STEAM in Rajakylä in theory and practice - Full STEAM day 13.2.2026

Essi Vuopala, PhD., assistant principal
Hanna Ontero, assistant manager
Lauri Nurmivuori, classroom teacher (technology-oriented class)
Jesse Jussila, classroom teacher (technology-oriented class)

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Outline of today

9.00 Welcome + introductions

9.15 About Rajakylä school/ Hanna

9.30 Walk around the school

10.00 STEAM-pedagogy/ Essi

10.30 Gamification and AI/ Lauri & Jesse

11.00 School lunch

11.30 Showcase: Robotic battle

12.00 Workshops

Workshop 1: Learning via making/ Essi

Workshop 2: Teachable machine/ Jesse

Workshop 3: Microbit/ Lauri

14.00 Afternoon coffee + Joint discussion and hometake message/ Essi, Lauri, Jesse

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Introductions

Who are you? What do you expect from this visit?

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About Rajakylä school

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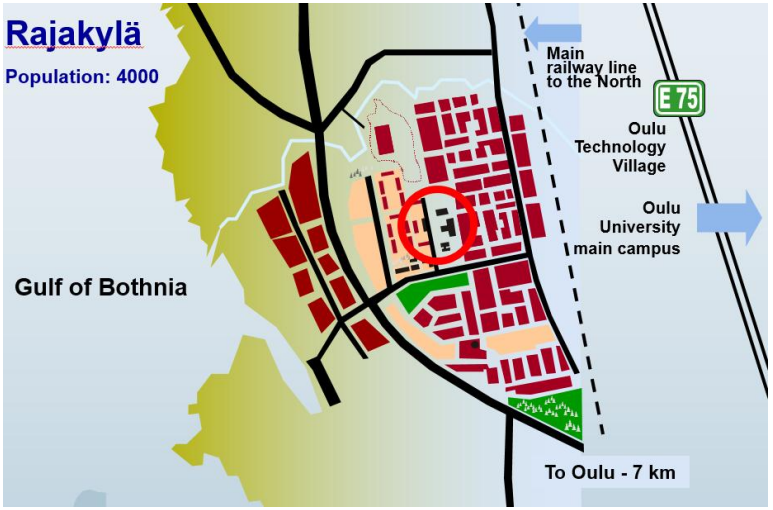
Rajakylä School

- School was build in 1977
- Located 7km north from the city center
- 610 students: grades 1-9
- 5 music classes
- 4 technology classes
- 5 special education classes
- 2 preparatory classes
- STEAM-education for all students



[Short video about our school]

[Technology Education Class | rajakylätekno (wordpress.com)]

Our pedagogical emphasis areas

- Wellbeing in Rajakylä school
- STEAM pedagogy (collaboration with the University of Oulu)
- Internationality (Erasmus accreditation 2023-2028)

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Transversal skills:
- Collaboration and interaction
- Regulation of learning
- Problem solving

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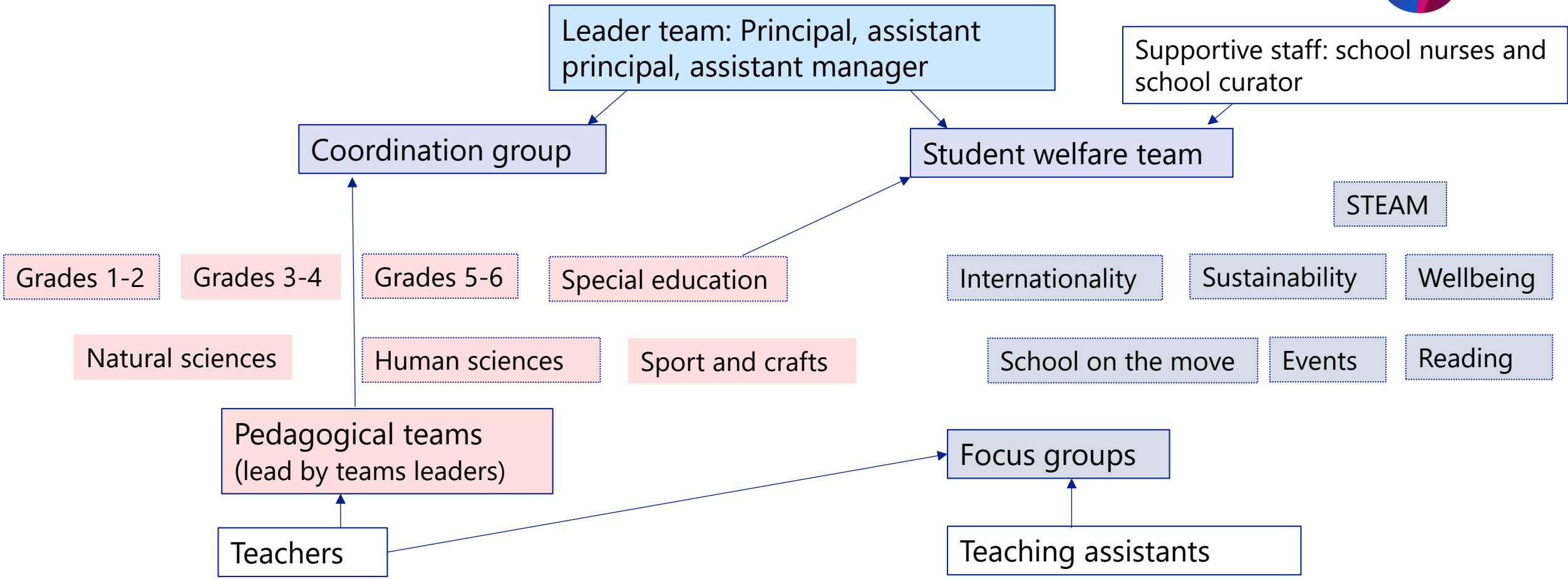
Organization structure of our school



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STEAM-pedagogical framework

Science, Technology, Engineering, Arts, Math

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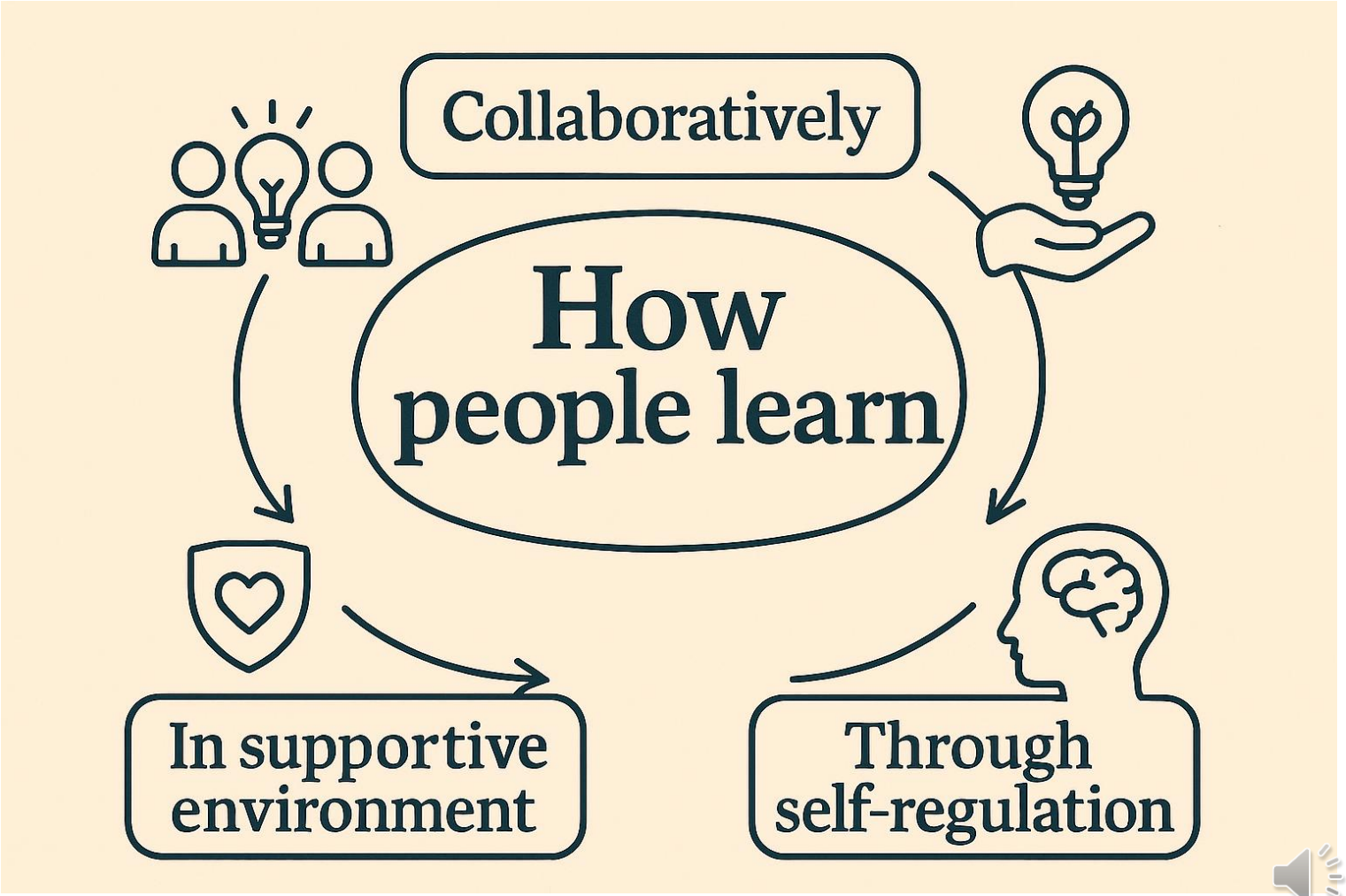
Definition

STEAM instruction has been conceptualized as foregrounding the **problem** to be solved by using (1) **project-based learning**; (2) **technology** to some extent for creativity and design; (3) **inquiry** approaches, allowing multiple paths to solve a problem; (4) science, technology, engineering, arts/humanities, and math as required by the problem; and (5) **collaborative learning** and problem solving (Herro and Quigley 2016; Vuopala, 2022), (6) **regulation of learning** (Järvelä & al., 2021; Vuopala & al., 2021) and (7) **entrepreneurial attitude and competences** to recognize the strengths of the outcomes.

STEAM pedagogy is a way of studying science and mathematics in a creative way with various technologies and based on collaborative problem-solving



Problems that can't be solved alone

Complex problems need multiple expertise areas

STEAM enhances collaboration and regulation of learning

Student-centered projects need constant regulation of

Cognition

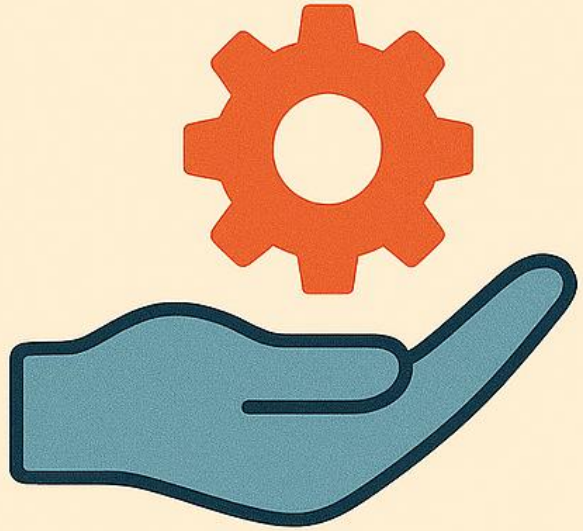
Metacogninition

Motivation

Self-and shared regulation is required

However...

Collaboration and regulation are not spontaneous processes. They need to be supported.



Collaboration starts by practicing co-operation, i.e. task division and joint goal setting with a peer.

Essential collaboration skills like active listening, argumentation and giving constructive feedback canbe trained first separately e.g. with prompts, sentence openers or modelling.

active listening

argumentation

giving constructive feedback

Also regulation of learning needs external support first.

Questions like

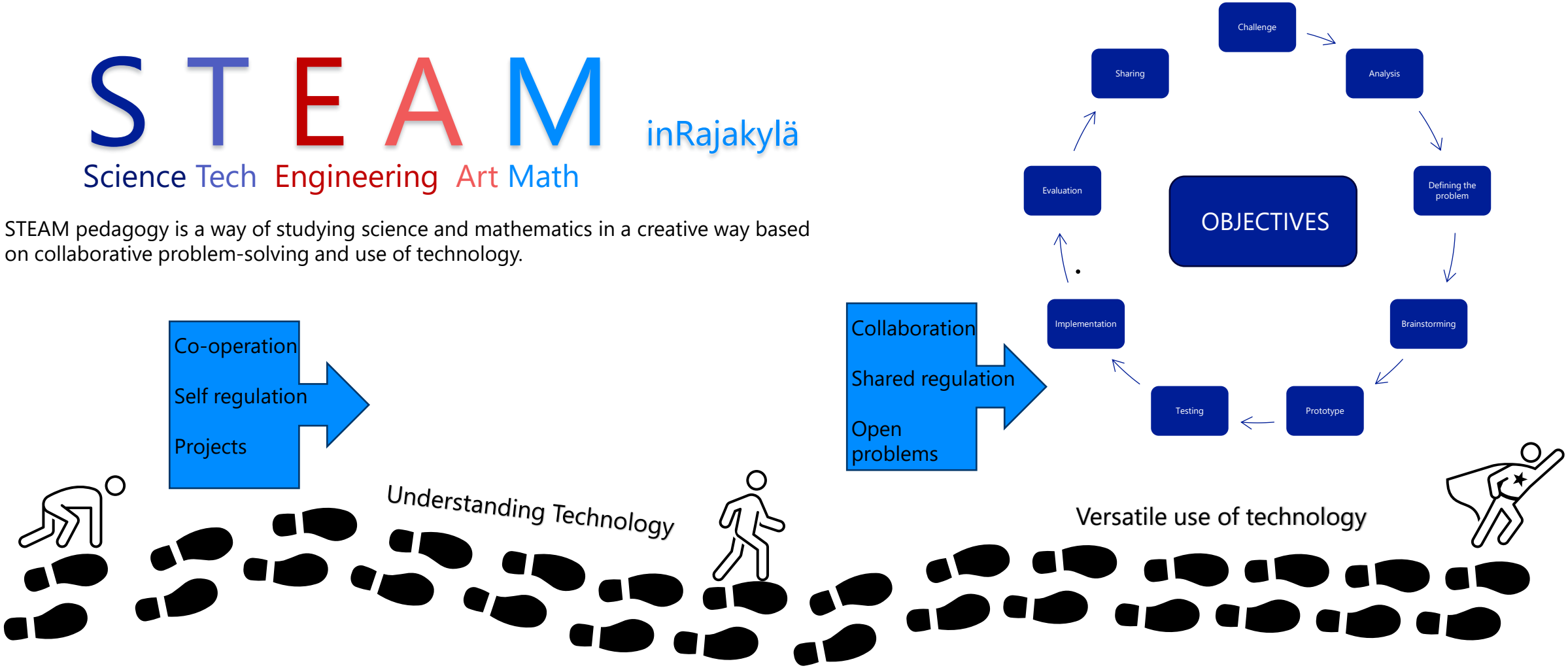
(planning) (monitoring) (assessing)

are examples of prompts supporting regulation.

STEAM inRajakylä

Science Tech Engineering Art Math

STEAM pedagogy is a way of studying science and mathematics in a creative way based on collaborative problem-solving and use of technology.



Objectives
-Content (STEAM)
-Learning skills: Collaborative learning, regulation of learning and problem-solving
-Technology: Coding and robotics, multimedia, maker learning and digital manufacturing, and artificial intelligence

Evaluation
-Process: Collaboration, problem-solving, use of technology, regulation of learning and activities, resilience, making activities visible
-Output: Creativity, responsibility, quality
-Content

STEAM for students
- Multidisciplinary study modules
- STEAM Club
- STEAM breaks
- Events: e.g. ToolCamp
- University cooperation
- Mini-projects
- Erasmus-cources
- 'VIP-evenings'

Case examples

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Case 1: ’Safety buddy’

Technology education class, grade 4

Essi Vuopala

Pedagogical design

‘Every night, when I go to bed, I have hard times to fall asleep. When lying down alone in my bed scary thoughts come in my mind. What are those noises around me? Is there a ghost under my bed? Please help me to feel safe and fall peacefully in sleep.’

Thinking assistants:
What would xxx do to solve this problem?
(Pictures of Gyro gearloose, Garfield, alien, baby, old man, president of Finland)
Make individually a list of alternative solutions.

Draw a joint picture of the solution.

Gallery tour:
Put your prototype on the table.
Walk around the gallery and look each group’s prototype. Give constructive feedback to the paper bedice the prototype.

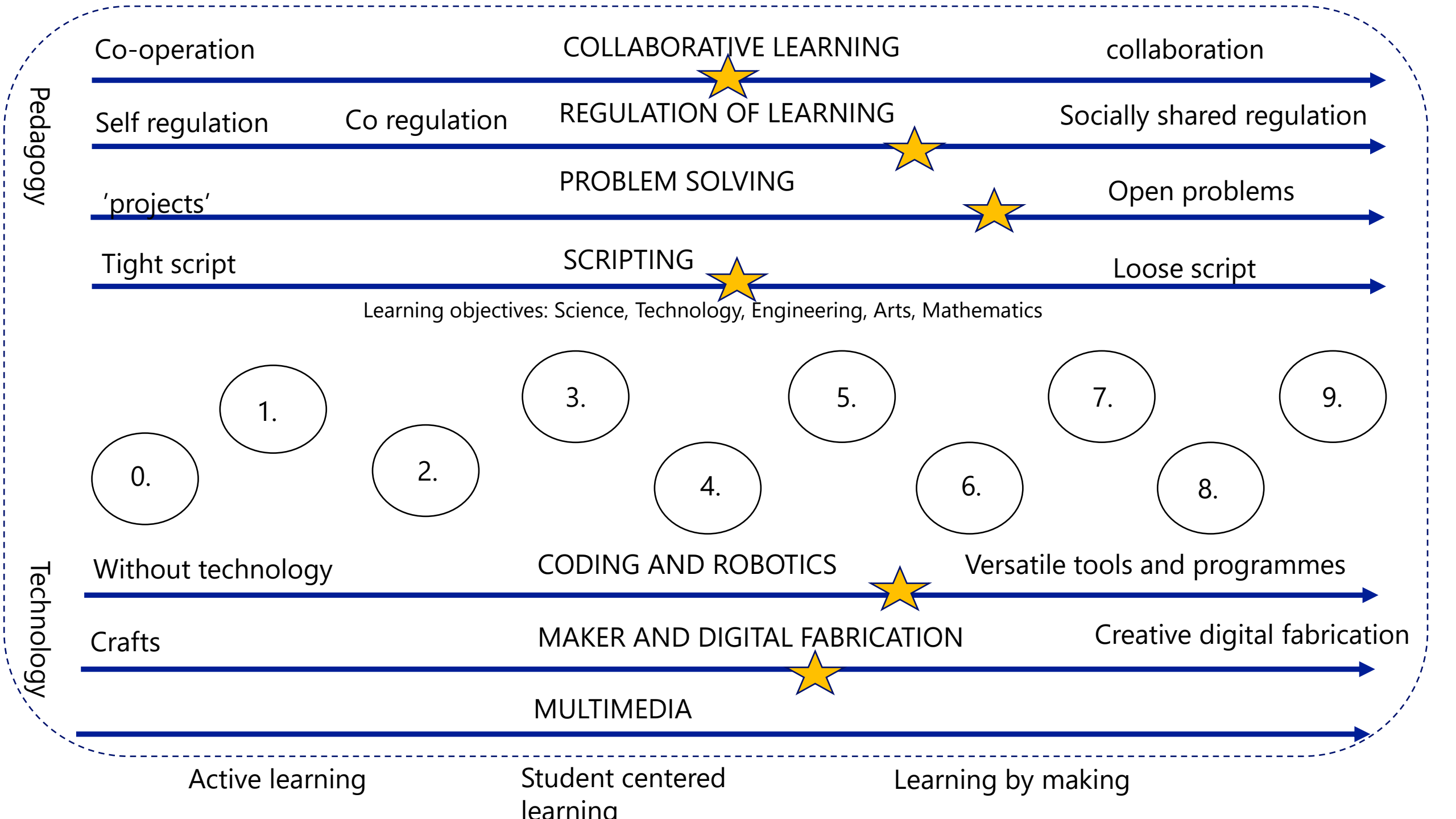
1. Challenge and client
2. Brainstorming solutions
3. Prototyping
4. Constructing, presenting and reflecting

Understanding the client:
Why Patu is afraid of?
What is he afraid of?
If his fears came true, what could happen?

Choosing three best ideas from your list, present them to th eothers in yuor small group.
Discuss and decide the final solution.

Building a prototype by using cardboard, paper, scissors, tape and glue.

Producing the ‘safety buddy’
Preparing a pitching talk
Presenting the product in ‘Shark’s tank’
Participating in reflection and evaluation discussion.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collaboration
Self regulation
Co regulation
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Socially shared regulation
'projects'
PROBLEM SOLVING
Open problems
Tight script
SCRIPTING
Loose script
Learning objectives: Science, Technology, Engineering, Arts, Mathematics
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Without technology
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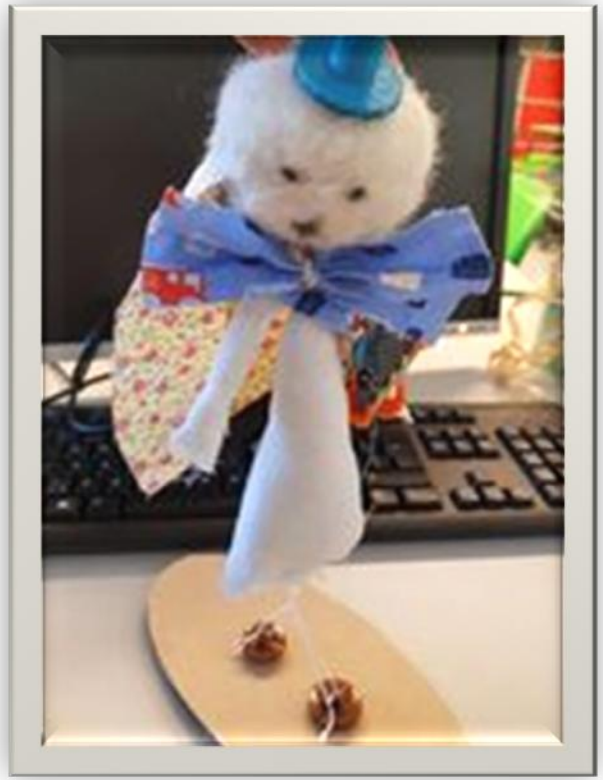
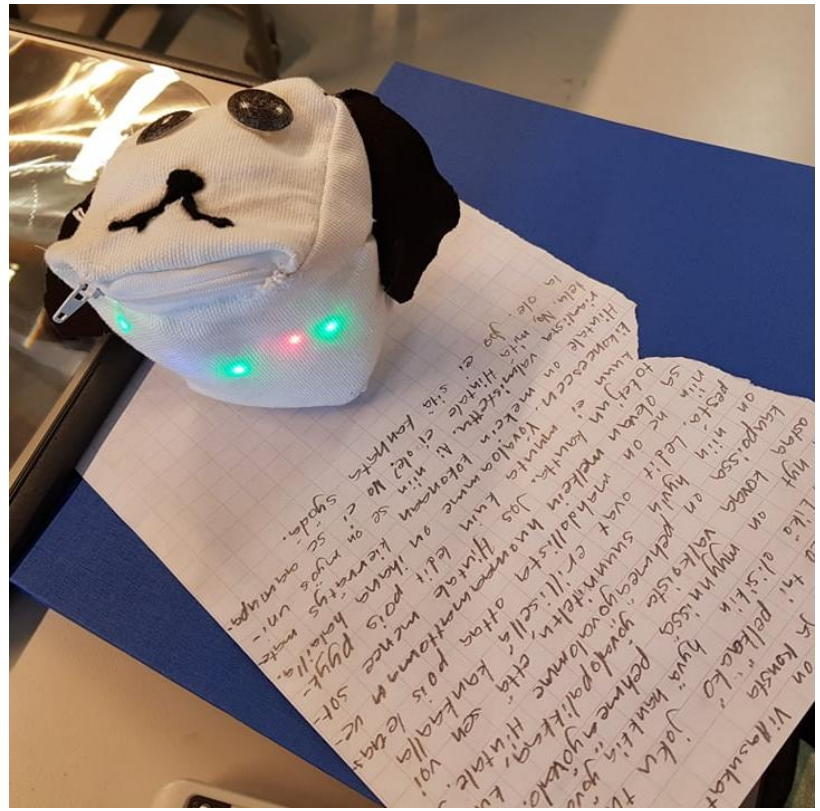
Creative digital fabrication
MULTIMEDIA
Active learning
Student centered learning
Learning by making





Case 2: ’Empowering forest’

Special education class, grades 3-5

Tiina Pyrrö, Sanni Kemppainen and Essi Vuopala

30 min

Orientation

Discussing about feelings (good and bad) and naming situation when you feel these feelings.

Discussing about situations when you need more 'power'

2 x 45 min

Narrative

Based on the previous discussion teachers write storyline.

Understanding the challenge

Describe the story in your own words: What kinds of feelings did the child experience? Why she/he felt these feelings? → Forming collaboratively the final challenge description.

Alternative solutions

In peers

Selecting the final solution.

2 x 45 min

Prototyping and peer feedback

4-6 x 45 min

Constructing the solution

2 x 45 min

Bringing solutions together → Empowering forest

2 x 45 min

Making a story of the forest and its inhabitants

2 x 45 min

Reflection

Exhibition in Oulu city center in April

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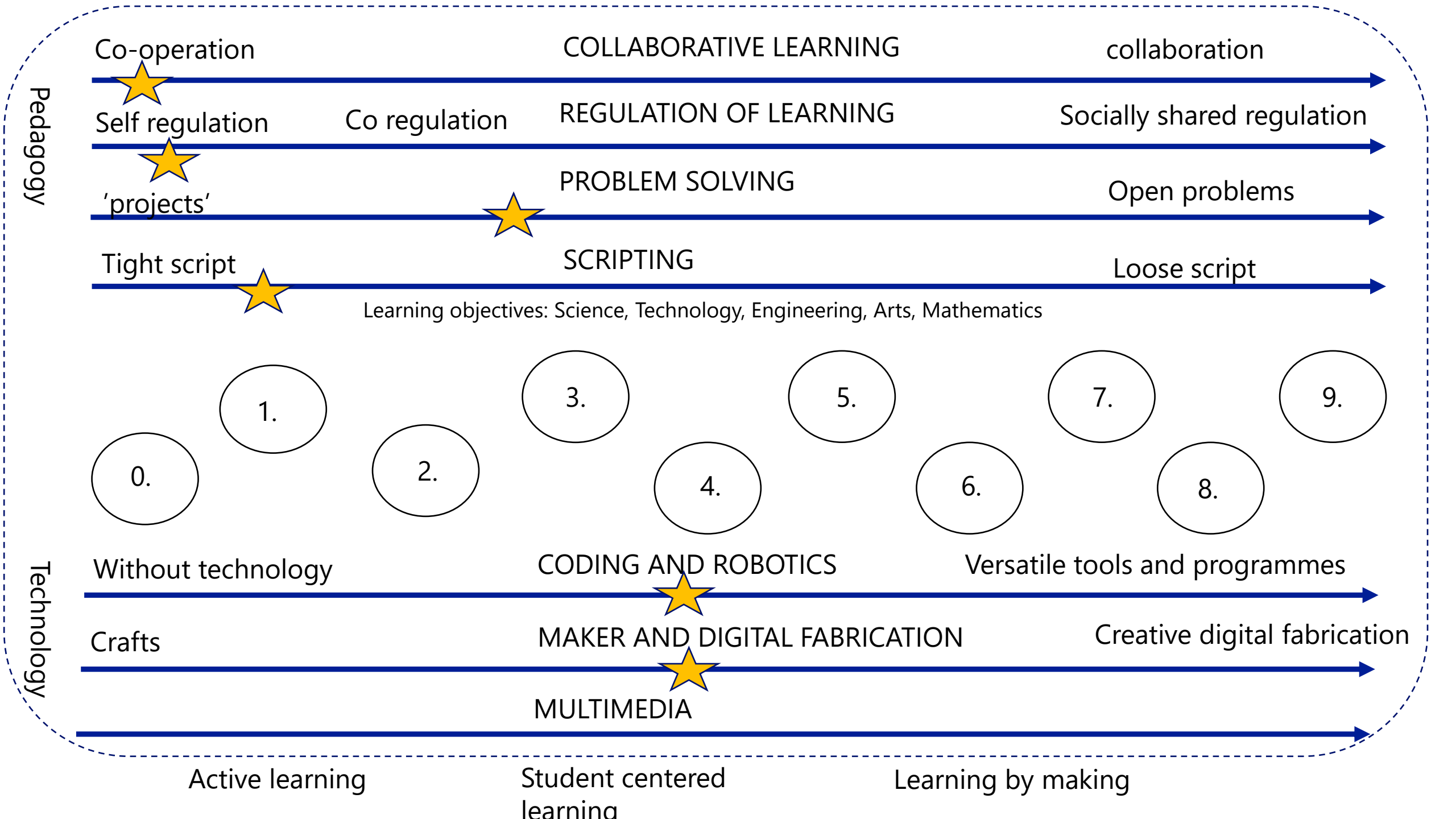
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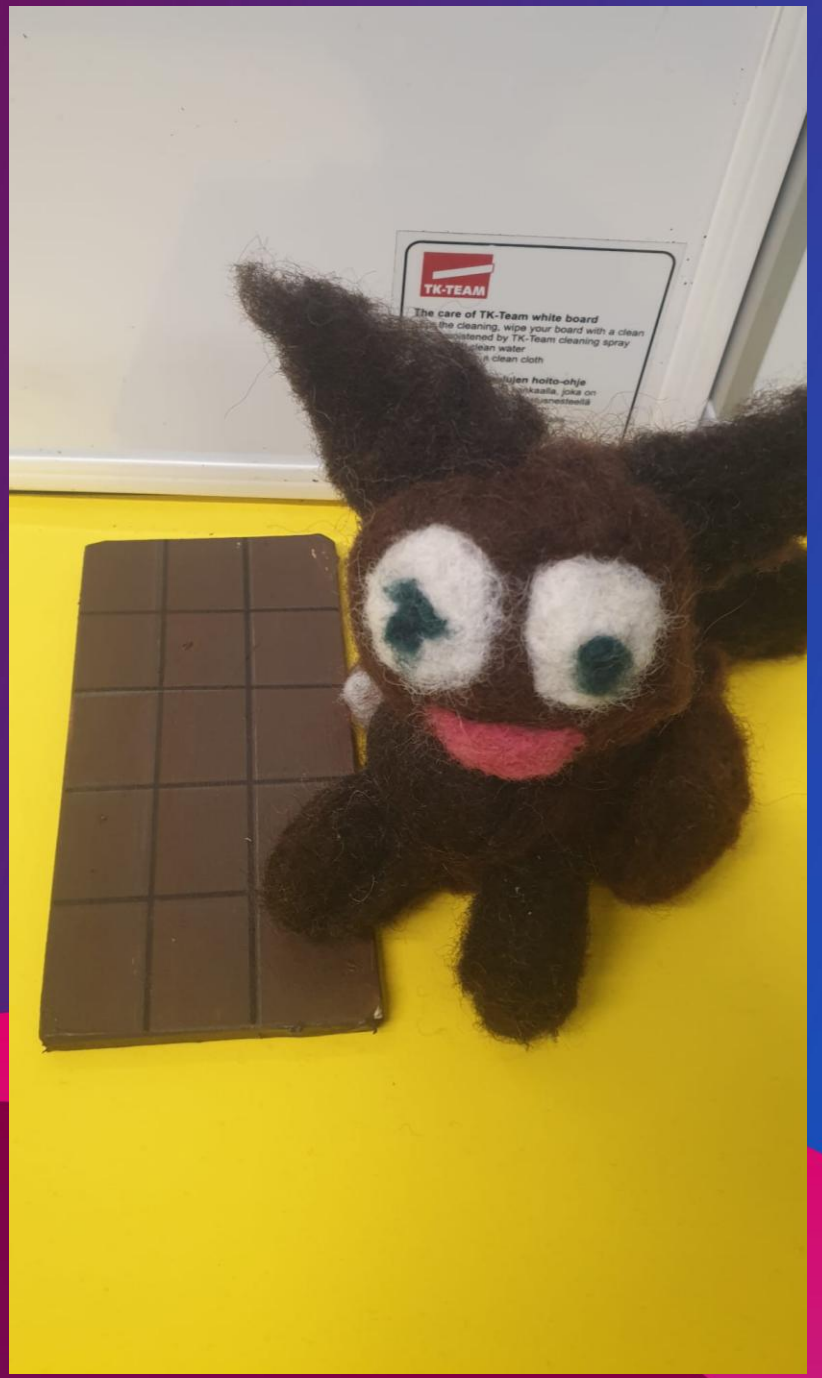

TK-TEAM
The care of TK-Team white board

Case 3:’Incredible space’

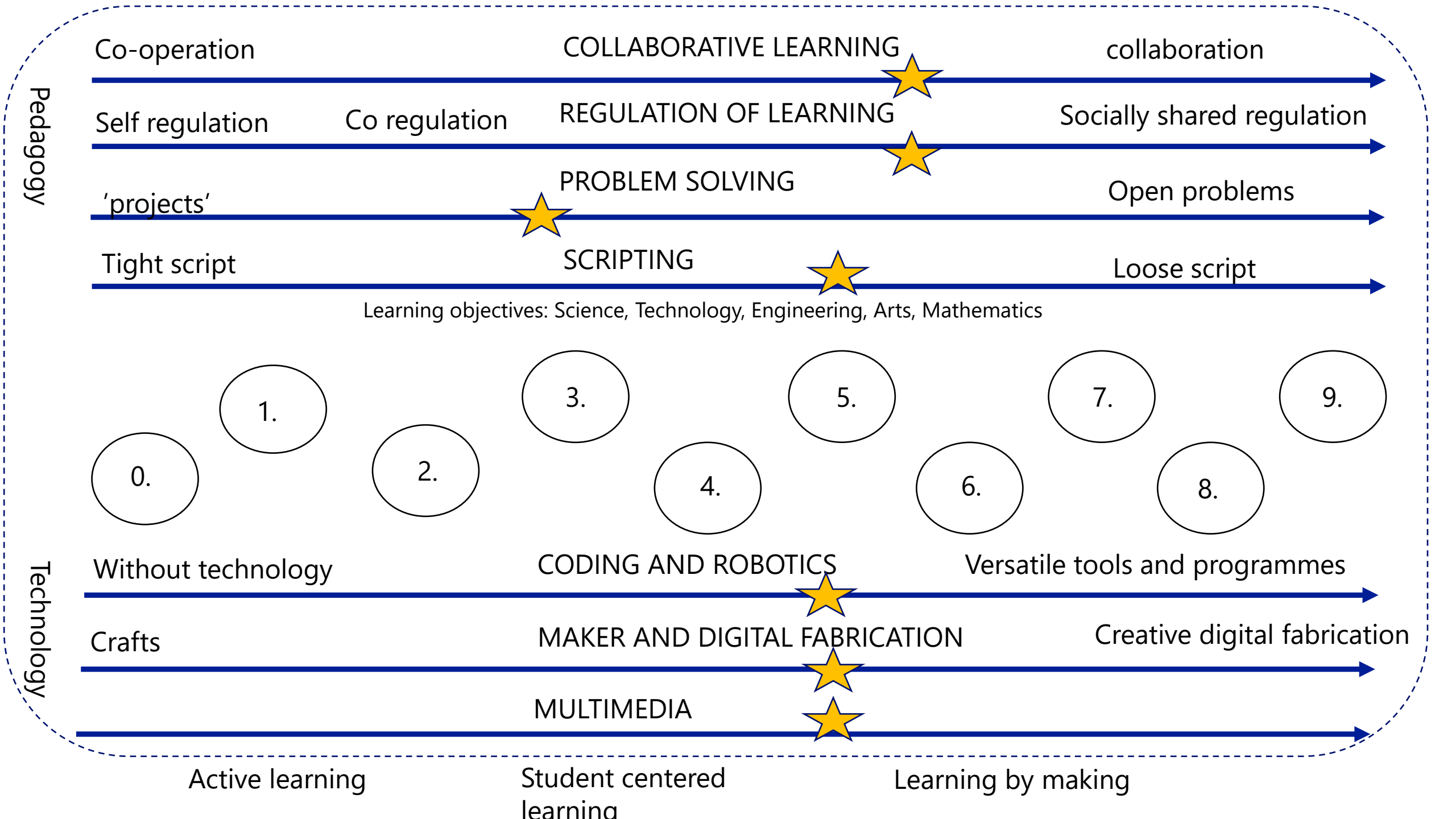
Music education class, grade 5

Laura Ronimus, Niko Ala-Louko, Essi Vuopala

WHAT WE ARE GOING TO DO?

How does the space look like? How does the space sound like? How it feels to be in the space?
What do we know about space?

Build a rook which looks, sounds and feels like space. A room in which all pupils in our school can come to learn and/or relax. A room which offers knowledge and experiences.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Case 4:’ ‘Bringing joy to the older people living in nursing home’’

STEAM-optional course for 5th and 6th graders

Essi Vuopala, Tarja Molander and Sanni Kemppainen

Challenge

‘Our clients suffer from various physical and psychological ailments due to which their living space is quite limited. They truly need joy into their lives, and we hope that you could invent something which could bring joy and happiness into our clients’ life.’

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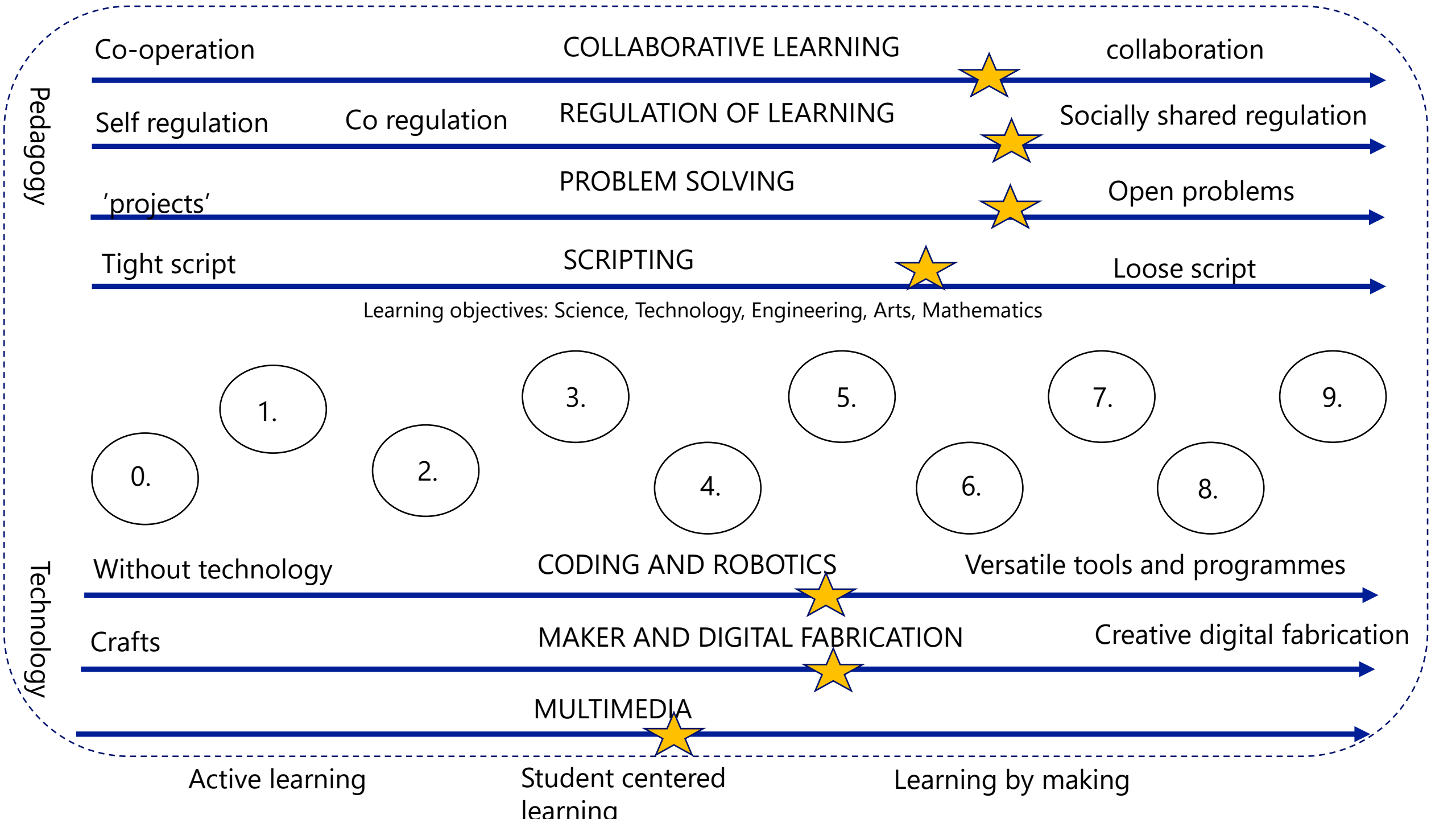
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Gamification and AI in teaching and learning

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Gamification and gamified learning

- Gamification and gamified learning have raised high interest among Finnish teachers, and are also emphasized in current national curriculum for primary and secondary education.
- Applying digital games, adding game elements into teaching, designing own games etc. are all part of gamified learning, and methods that can be applied even with young children.
- Gamified learning – learning through playing games – creating games

- Game it now –project (INNOKAS-network)

Examples of gamification

- **Games as media text**
  - As a part of Finnish lessons and art class, students defined and introduced words used in gaming scene/culture.
  - Students analyzed and compared game plots (like they would any other media) and wrote their own game synopsis and drew concept art.
- **Boardgame elements in classroom**
  - Earning points and dice rolls through completed assignments. Students move on a board racing to finish first.
- **Escape rooms**
  - Students design and assemble escape rooms for others to enjoy.
- **Gamified writing**
  - Fantasy game where everyone writes their own adventure. Students gather experience points and money by writing – afterwards they visit a shop to buy magical items for their hero.
  - We created pictures of our heroes/heroins with AI.

(Gamified learning/ Game-based learning - Games as a learning environment)

- *Building an ancient city in Minecraft (Ancient Roman and Greek culture)*
  - *Students built an ancient city together and 3D printed the buildings.*
- *Quizzes (e.g. Kahoot!, blooket)*

AI in school

Purpose is to

- familiarize students with the concept of AI (what AI is, where AI is etc.),
- support students' skills to utilize AI for learning purposes,
- teach students to 'master' AI

- Articifial intelligence now! –project (INNOKAS-network)
  - https://www.thinglink.com/card/1786344482254356966
- Generation AI (University of Oulu)
  - https://www.gen-ai.fi/fi

Examples of using AI in teaching and learning

AI as teacher's assistant

- Differentiation – modifying excercises for different levels of competence
- Backstories – embedding problems into stories
- Message templates, word/excel-templates etc.

AI in learning

- Integrating AI into subjects
- Using AI to illustrate own stories
- AI for oceans – Teach AI to clean oceans AI for Oceans - Code.org
- Co-writing with AI -> Asking AI to help with creating stories, different routes to continue writing etc.

Learning about AI itself

- How does AI learn (machine learning and the importance of data)
- How does AI generate it's output
  - Biases
- How do social media algorithms gather data and create profiles of users (with incomplete data)

Workshop

Learning via making

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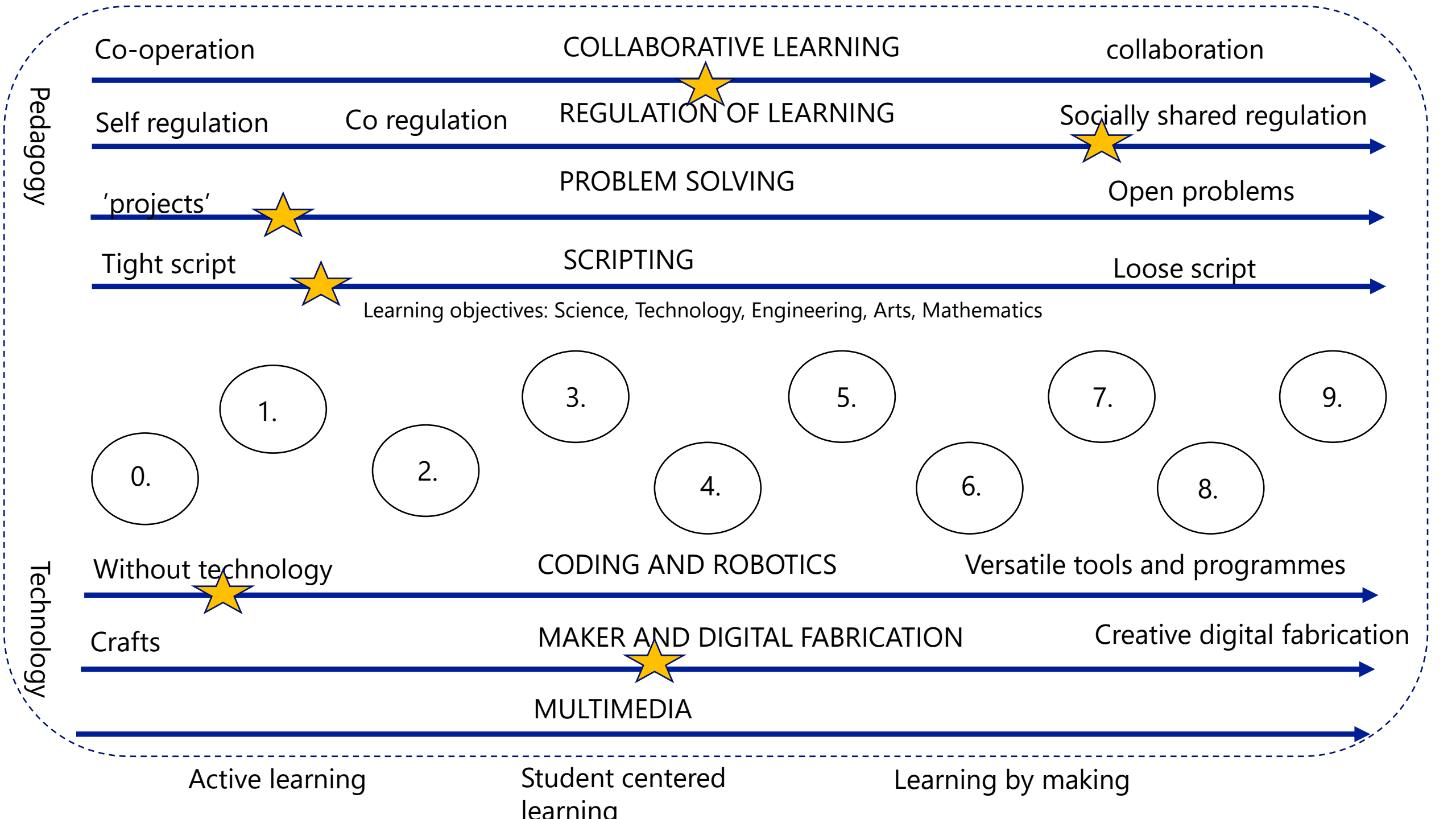
’Hill-vehicle’

Finnish rally driver Erkki is taking part of a vehicle race. Your task is to design and build an ecologic vehicle for Erkki.

Your task is (in peers):

- Draw a design of a vehicle.
- List materials and skills you need to build your vehicle.
- Build the vehicle and test it (two tests).
- Participate in the competition.
- Reflect; what went well, which challenges you confronted.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Hometake messages

1. Power of collaboration; both students' and teachers'
2. STEAM-pedagogy is a powerful tool for developing learning skills as well as enhance content learning.
3. The importance of keeping LEARNING in the center of all school activities, including STEAM!

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Thank you! Kiitos!

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