Bridging play and STEM: Empowering early learners through pupil-initiated exploration

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Introduction

Children's digital skills develop early, influenced by their exposure to technology at home. However, there is often a gap between these personal digital experiences and their integration at school. Pretend play, a key activity in early childhood education, offers an opportunity to bridge this gap by introducing unconnected technologies that stimulate children's creativity while simulating real-world digital scenarios. Research suggests that these tools encourage children to design new technologies, adapt materials to their imaginative needs, and explore technological identities through creative play.

Teachers play a critical role in supporting this process by acting as facilitators and co-players, providing materials, asking questions, and documenting activities. However, integrating such innovative approaches requires clear pedagogical strategies and appropriate training.

Methodology

The study adopts a participatory observation approach to understand children's perspectives during pretend play. Data were collected over 22 sessions, each lasting one to two hours, using two to four GoPro cameras. These cameras were strategically placed around the classroom or attached to the researcher to capture detailed interactions. Drawing on a cultural-historical framework, the interactions between the researcher, children, and teacher were analysed by considering the intentions and perspectives of all actors involved (Fleer & Veresov, 2018).

To analyse the data, the children's pretend play scenarios were reconstructed from beginning to end. Using iMovie software, 32 scenarios were identified from the recorded sessions (e.g., school play, library, high-speed train (TGV), or Ninja Turtles). These scenarios were transcribed with detailed observations, including verbal and nonverbal interactions, gestures, and material use. The researcher's reflections were also included. This study, as part of a broader research development project, highlights the co-creation of materials and the collaborative involvement of the teacher in the research design.

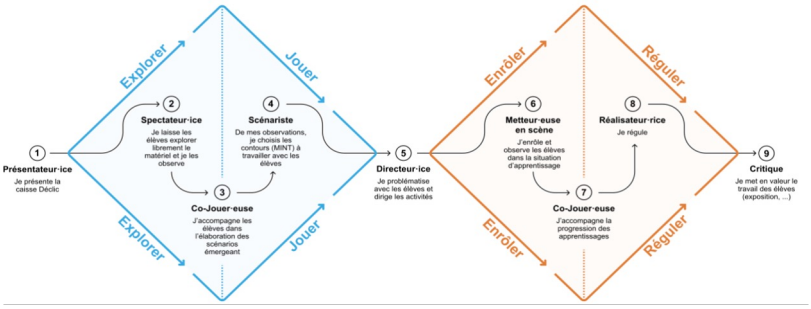

Figure 1: Double diamond model (British Design Council, 2005), adapted for the DECLIC project (Bolli et al, 2022)

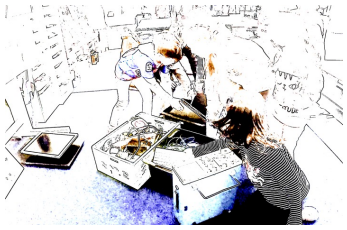

Figure 2: DéCLIC Kit Materials

Figure 3: Ninja Turtle Scenario

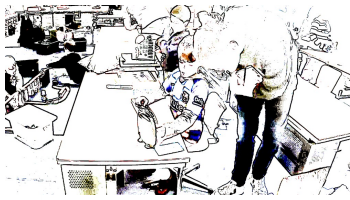

Figure 4: High-Speed Train Scenario

Outcomes and practical contributions for teachers

A key outcome of this project is the co-creation of a didactic model based on the Double Diamond framework (British Design Council, 2005), developed in collaboration with teachers to support both the children's activities and the different roles teachers can take during the process. This model emphasizes a step-by-step approach. First, children engage in free exploration with objects from the DéCLIC kit, encouraging creativity and autonomy. Teachers then take on specific roles-such as facilitator, co-player, or guide-to scaffold children's thinking and gradually direct their inquiry toward structured problem solving. The model integrates disciplinary content into the play process, linking subjects such as math, science, and social studies. This framework provides teachers with practical tools to guide digital play and foster creative, critical, and collaborative skills in young learners.

Illustration 1: Learning through Ninja Turtles

Three children engage in a Ninja Turtles pretend play. They are constructing a global operations and surveillance base out of disconnected materials, simulating a mission to ensure global security. Guided by an imaginary map displayed on a non-digital screen, the children navigate the classroom and dynamically intervene in imaginary global crises. To combat crime, they creatively combine disconnected digital tools with classroom materials, fostering collaborative problem solving and integrating geographic knowledge. The teacher uses this scenario to introduce map reading skills, guiding the children to use the map as a tool for planning their interventions.

Illustration 2: Exploring speed with a high-speed train (TGV)

In another scenario, a child uses unconnected tools to build a control panel for a high-speed train (TGV). Gradually, peers join in, adding a train car and creating a shared narrative about transporting passengers between major European cities. Challenges such as delays prompt the "pilot" to manage speed and schedules. The teacher uses this opportunity to introduce the concept of speed, guiding the children to explore its relationship to time and distance. This turns imaginative play into a practical exploration of key math and science concepts from the curriculum.

To read more about this project

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