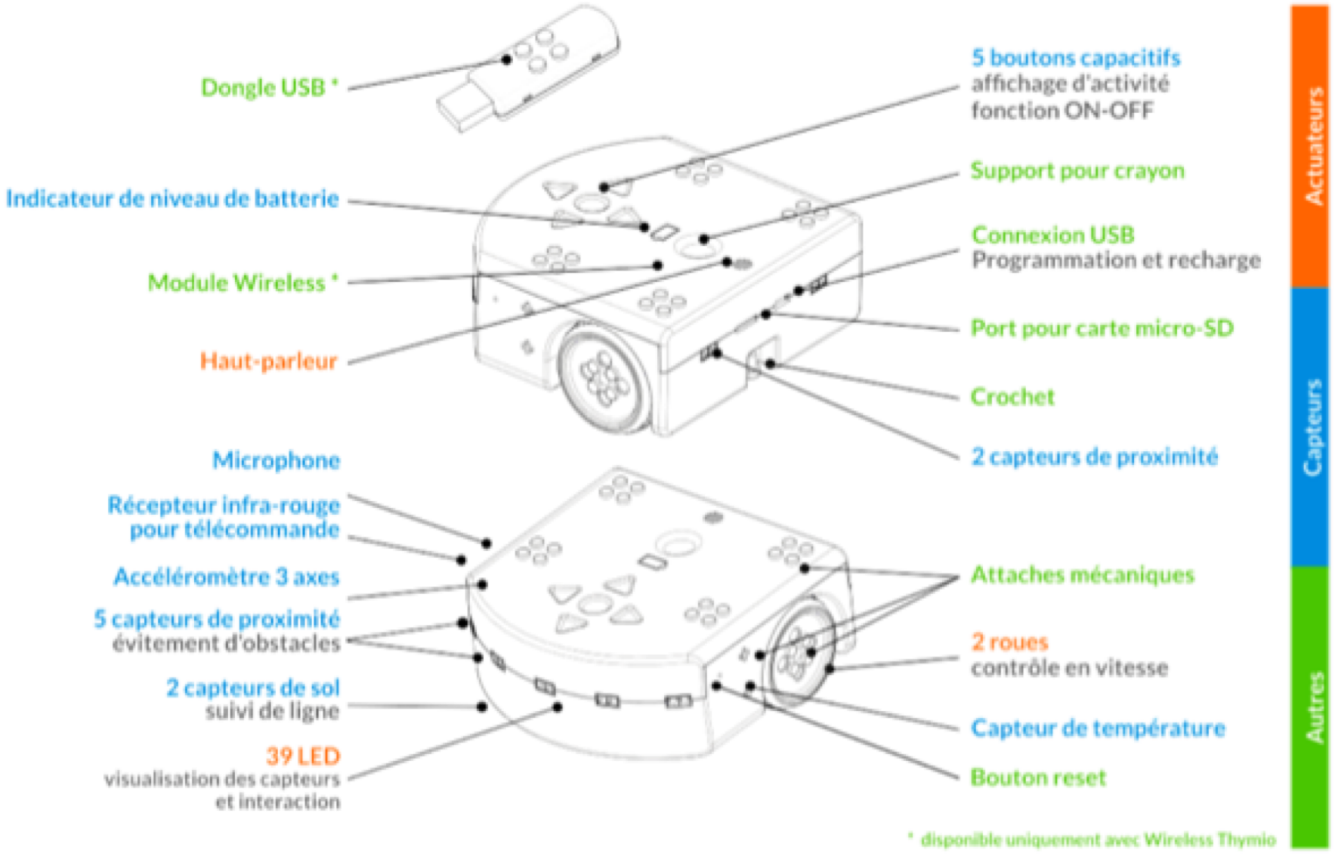
Activités avec le robot Thymio



Le robot Thymio

Thymio II
Robot open source, EPFL, ECAL
MOBSYA

Francesco Mondada
Professeur de robotique, EPFL



A robotic teachers community (roteco.ch)

with many resources :

Collaborative mission to foster CT:

Escape Game of C. Giang

R2T2 mission

Unplugged activities with Square Project (https://wap.rocks/)

Project Square

Project Square is an example of a future-oriented application of the science of play and learning. It is an open education initiative that makes it easy and fun for educators to bring computational thinking into the classroom, beyond the screens. Developed in an interdisciplinary setting by designers, researchers, entrepreneurs and educators, it is based on frameworks and research evidence from the science of learning. An inclusive and engaging 21st century learning experience by design, it empowers teachers and students to become educreators and actors of change in the classroom.

4. Consequences on professional training, teacher posture, pedagogical practices, classroom organization, curricula and acquisition of competencies (in particular 21st century competencies & skills).

Robotics in the new teaching of CS in the “Canton de Vaud”

Cycle 1a (4-5 old)

- Robot game (unplugged)
- Discovery of an automaton : Beebot, bluebot
- Discovery of a robot : Thymio with pre-programmed modes

Cycle 1b (6-7 old)

- Programming an automaton: Beebot, Bluebot
- Simple programming of a robot : Thymio with VPL (Visual Programming Language)

Robotics in the new teaching of CS in the “Canton de Vaud”

Cycle 2a (8-9 old)

- Programming Thymio with the VPL language
- Discovery of conditional instructions : Square unplugged activities

Cycle 2b (10-11 old)

- Programming Thymio with the Scratch 3.0 language
- Creation and programming in Scratch 3.0 of a robotic object (based on Arduino board or Raspberry PI)

Cycle 3 (12-14 old)

- Programming Thymio with Scratch 3.0 or Python.
- Under consideration: construction and programming of Poppy Ergo Jr, 3d printed robotic arm with Scratch 3.0 or Python.