



# 21ST CENTURY SKILLS AND INNOVATION PEDAGOGY

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University of Nairobi, Kenya

# 21ST CENTURY SKILLS AND INNOVATION PEDAGOGY

BUILDING A CULTURE OF COLLABORATION

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# KENYAN BASIC EDUCATION CURRICULUM FRAMEWORK (2016) FOR BASIC EDUCATION – COMPETENCY-BASED APPROACH (CBA)

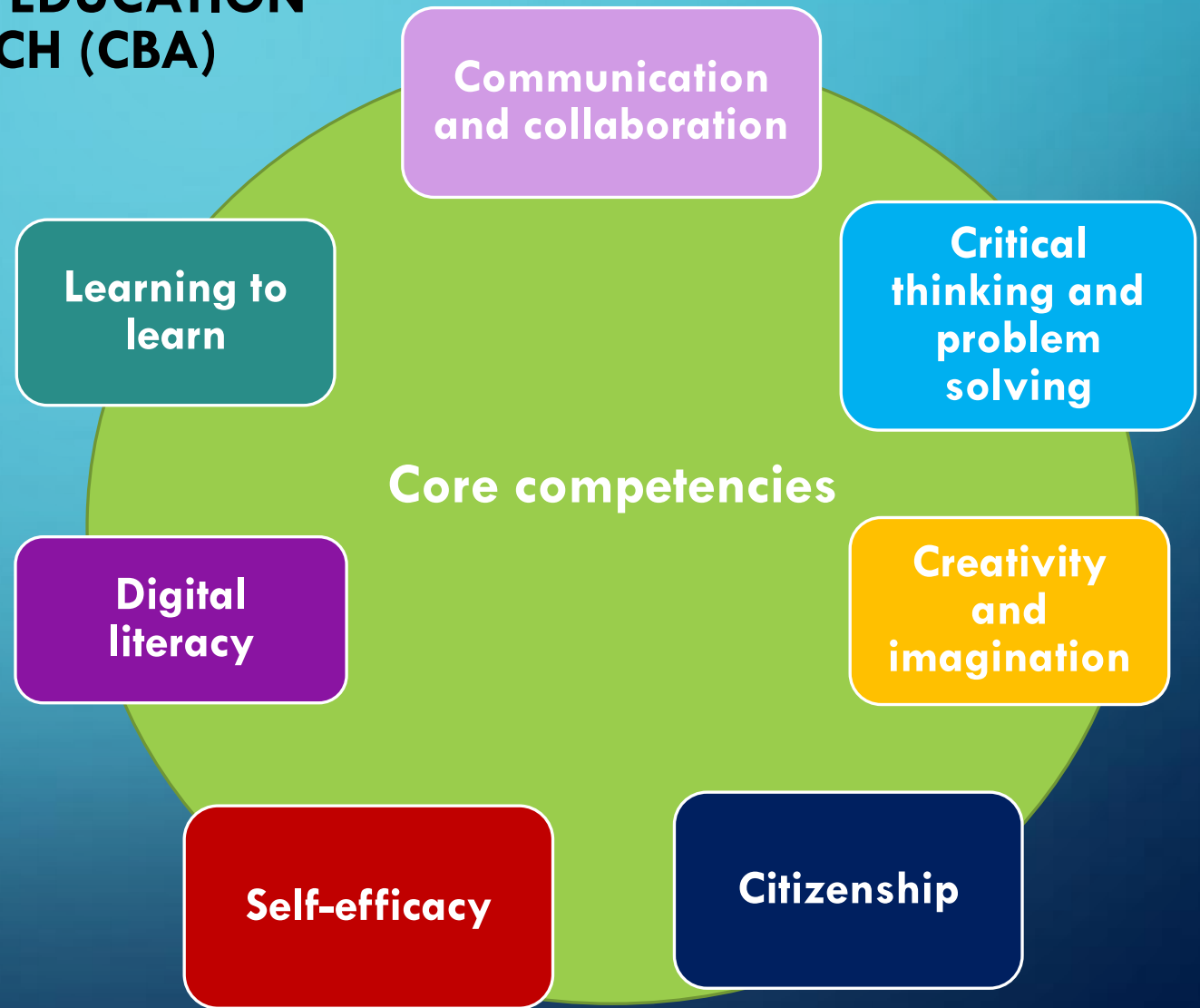
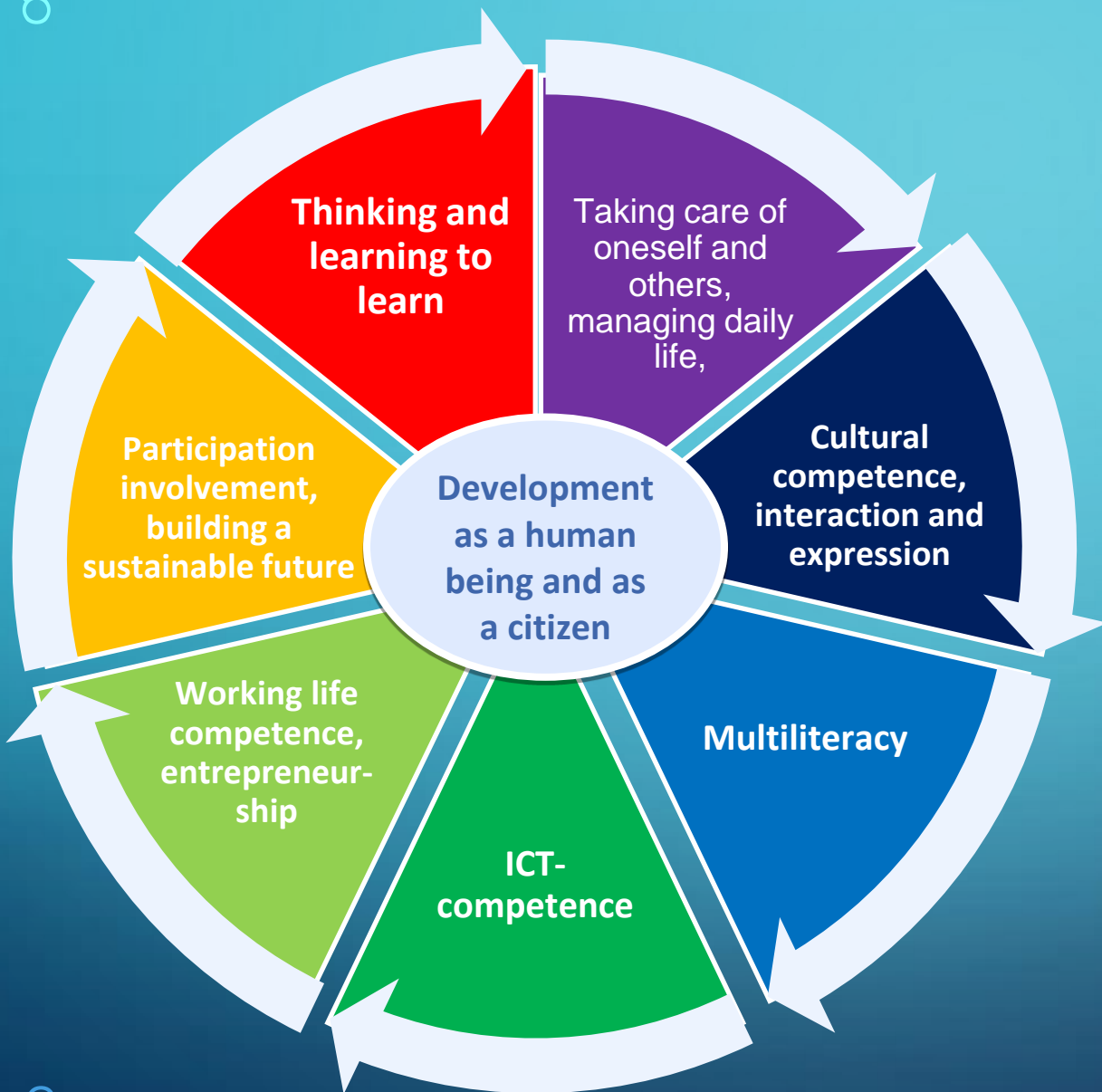


Figure 2.



## FINNISH NATIONAL CORE CURRICULUM

- National goals for basic education and transversal competences
  - knowledge
  - skills
  - values
  - attitudes
  - will

Figure 3

IRMELI HALINEN

# Learning skills in 4Cs

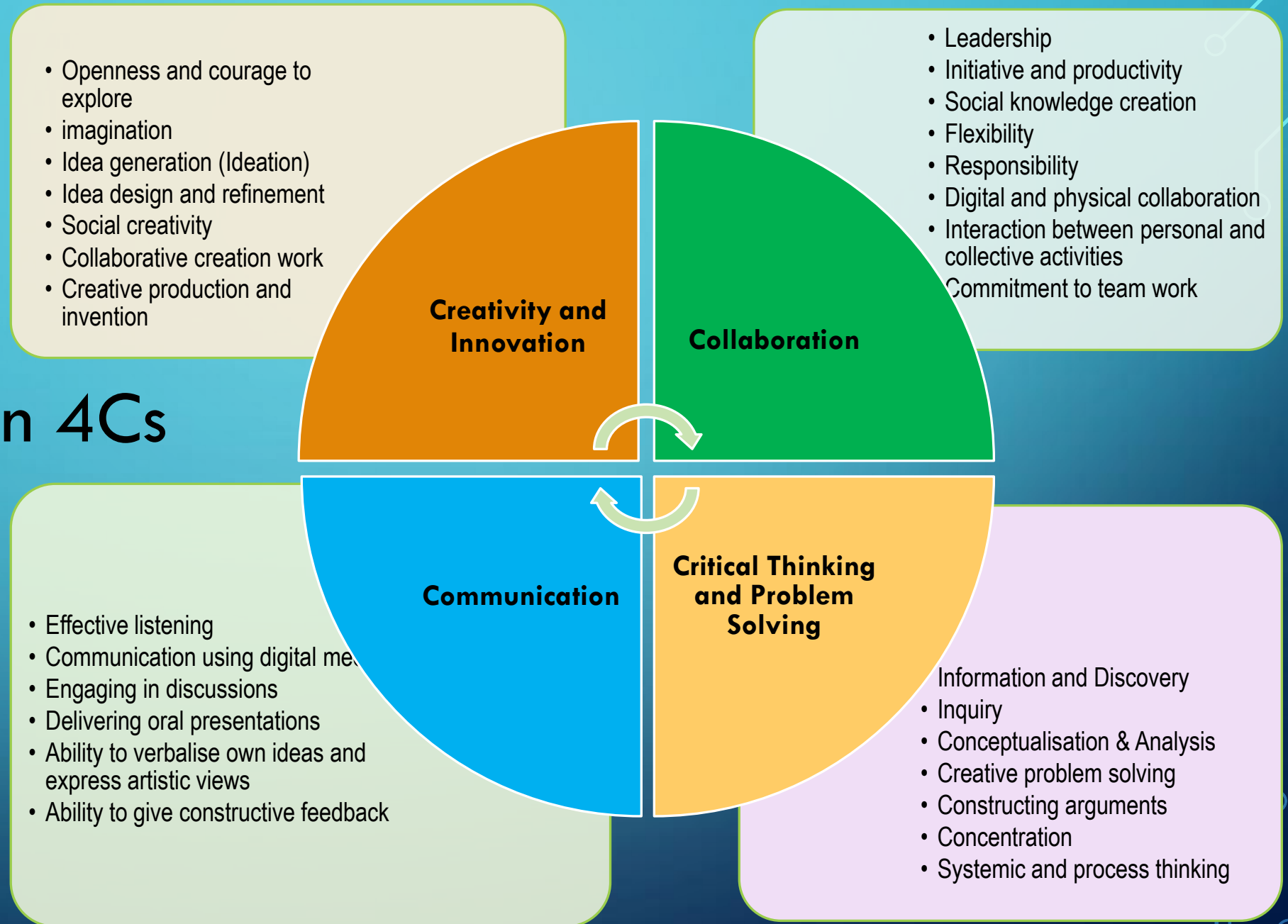


Figure 4.

# CO-CREATING AND CO-LEARNING

COLLABORATION, CREATIVITY AND INNOVATION

Collaboration,  
Creativity and  
innovation

# INNOVATION PEDAGOGY AND LEARNING IN THE DIGITAL ERA

- Innovation pedagogy offers place for students to learn extensive skills through multi-discipline design processes
- Kind of processes fit to varied scientific, technological, engineering, artistic, and mathematical entities (STEM / STEAM)
- Developing skills particularly required in 21st century changing society and labor market.

(e.g. Korhonen & Kangas, 2020; Korhonen et al., 2020; Karppinen, 2018; Kallunki et al., 2017; Kennedy & Odell, 2014)



Collaboration,  
Creativity and  
innovation

# INTERDISCIPLINARY LEARNING - STEM, STEAM, STREAM

- STEM / STEAM curriculum and schools
- STEM / STEAM projects and learning
- STREAM projects and learning



Collaboration,  
Creativity and  
innovation

# COUNTRIES STRONG IN STEM

(Marginson et al., 2013)

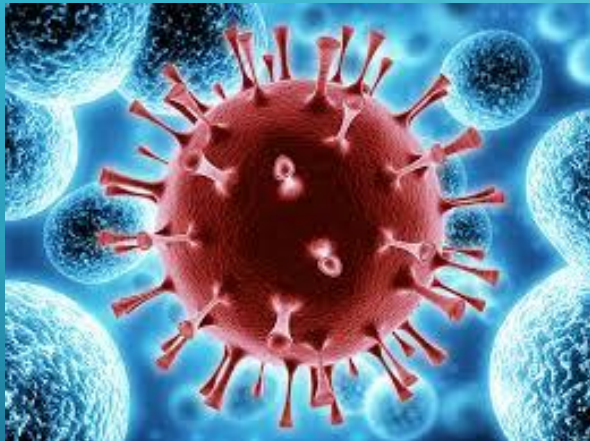
Certain features recur in common:

- 1) School teachers enjoy high esteem, are better paid and work within more meritocratic career structures than found elsewhere.
- 2) These countries have an unbreakable commitment to disciplinary contents.
- 3) The most successful countries have instituted active programs of reform in curriculum and pedagogy that are focused on making science and mathematics more engaging and practical, through problem-based and inquiry-based learning, student-centred approaches, and emphases on creativity and critical thinking. STEM / STEAM / STREAM
- 4) Many of these countries have developed innovative policies to lift STEM participation among formerly excluded groups. E.g. Finland's focus on low achieving students has been mentioned.

Collaboration,  
Creativity and  
innovation

# EXAMPLE: EFFECTS OF CURRENT COVID-19 SITUATION

(Okhee & Campbell, 2020)



<https://www.cslobehring.fi/lehdistotiedotteet/2020/covid-19-update>

- What Science and STEM Teachers Can Learn from COVID-19 ?
- Engaging K-12 students in complex societal problems like the pandemic
- Instructional framework that emerged out of the real-time responses of STEM professionals to explain the pandemic and find solutions.
- As a result the project made STEM subjects fascinating

Collaboration,  
Creativity and  
innovation

# BEYOND STEAM DISCIPLINES – INTERDISCIPLINARY LEARNING

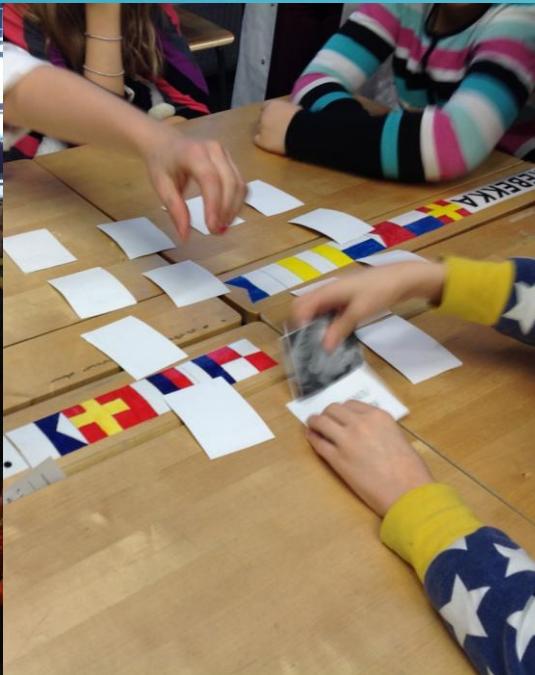
- An interdisciplinary approach refers not only to learning themes across disciplines, but refers to their relationship with the real world and an understanding of connections.
- As early as the 1840s William Whewell introduced a concept of consilience, which means the “linking of facts and fact-based theory across disciplines to create a common groundwork of explanation,” i.e., to find what they share in common and then create a complete picture (Wilson 1999)
- Today’s making-based pedagogy lays much emphasis on John Dewey’s “learning by doing” and Seymour Papert’s “learning by making” practices and underlines collaboration, project-based and inquiry-driven education, especially in the STEAM disciplines, but as well, creating collaboration between varied disciplines.
- E.g. maker spaces like the FabLearn labs (Stanford University, U.S.A.), Co4-Labs (University of Helsinki, Finland) and Innokas-Network (Finland) support development of socio-digital invention pedagogy in schools and school-university cooperation.



Collaboration and  
Creativity

# PEDAGOGICAL ENERGY GAME

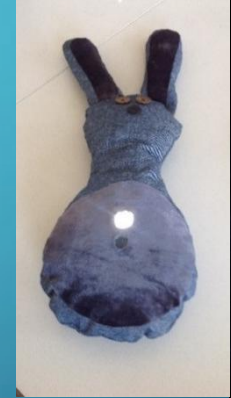
- interdisciplinary collaboration between University and elementary school and between primary student teachers and 4<sup>th</sup> grade students (10 year olds).
- Discipline-based integration of physics, drama and crafts



Collaboration,  
Creativity and  
innovation

# INVENTION PEDAGOGY AND MAKING IN FINNISH SCHOOL

- Invention pedagogy is guiding to explore and jointly develop new invention.
- Aim is that students will find an inventor and explorer mindset, willingness to create and experiment together and share knowledge and skills.
- Students are encourage to ideation, see inventions around in society, design, implement own inventions and utilize technology around them
- Students will gain commitment to team work and share responsibility of work and working process.
- STEM/STEAM and Robotics
- Technology enhanced learning, i.e. using mobile devices and web-based platforms for learning (e.g. [EdVisto](https://edvisto.com/) (<https://edvisto.com/>), FUSE Studio,
- Coding, 3d-printing, laser-cutter.....



(e.g. Seitamaa-Hakkarainen et al., 2010; Korhonen et al., 2020; Karppinen, 2018; Buechley 2014)

# CO-TEACHING AND CO-LEARNING

COLLABORATION

# COLLABORATION BETWEEN TEACHERS

## Collaboration in school

- What makes collaboration beneficial?
- Teaching is no longer the isolating profession it once was. In today's schools, success is reliant on teachers working with school leaders, their peers, parents and the wider community to create the best possible learning experiences for their students.
- OECD's own findings show that teacher collaboration has a positive impact on aspects of both teacher well-being and self-confidence.





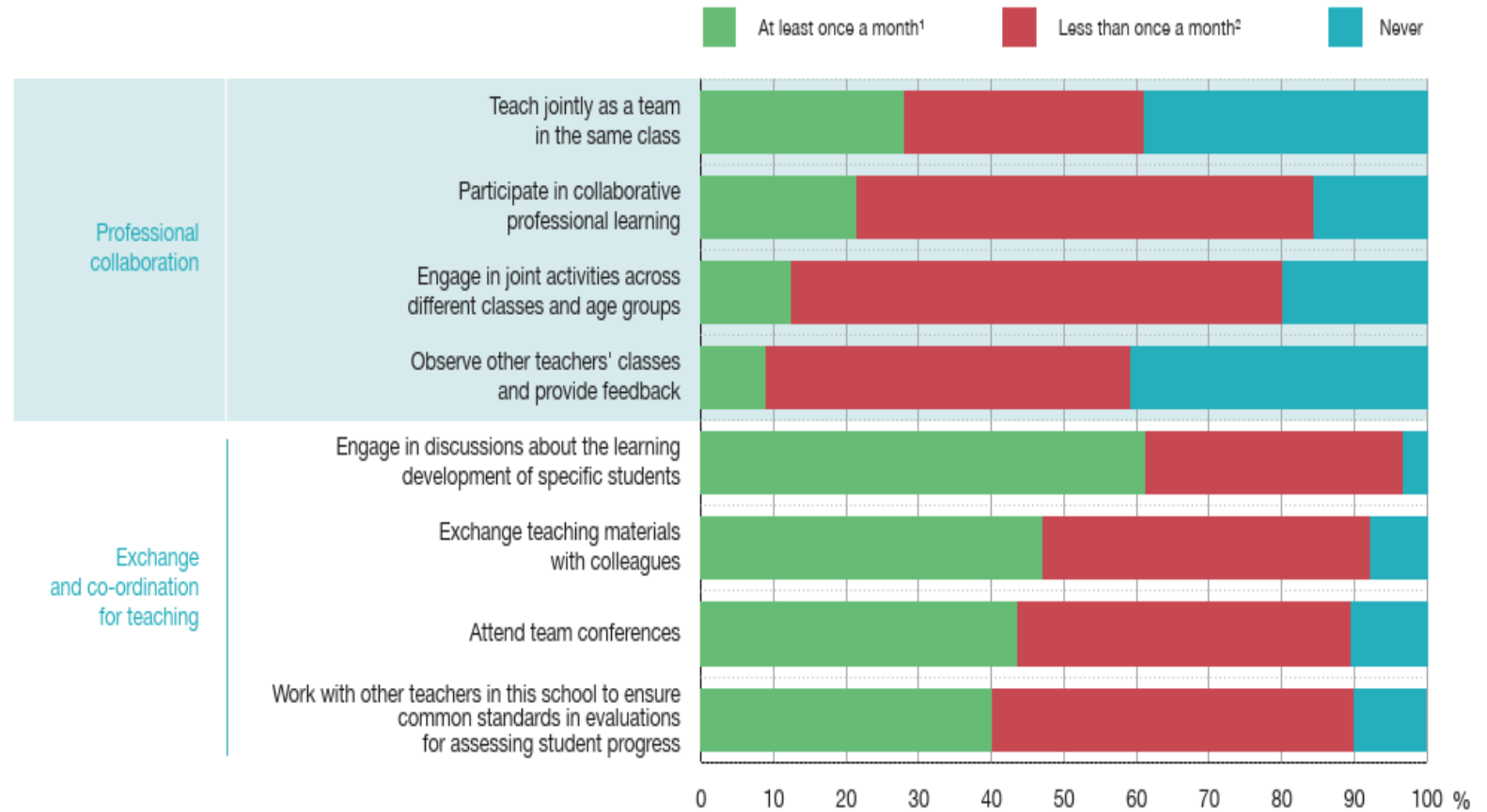
## Collaboration

# Teachers' collaboration with colleagues

Figure 5.

## Figure 6. Teachers' collaboration with colleagues

Percentage of lower secondary teachers who report engaging in the following collaborative activities in their school with the following frequency (OECD average-31)



<sup>1</sup> "At least once a month" covers the following response options: "1-3 times a month", "Once a week or more".

<sup>2</sup> "Less than once a month" covers the following response options: "Once a year or less", "2-4 times a year", "5-10 times a year".

Values are grouped by type of collaborative activity and, within each group, ranked in descending order of the collaborative activities in which lower secondary teachers report to engage at least once month.

Source: OECD, TALIS 2018 Database, Table II.4.1.

Collaboration

# CO-TEACHING

- Co-teaching - innovative forms of 21st century teaching
- The aim of co-teaching is to turn the learning environment (e.g. school) into an inspiring learning community, where teachers can also learn.
- Multidisciplinary learning modules (example from Finland)
- Students teaching teachers and lecturers (example from Finland)

# CONCLUSION

- Innovation and invention pedagogy, where making, creativity, sharing, invention, and imagination are at the focus, in the best cases, may increase students' motivation in doing school work and enhance school satisfaction.
- Bringing making culture and innovation pedagogy into schools could also be a response to a phenomenon that students lack an interest in science education.
- Moreover, student-centered self-piloting and lateral learning, as opposed to a top-down model, is a much more authentic representation of how learning happens in everyday life.
- Invention driven creation may keep on curious mindset and initiates students for new innovative processes.

**THANK YOU !**

