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Fostering Computational Thinking and Data Literacy through Collaborative Classification: The SorBET Interaction Design

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Research background & stage

- **Sorting** and **classification** underlie both **Computational Thinking** (CT) and **Data Literacy** (DL) skills, yet few tools make this reasoning visible through **interaction**
- This PhD investigates **secondary students' CT/DL development** through **collaborative classification** with SorBET
- Two **DBR pilot cycles** completed; moving from pilot design into the main intervention phase

Objectives & RQ

How does the **input modality** (mouse-based vs. gesture-based interaction) of a collaborative classification tool **affect** secondary **students' engagement in classification tasks** that support **Computational Thinking** and **Data Literacy** development?

Motivation & Relevance

- **Classification underlies core CT practices**: pattern recognition, abstraction, categorization
- It also underlies **DL competencies**: evaluating source reliability, distinguishing signal from noise
- **Embodied**, **gesture-based interaction** supports **conceptual engagement**, but its role in collaborative CT/DL classification remains underexplored
- This motivates a design-based comparison across input modalities

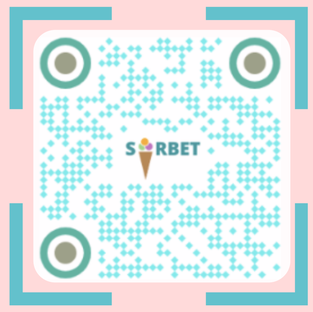
Implementation

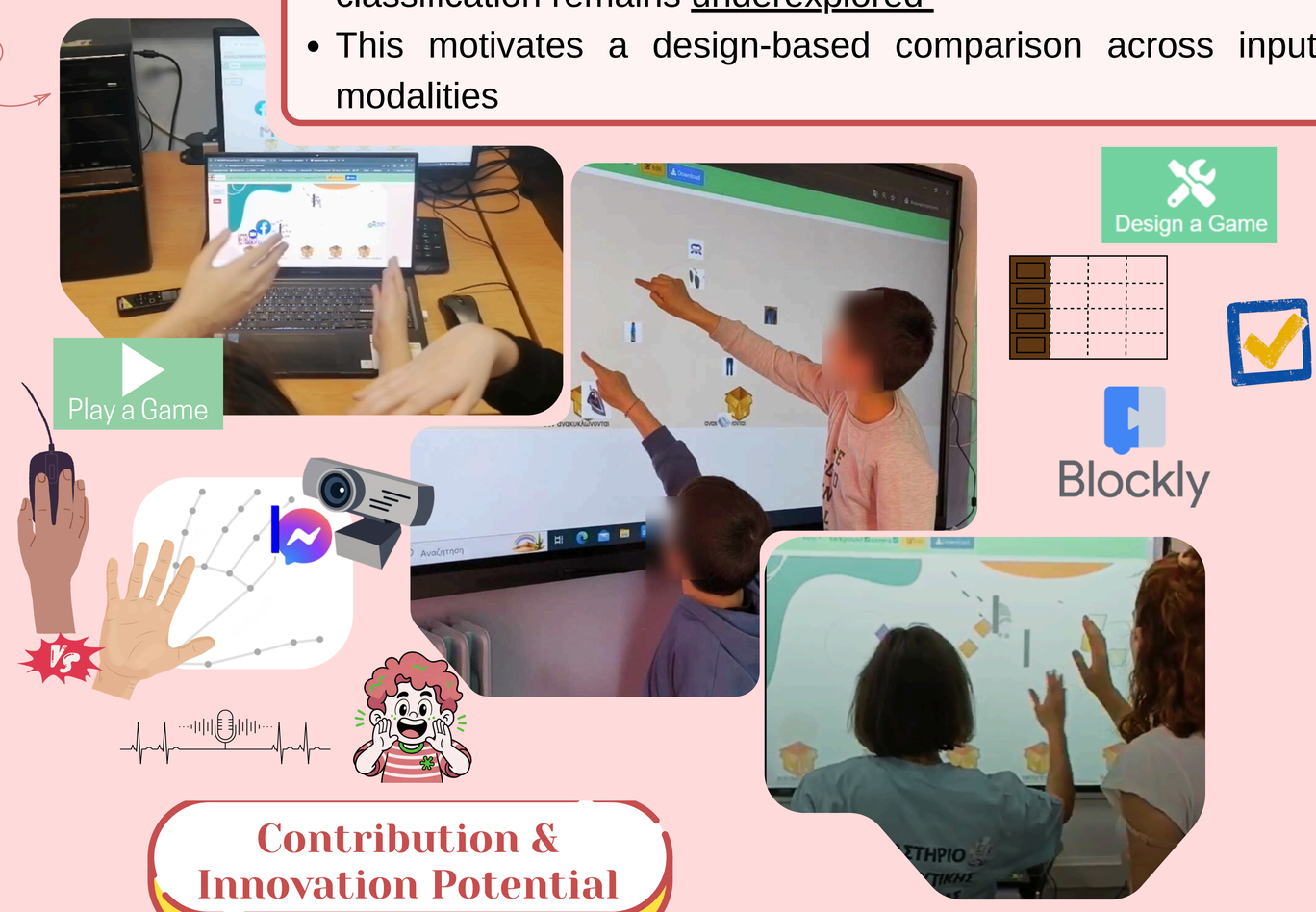
Students **collaboratively sort falling items** into pre-defined, but editable, categories, using either **mouse-based** or **gesture/voice-based input.**

- Handtrack.js/Tensorflow/MediaPipe for hand detection
- Webspeech API for voice recognition

Acces to game mechanics to adapt objects & categories - or **design new game from scratch**

- Interactive Database / Data editing
- Block based coding for adjusting game's parameters such as speed of falling objects (Google Blockly)





Preliminary insights

1st Pilot

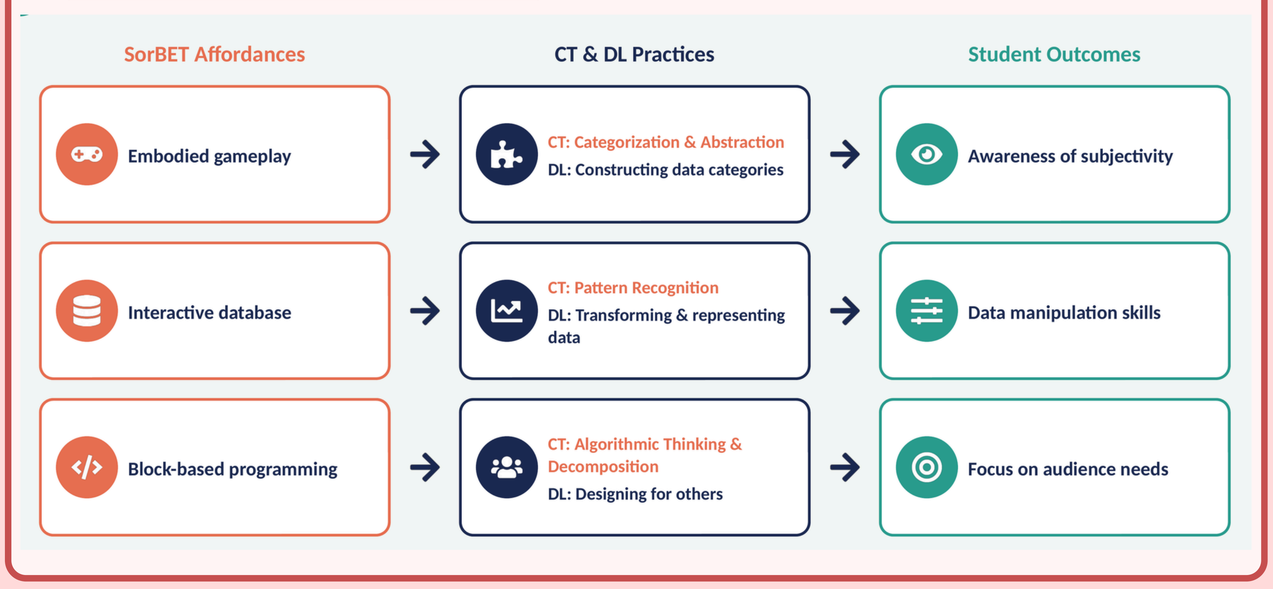
Same pairs tried mouse input first, then the single-hand gesture prototype (closed fist / open palm)

2nd Pilot

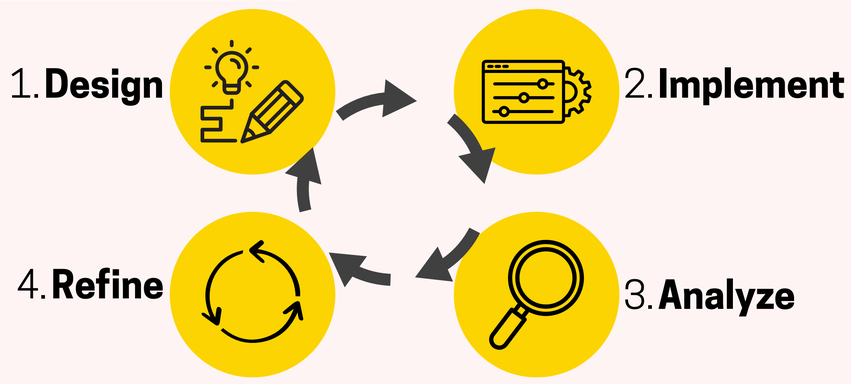
Group A used the mouse-based version; **Group B** used the extended 2-hand gesture + voice version.

- All worked in pairs
- Sessions were video- and screen-recorded for post-session interaction analysis

Contribution & Innovation Potential



Proposed Methodology



- Grounded in **constructionist learning theory** (Papert, 1980) and conducted through **Design-Based Research** (Barab & Squire, 2004)
- **Iterative** across **cycles -** each loop **refines** the **tool**, the **activity** and the **pedagogical framework**

Expected Impact & Added Value

- Informs the **design of gesture- and voice-based educational tools** that support CT/DL development through embodied, collaborative interaction
- Offers **design guidance** applicable beyond SorBET to other **classification-based learning technologies**