

The background features several stylized geometric shapes in teal and dark blue, including L-shapes, triangles, and squares, some with drop shadows, arranged in a scattered pattern on the left side of the slide.

Technology for creative thinking and creative thinking for technology education

Creativity in Education Summit, November 2023



Two questions:

- 1) How can we embed creative thinking in technology education?
- 2) How can technology support creative thinking in the classroom?



Learning and assessment
with technology in **PILA**

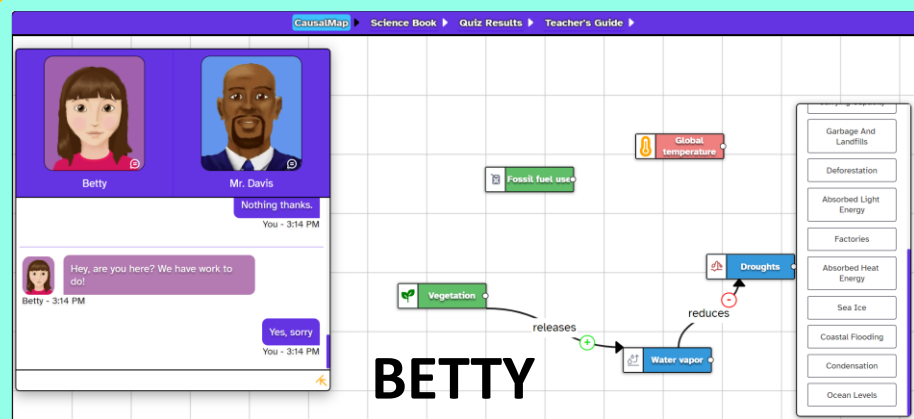
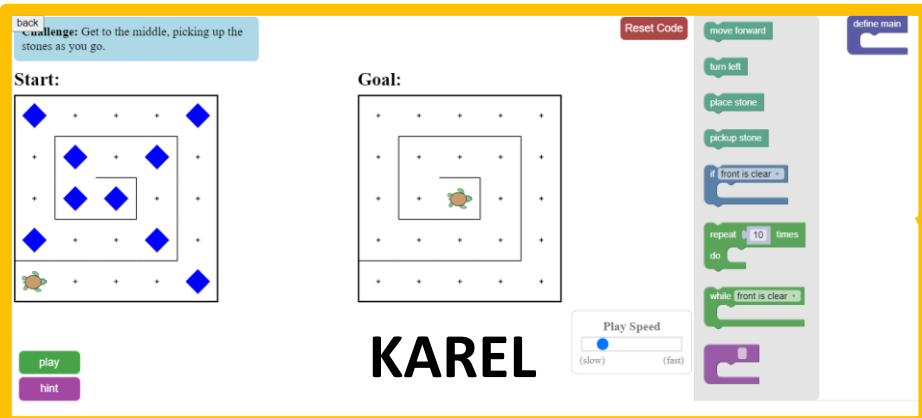
What is the Platform for Innovative Learning Assessments?

- ❑ **Free tool for the continuous, formative assessment** of 21st century competences
- ❑ **Research-based learning progressions, based on and expanding PISA frameworks**
- ❑ **A collaborative lab** for next-generation digital learning & assessment
- ❑ **A platform for teachers** to create and share digital learning material and assignments



PILA applications

& what they teach and assess



Computational thinking

Systems thinking

Self-regulated learning

Creative thinking

Collaboration

Coding concepts

Math concepts

Scientific concepts

Physics concepts

Forthcoming:

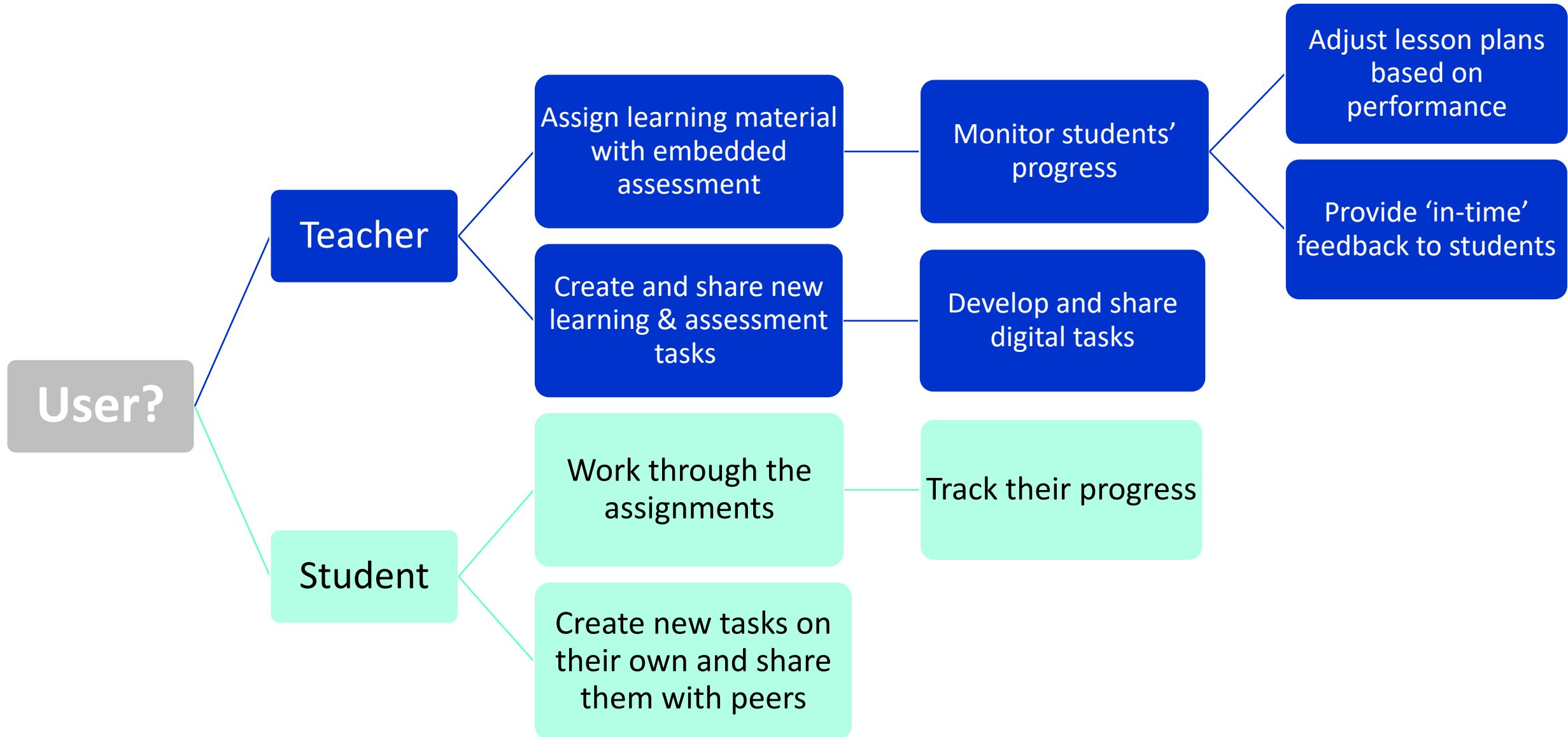
Mathematics problem solving

Scientific inquiry

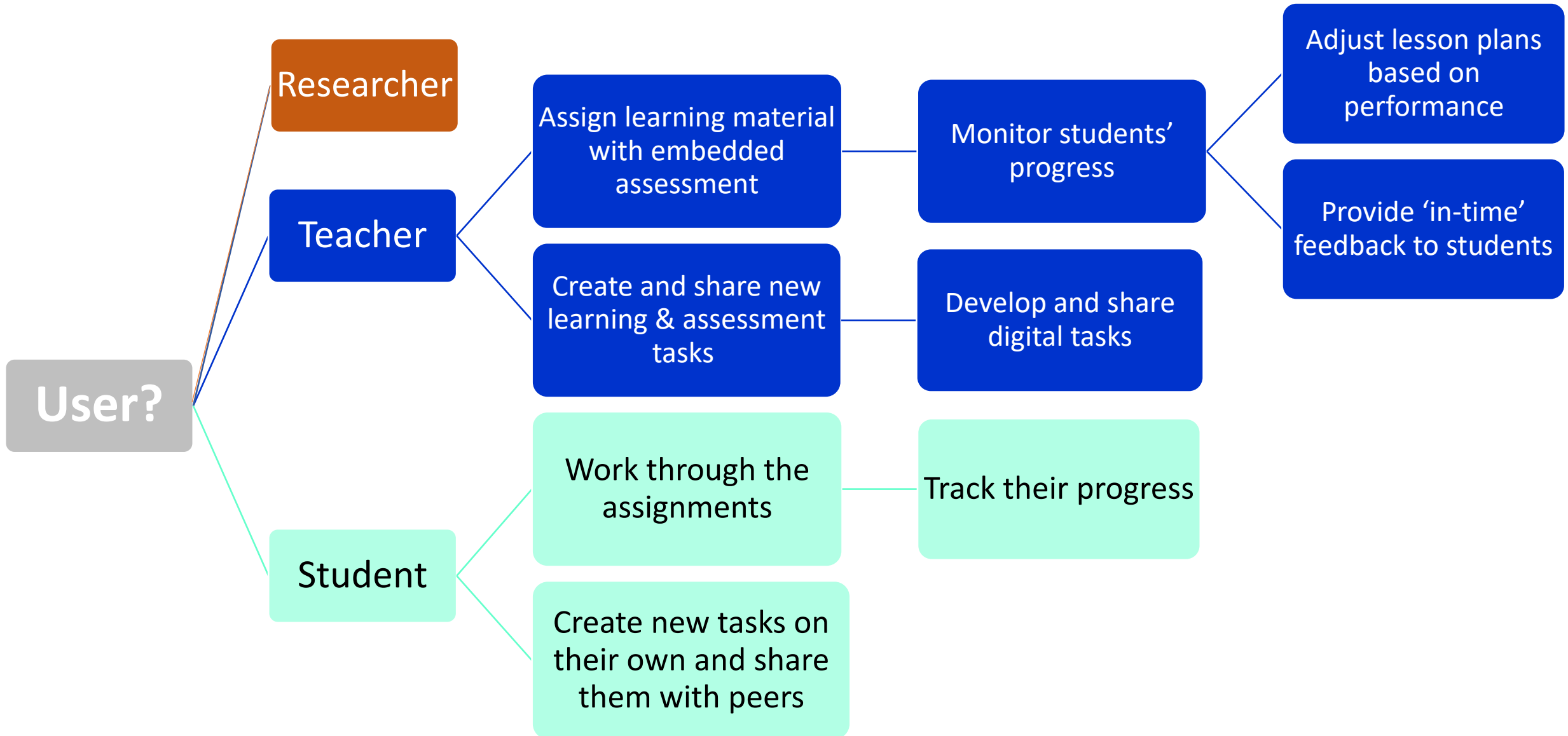
Data science

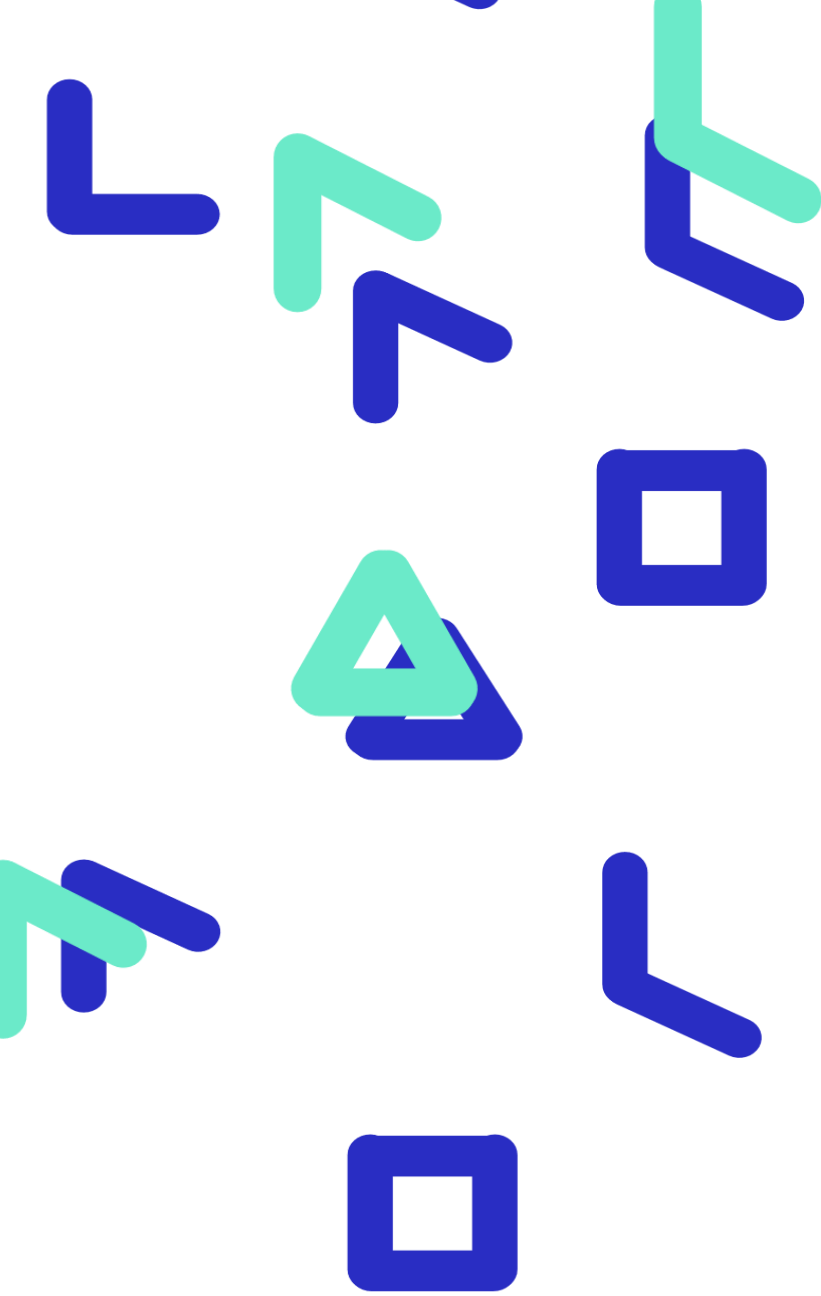
Vocational education and training

Simple, “all-in-one” architecture



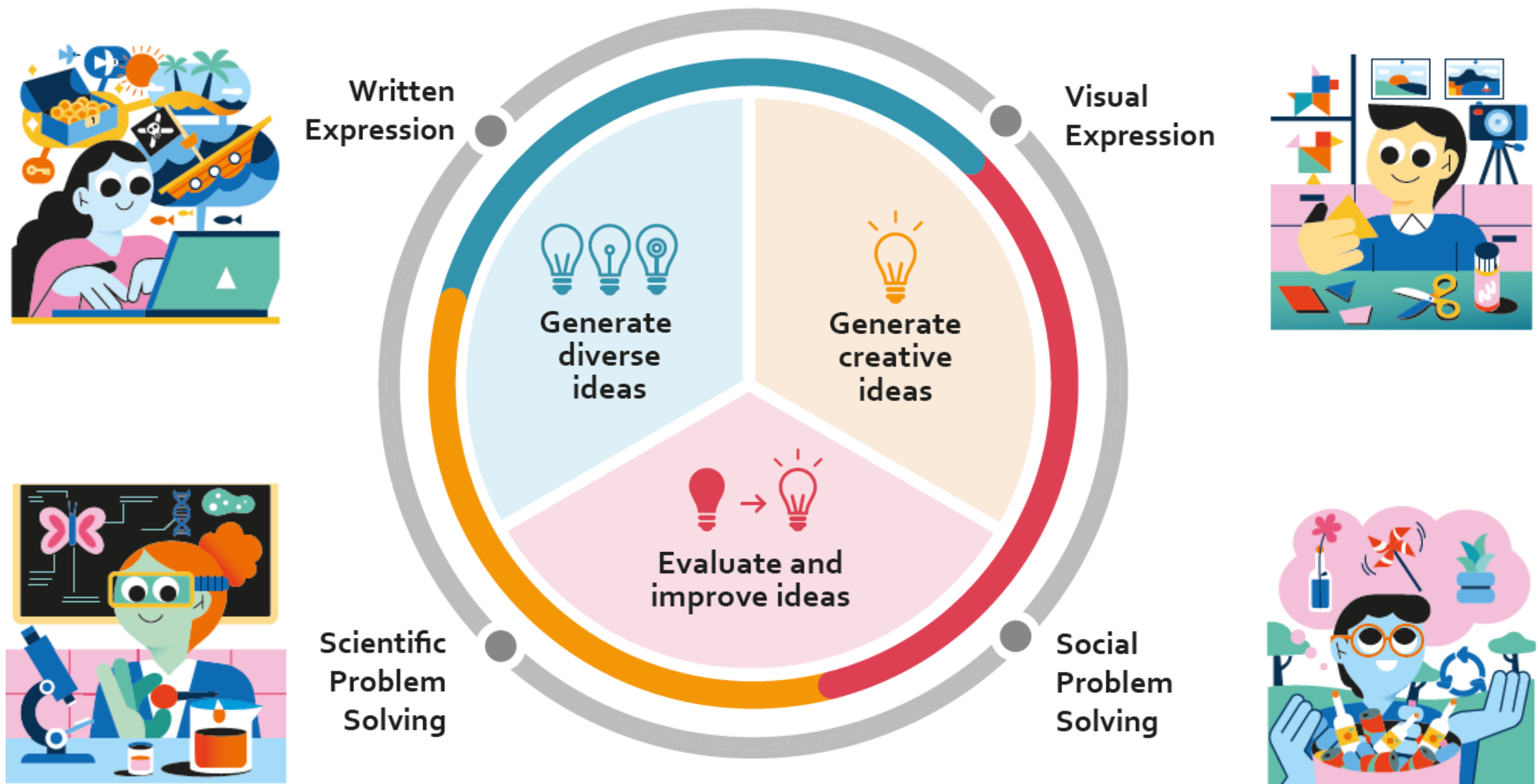
Simple, “all-in-one” architecture





Encouraging creative
solutions

PISA 2022 Creative thinking



Design of digital stories and games in Cand.li

What is Cand.li

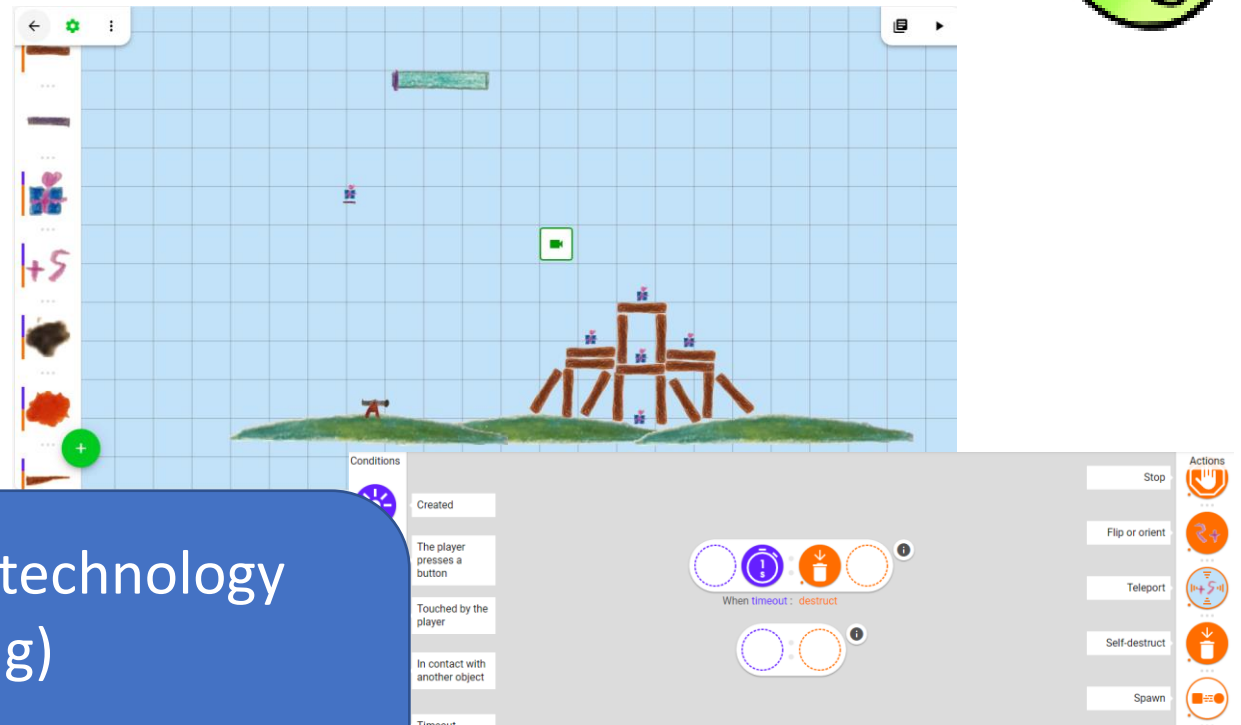
Developed by Enlighthouse in Switzerland. Students think of a game, draw elements of the game on paper, upload, arrange them and make them interactive using a visual **event-based programming language**



Students learn to use technology
(programming)

+

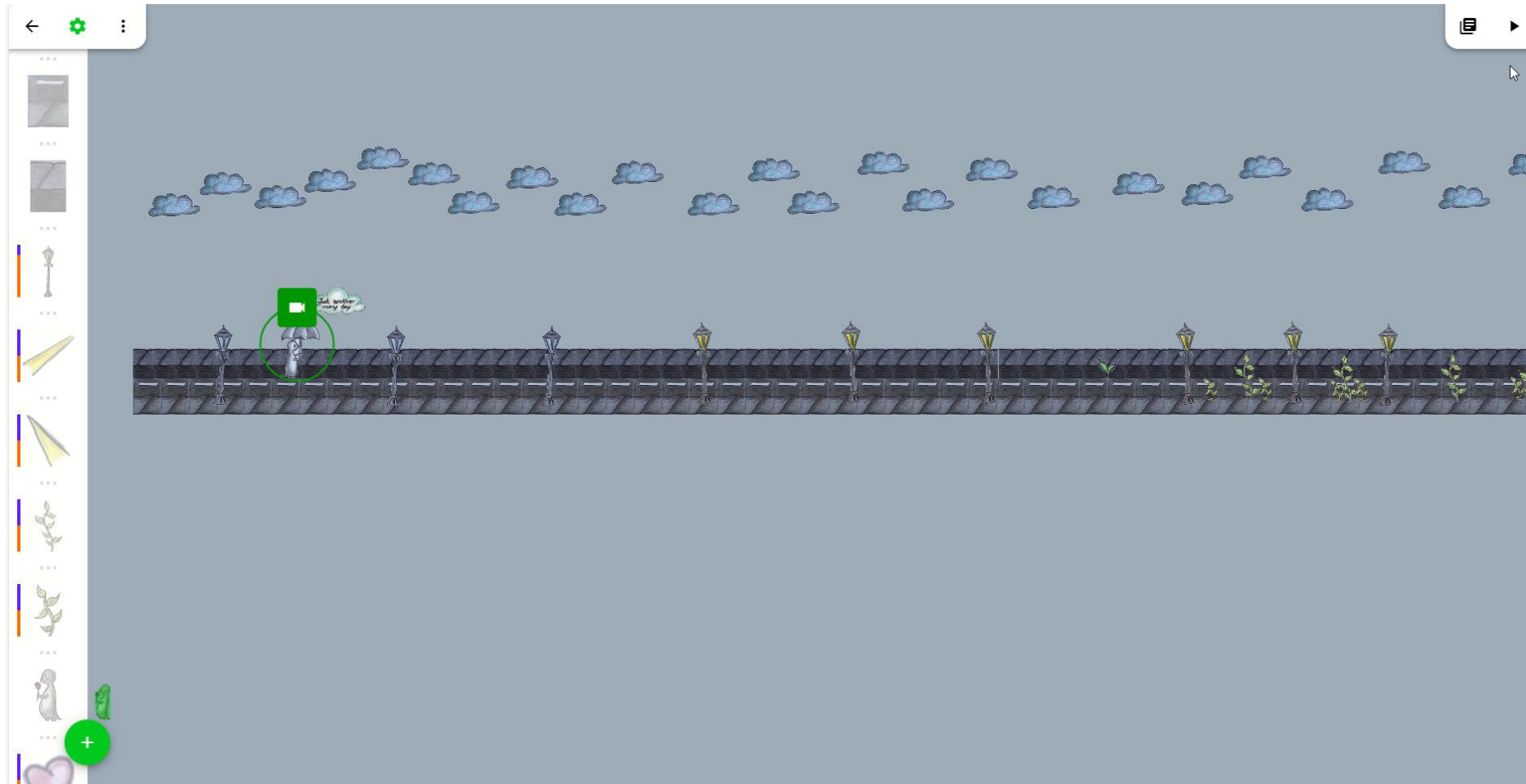
Students develop their creative
thinking skills



Creative solutions in a story-telling task



Goal: Create and programme an interactive story using your own drawings.



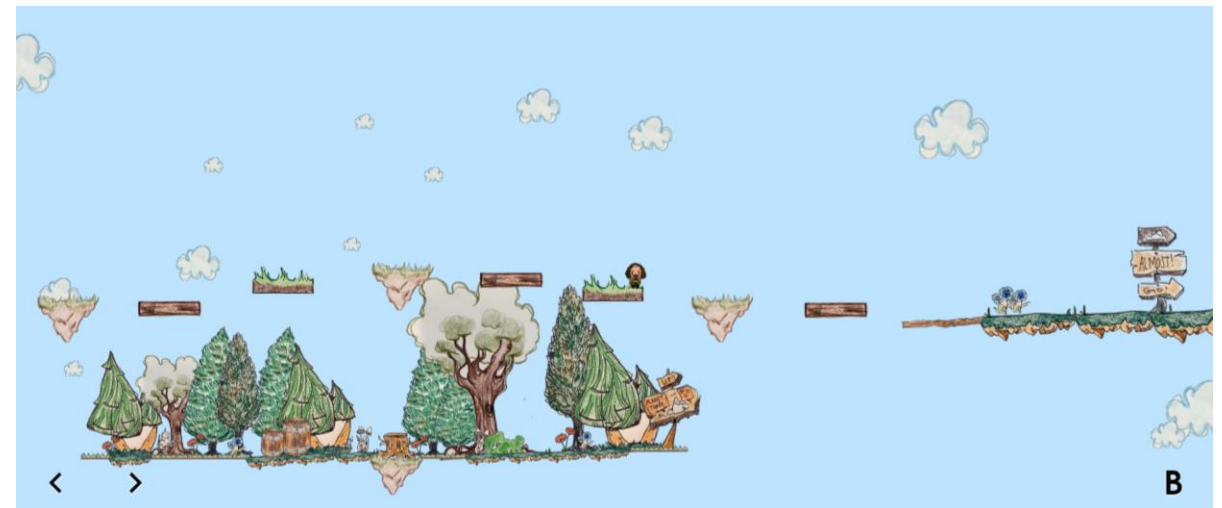
Creative solutions in a scaffolded, problem-solving task

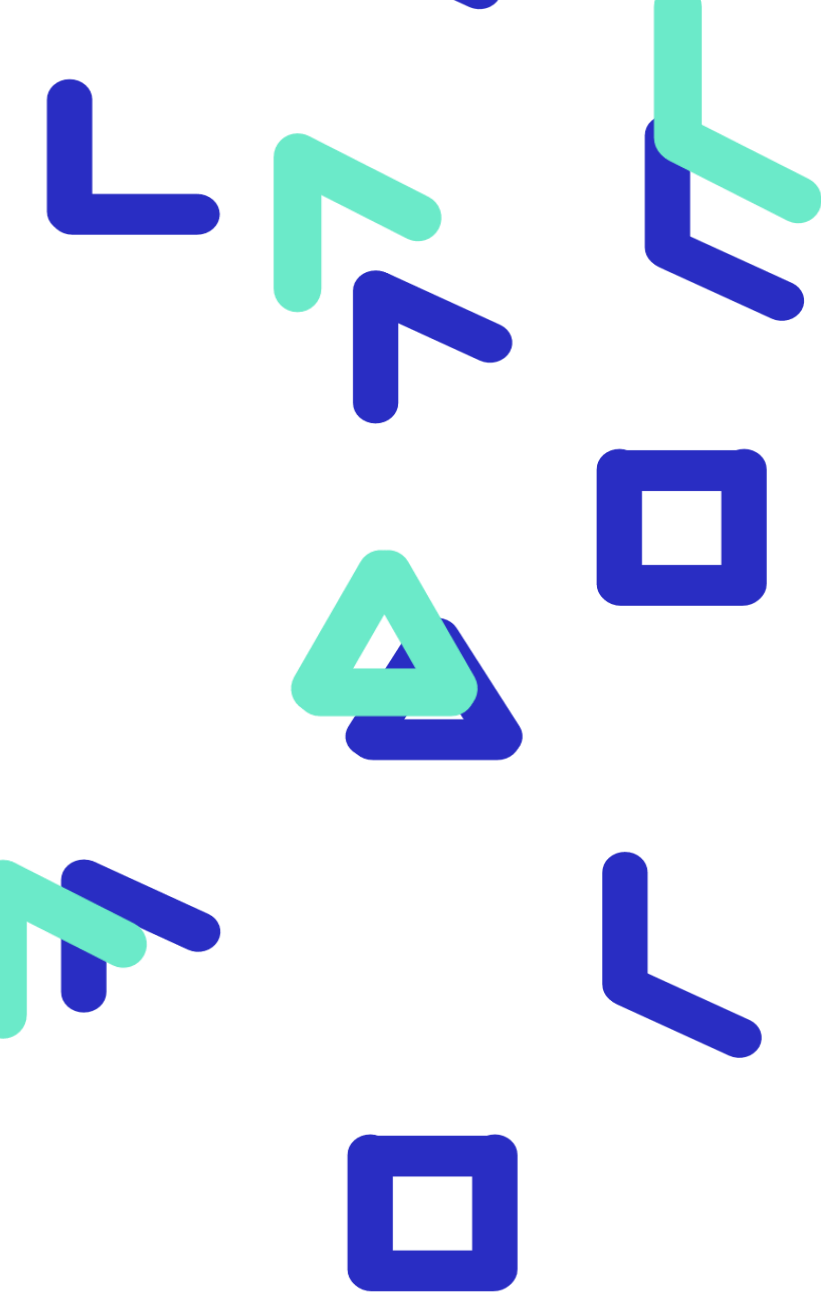


Goal: Programme the character and design the environment to help the character reach the barrel.



Creative solutions in a scaffolded, problem-solving task





Assessing creative
solutions

Using technology to better assess higher-order skills: interactivity...

PISA 2015

Bird Migration
Question 1 / 3


Refer to "Bird Migration" on the right. Click on a choice to answer the question.

Most migratory birds gather in one area and then migrate in large groups rather than individually. This behaviour is a result of evolution. Which of the following is the best scientific explanation for the evolution of this behaviour in most migratory birds?

- ☐ Birds that migrated individually or in small groups were less likely to survive and have offspring.
- ☐ Birds that migrated individually or in small groups were more likely to find adequate food.
- ☐ Flying in large groups allowed other bird species to join the migration.
- ☐ Flying in large groups allowed each bird to have a better chance of finding a nesting site.

BIRD MIGRATION

Bird migration is a seasonal large-scale movement of birds to and from their breeding grounds. Every year volunteers count migrating birds at specific locations. Scientists capture some of the birds and tag their legs with a combination of coloured rings and flags. The scientists use sightings of tagged birds together with volunteers' counts to determine the migratory routes of birds.



- Traditional PISA science item
- Multiple-choice
- Limited data (selected response, timing)

Without Tech


Do heavier objects fall faster?

Did your prediction come true?

Why do you think they both fell at the same time?

<Student answers here>

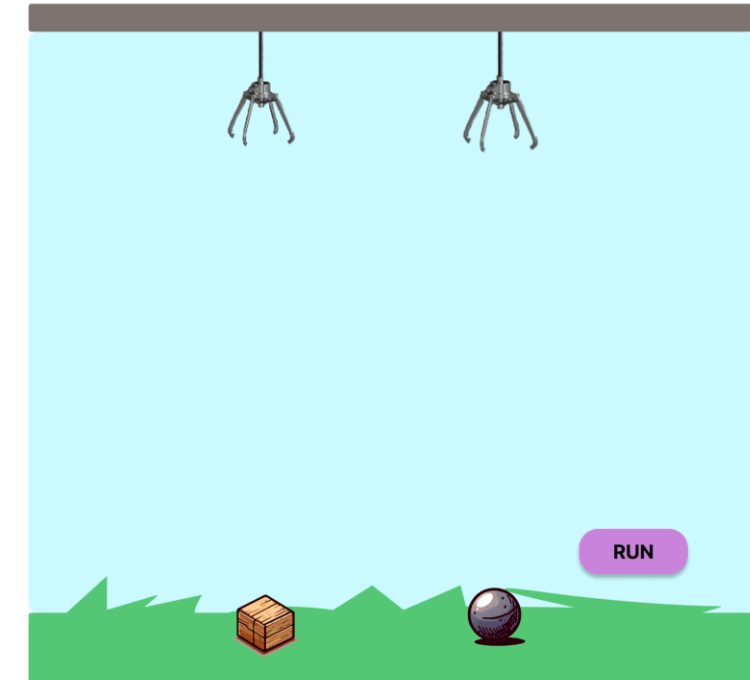
Object Types



3 kg 1 kg 10 g 10 g 1 g

Variables

Air Resistance ZERO MAX



- Interactive PILA task on scientific inquiry
- Open exploration and response format
- Rich process data

With Tech

And openness of solution space

Karel the Turtle

Apply ●●★

Task Solutions Submit ↗

Move the stones into their goal position using as few blocks as possible.

Code blocks

Workspace

Blocks used: 1

move forward

turn left

place stone

pickup stone

while front is clear

define main

Karel:

+	+	2	+	+
+	+	+	+	+
4	+	+	+	3
+	+	+	+	+
	+	2	+	+

Goal:

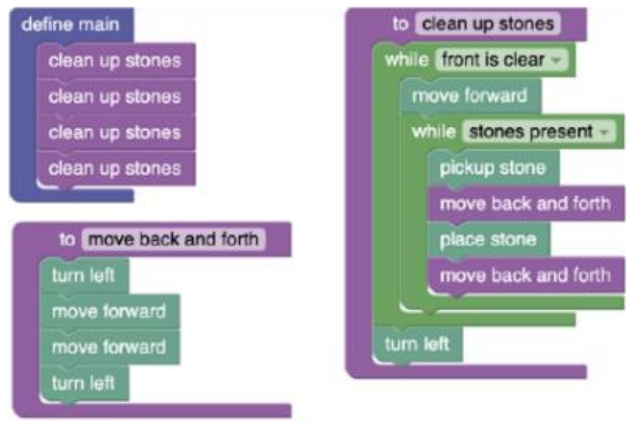
+	+	+	+	+
+	+	+	+	+
+	+	11	+	+
+	+	+	+	+
	+	+	+	+

↶ ↷ 🗑️

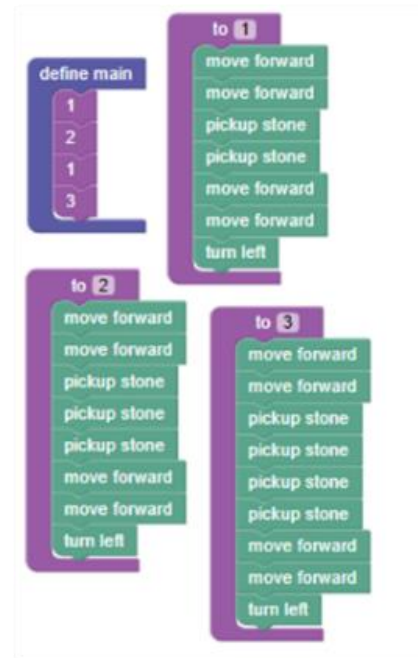
Run ⏸

slow fast

More insights on ability and on strategies



Solution A: Full credit – student achieved the goal state and used correctly while loops and functions



Solution B: Partial credit – student did not achieve the goal state (failed to place 11 stones), but correctly used functions



Solution C: Partial credit – student achieved the goal state but did not use correctly while loops or functions

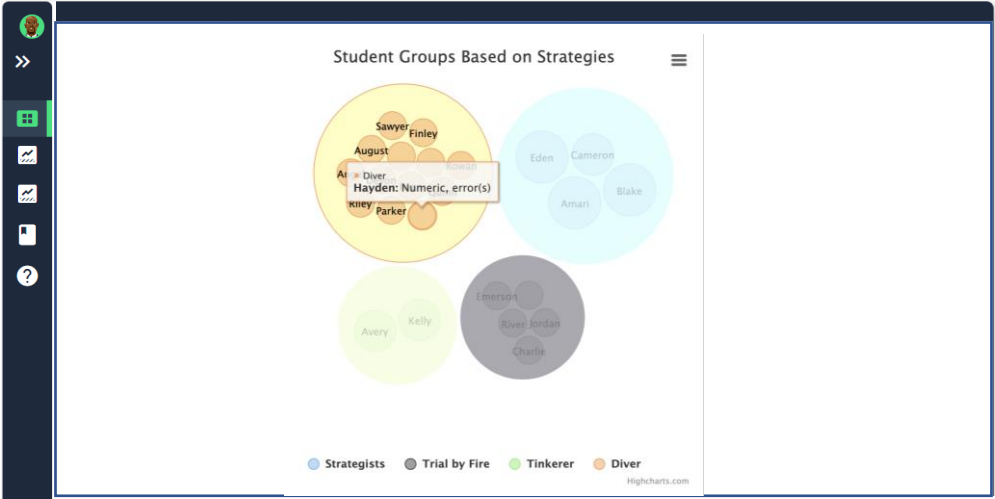


Empowering (rather than
replacing) teachers

PILA dashboards



User	My first game	Flying bird	Racing	Lap counter	Candl UI	Game design	Computational thinking
	progression ⓘ ?	progression ⓘ ?	progression ⓘ ?	progression ⓘ ?		Level editor UI Level design Objects and behaviours Controls Ending a game and scoring Time Visual and audio feedback Simulated physics Conditionals Creation and destruction Variables State Repetition Representation Modularity	
Betty	not started	20 s 18 s 28 s 9.3 s 30 s 0 s 16 s 2 min 0	25 s 33 s 1 min 44 s 3 min 6 min 4	not started	3 1 1 1 1	1 1	
Sruthi	6.7 s 46 s 2 min 2	1 min 1 min 2 min 40 s 1 min 18 s 25 s 18 s 5 min 2 min 15 min 3	43 s 1 min 2 min 0	3.1 s 0	3 2 1 1 2	1 2 1	1
Marta	not started	8 min 35 s 2 min 7 min 14 s 47 s 15 s 2 min 21 min 6	2 min 2 min 15 s 4 min 1 min 2 min 12 min 7	not started	3 1	1 1	
Emma	7.3 s 1 min 2 min 1	not started	not started	5.2 s 36 s 48 s 1	1		



[selected session] x 6 Tasks 1h 25 students 20 students YES December 10th, 2023

Criteria for grouping solutions

- ☐ N. Loops
- ☐ Use of while
- ☐ Use of nested repeat
- ☐ ...
- ☐ ...

SOLUTION GROUP 1

Students

Analysis of characteristics

SOLUTION GROUP 2

Students

Analysis of characteristics

SOLUTION GROUP 3

Students

Analysis of characteristics

SOLUTION GROUP 4

Students

Analysis of characteristics

Live Monitoring

Progress View

Reflection Board

Alex

Luis

Bea

Jill

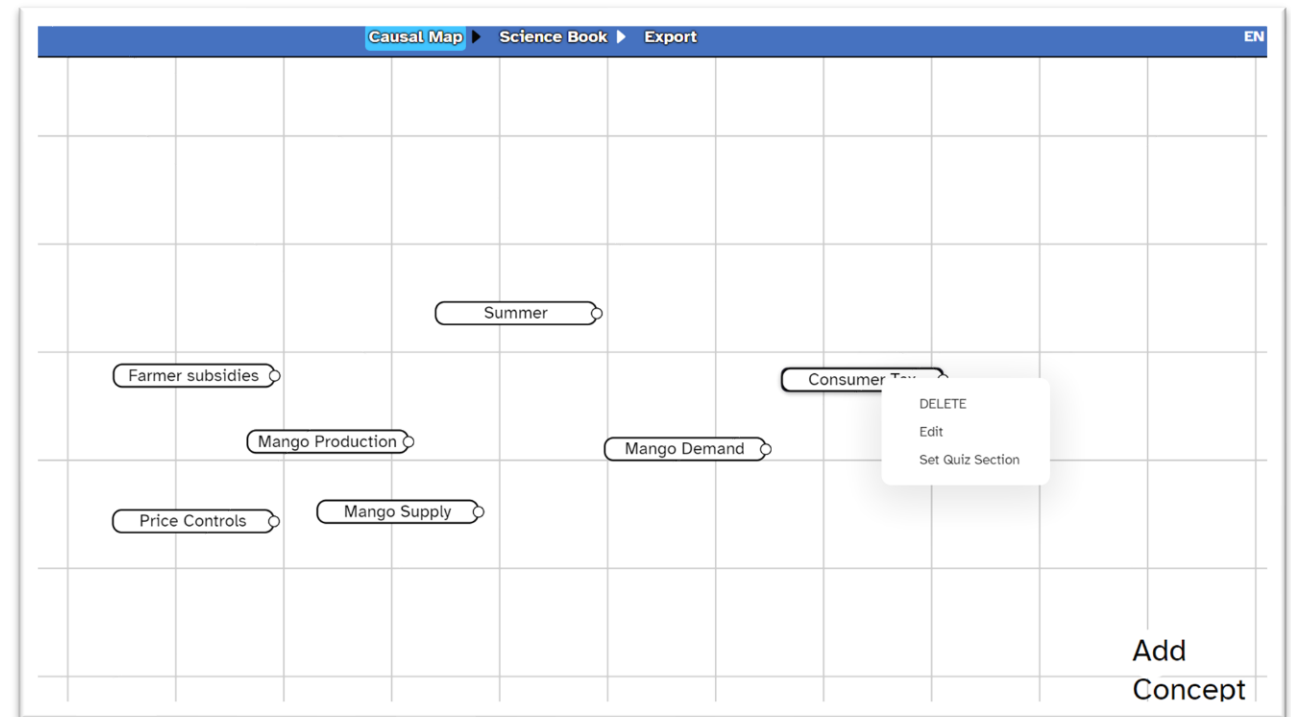
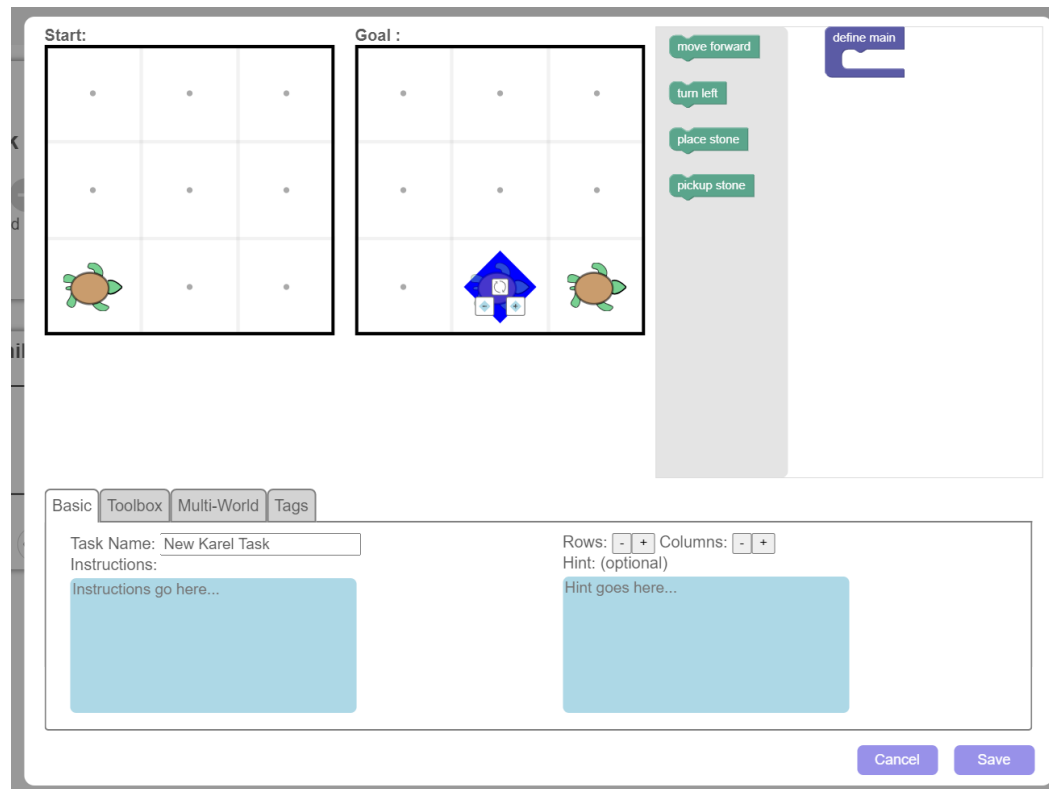
Paul

Sarah

Max

Young

PILA authoring tools allow teachers to adapt or create their own digital content without programming knowledge

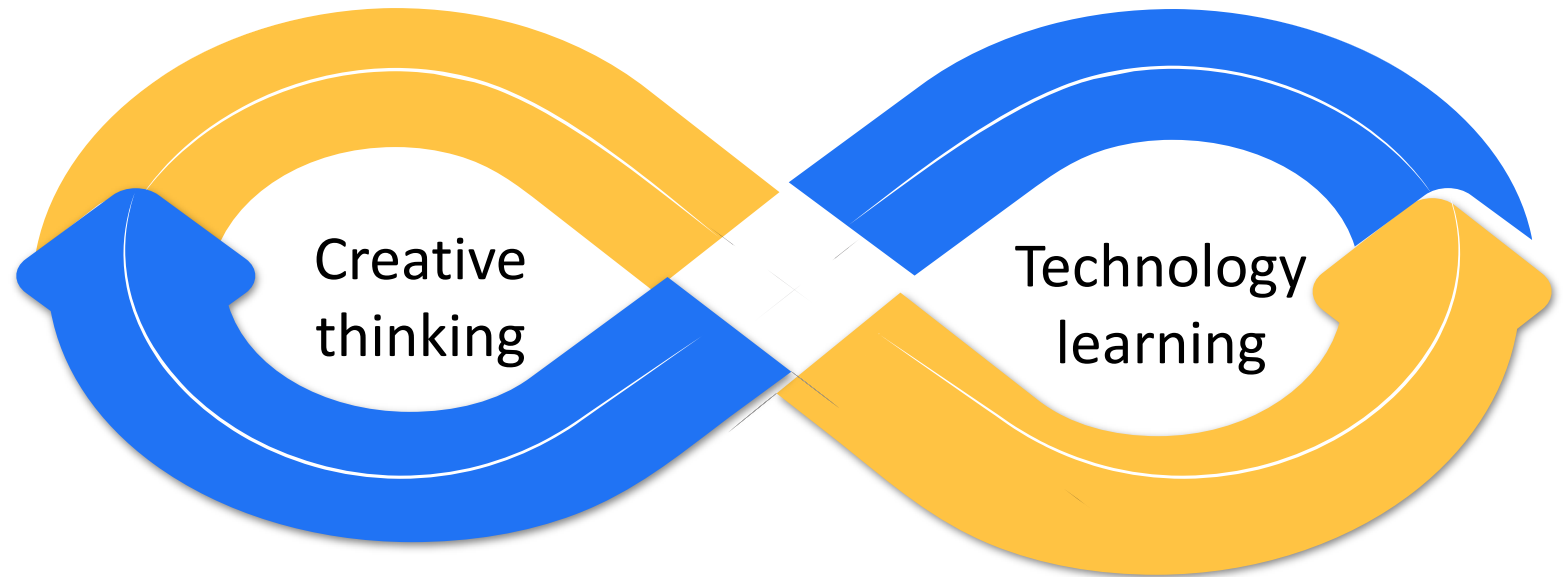


Some conclusions

Technology provides new tools for creative expression and problem solving, and make easier the evaluation of creative work

Big opportunities to connect technology education with other subjects, through applications where students construct their unique digital artifacts

The sustainable creation of high quality applications is possible with open-source platforms like PILA



Work with us

Try out PILA's applications at: <https://pilaproject.org>



PILA

Public launch of PILA on December 14

Check out our work on innovative assessments in PISA at www.oecd.org/pisa/Innovation

For any question, contact me at:
mario.piacentini@oecd.org