

Emotion Detectives: Co-designing Inclusive SEL Games with Preschool Children

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Abstract: Preschool-aged children are still rarely involved as genuine co-design partners in the development of Digital Educational Games (DEGs). In participatory design research, they are often positioned as users or testers, while adult assumptions continue to dominate design decisions. This exclusion is especially significant in game design, where children's ways of imagining, narrating and representing experience could inform more meaningful educational technologies. This paper presents a participatory co-design method and derives four preliminary design principles for inclusive preschool social-emotional learning (SEL) games from an exploratory workshop, "Emotion Detectives," conducted within a broader Educational Design Research (EDR) project aimed at co-designing an inclusive digital educational game for preschool-aged children. The game's pedagogical framework draws on the CASEL-5 competencies and Universal Design for Learning (UDL), with the goal of supporting SEL through accessible, developmentally appropriate digital play. The workshop was conducted with families from a disability support group using a low-fidelity, hands-on co-design toolkit. Children and caregivers collaboratively created three artefacts for each game concept: a protagonist profile, a narrative storyboard, and an interface sketch. To ensure coverage across the full SEL framework, each family group was randomly assigned one CASEL-5 competency. Reflexive thematic analysis of the artefacts and field notes showed that children could meaningfully contribute to co-design when the process relied on tangible materials, symbolic play, and caregiver mediation. This paper proposes four preliminary design principles for SEL-oriented DEGs in early childhood: use non-human protagonists to create symbolic distance for emotional exploration; design fail-soft feedback systems that support trial-and-error learning; integrate accessibility and representation from the outset as core elements of gameplay and narrative; and structurally embed balanced CASEL-5 coverage across interaction and progression. The study presents a co-design approach suited to preschool children and argues that their exclusion is shaped by methodological choices rather than by developmental limits.

Keywords: Participatory design, Digital educational games, Preschool education, Social emotional learning

1. Introduction

Participatory Design (PD) is a collaborative approach in which end-users actively contribute to the design process, helping shape decisions rather than just evaluating an already finished product (Schuler and Namioka, 1993; Spinuzzi, 2005; Norman, 2023). Although PD methods are increasingly applied with children, preschoolers are seldom involved as genuine co-designers in the development of digital educational tools, where their role is often limited to user or tester (Druin, 2002; Albu, Lindberg and Szymaszek, 2014; Iversen, Smith and Dindler, 2017; Paracha *et al.*, 2019; Korte, 2022; Buckmayer and Rubegni, 2024). This exclusion is especially problematic because the preschool years are a critical period for social-emotional development, making them an important stage for educational approaches that support learning, well-being, and later participation in society (Denham, 2006; UNESCO, 2023).

This gap is particularly relevant in the Portuguese context, where concerns about child and adolescent mental health strengthen the case for early educational approaches that support SED (Direção-Geral da Saúde [DGS], 2013; Coelho *et al.*, 2023; European Union, 2026). Additionally, preschool children are seldom invited to shape the design of Digital Educational Games (DEGs), so these tools are often built around adult assumptions rather than children's own perspectives (Druin, 2002; Veloso, 2006; Saiger, Deterding and Gega, 2023). This is especially problematic for children with disabilities or from culturally diverse backgrounds, whose experiences are rarely reflected in mainstream educational media (Pires, Martins and Tymoshchuk, 2023). For inclusive design, this matters not only because representation is limited, but also because the social and emotional situations built into games may fail to match the ways children actually experience inclusion, conflict, and cooperation.

Pretend play and symbolic activity are linked to emotional regulation and creativity, and digital games can extend these forms of play by offering safe environments where children can explore unfamiliar situations and rehearse behaviours through trial and error (Barz *et al.*, 2024). For young children, this potential depends on content that respects their cognitive and physical constraints and supports simple, multimodal, and non-punitive interaction (Samarakoon, Weerasinghe and Usoof, 2021). In other words, a preschool game needs more than child-friendly visuals: the interaction itself has to be easy to follow and safe enough for trial and error. Recent participatory

design work with children shows the value of involving them more meaningfully in digital learning design, yet preschoolers remain rarely included as co-designers (Galvão, García and Felipe, 2023; Xiao and Xu, 2025).

In response to the gap between games designed *for* young children and games designed *with* young children, this paper reports on “Emotion Detectives,” an exploratory workshop within a broader Educational Design Research (EDR) project on the co-design of an inclusive DEG for children. The study investigates whether preschool children can contribute meaningfully to game design when supported by tangible, play-based, and developmentally appropriate materials. The project is informed by the CASEL-5 framework (CASEL, 2020), which defines five core social-emotional learning competencies (self-awareness, self-management, social awareness, relationship skills, and responsible decision-making) and by Universal Design for Learning (UDL) (CAST, 2024), which promotes multiple ways of engaging learners, presenting information, and supporting expression. Together, these frameworks provide a way to design games that are both socially meaningful and accessible to children with different abilities and ways of participating.

By combining these frameworks, the study aims to design SEL experiences that are educationally grounded, inclusive, and suitable for young children. Rather than treating children as passive respondents, the workshop positions them as co-design partners in shaping characters, narratives, and interaction ideas for a DEG. By examining the artefacts and interactions produced in the workshop, this paper asks how preschoolers can participate in co-design and what the findings reveal about the methods needed to include them more fully in game development.

2. Methodology

The study was framed as an exploratory phase within a broader Educational Design Research (EDR) project. The workshop, “Emotion Detectives,” was used to refine the co-design materials before their use in preschool contexts and to observe how children and caregivers responded to a structured but open-ended design process. Participating groups were randomly assigned one of the five CASEL-5 dimensions: self-awareness, self-management, social awareness, relationship skills, and responsible decision-making (CASEL, 2020). This assignment was intended to support balanced coverage of the framework across the workshop outputs. The workshop prompt and toolkit were informed by findings from a systematic literature review and content analysis that highlighted the need for more inclusive, emotionally expressive, and child-centered design approaches (Raminhos Silveira, Tymoshchuk and Veloso, 2025, 2026).

A convenience sample of families was recruited through a disability support group’s communication channels, including social media, email, and in-person meetings. The final sample included 7 children aged 3 to 6 and 11 caregivers; 6 of the children had a diagnosed disability. Participation was voluntary, and informed consent was obtained from caregivers and children using age-appropriate explanations. The group was selected because it aligned with the project’s focus on inclusive representation and because its existing culture of mutual support helped create a setting where families could engage openly in collaborative work.

The workshop lasted approximately two hours and used a low-fidelity, hands-on co-design toolkit. Each family group worked through three activities that produced one protagonist biography, one narrative storyboard, and one game screen sketch. The activities were designed to support children’s participation through tangible materials, play-based prompts, and caregiver mediation, while also giving families enough structure to translate an abstract social-emotional skill into a playable game concept. One researcher facilitated the session, moved between groups, and took field notes on interaction patterns, decision-making, and how ideas evolved during the activities.

Data consisted of researcher field notes and photographs of the completed artefacts. These materials captured both the final outputs and the process by which families negotiated ideas, distributed roles, and transformed prompts into game concepts. Reflexive thematic analysis was used to identify recurring patterns across the groups, following repeated reading, clustering of codes into themes, and iterative refinement. This approach was appropriate because the study aimed not only to catalogue the artefacts produced, but also to understand how participants interpreted the workshop prompts and how their ideas shaped the emerging game designs.

This study was guided by three research questions:

RQ1: How do young children and their caregivers function as co-design partners in translating CASEL-5 skills into concrete preschool DEG requirements?

RQ2: What specific narrative structures, character features and feedback mechanics do families envision to support early childhood emotional regulation, inclusion and representation in digital learning environments?

RQ3: What preliminary inclusive design principles can be extracted from participatory data to guide the digital development and classroom testing of SEL-oriented digital educational tools?

3. Workshop Structure

The “Emotion Detectives” workshop was structured as an interactive co-design session in which children and caregivers worked together to create ideas for an inclusive preschool digital game. Each group received a dedicated toolkit with visual instructions and materials designed to support low-fidelity game making. The workshop lasted approximately two hours and was led by one of the researchers, who introduced the tasks, moved between tables to support discussion, and took notes on how families responded to the prompts.

The workshop produced three low-fidelity artefacts that captured design ideas at the character, narrative, and interface levels: Deliverable 1 (D1), a user interface layout showing the main character, background environment, and interactive buttons; Deliverable 2 (D2), a protagonist biography based on the Creating Empathetic Characters toolkit (Ribeiro, Veloso and Brinson, 2025), mapping the character’s personality, life foundation, path, and central conflict; and Deliverable 3 (D3), a three-act narrative sequence (beginning, conflict, resolution) scaffolding problem-solving mechanics linked to emotional regulation and social competence.

The session was organized around a shared co-design prompt: each family was assigned one CASEL-5 dimension and asked to translate that competency into an original non-human protagonist, a central conflict, and a low-fidelity digital solution. This structure was designed to support comparison across groups while leaving room for distinct interpretations of the assigned social-emotional skill across emotional regulation, interaction, and representation.

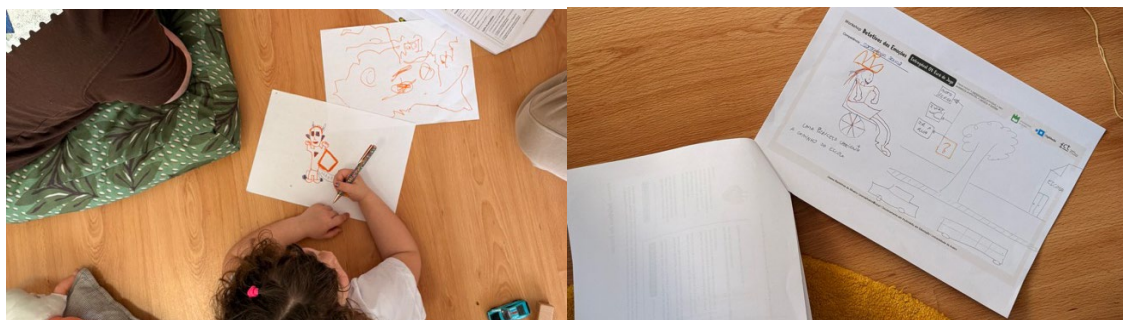


Figure 1: Participants engaging with the Emotion Detectives toolkit during a co-design activity

3.1 Welcome and introduction (15 min)

The researcher introduced the session, explained the workshop goals, and briefly presented the CASEL-5 framework. Families were divided into five groups and assigned one CASEL-5 dimension to guide their work.

3.2 Protagonist design (30 min)

Families co-created an original non-human protagonist for a preschool game. Children chose the character’s name, appearance, and conflict, while caregivers helped verbalize and register ideas. This activity produced D2, the protagonist biography.

3.3 Narrative storyboard (30 min)

Families created a three-part story arc (beginning, conflict, and resolution) showing how the protagonist might use the assigned social-emotional skill to respond to a problem.

3.4 Interface sketch (25 minutes)

Families translated their ideas into a game screen, focusing on simple, multimodal, and non-punitive interaction. This activity resulted in D1, the UI layout.

3.5 Sharing & Wrap-Up (20 min)

Each family briefly presented its concept to the group. Because the workshop was distributed across all five CASEL-5 dimensions, the resulting artefacts covered the broader SEL framework rather than focusing on a single skill.

4. Preliminary Results and Observations

The workshop produced five low-fidelity paper prototypes, one for each CASEL-5 dimension. All groups worked from the same design brief: create an original non-human protagonist, define a central conflict, and propose a low-fidelity digital solution with multimodal, non-punitive feedback. Within this shared structure, participant engagement was high, and the random assignment encouraged families to interpret the assigned SEL skill in creative ways. Overall, the session showed how children and caregivers could translate abstract competencies into concrete game ideas through low-fidelity materials and structured prompts.

4.1 Team 1: Little Panther Monster for Relationship Skills (*Competências sociais*)

The first family's protagonist, Little Panther Monster (*Monstrinho Panterinha*, Figure 2), is a 5-year-old described as secure, energetic, talkative and friendly, but prone to angry outbursts when events don't meet his expectations. The family gave him a prosthetic-leg-inspired weapon: a prosthetic pistol that spits fire, directly recontextualizing one child participant's own lived experience with a prosthetic limb as an empowering, central game element rather than a passive medical detail.

The storyboard follows a "fail-soft" arc (Samarakoon, Weerasinghe and Usoof, 2021): the character's outbursts alienate his peers, but instead of punishing or isolating him, his friends recall his dream of becoming a go-kart pilot and adapt the environment to include him. The story resolves in a group hug, with the character concluding that "the most important thing is to be with friends who care about him." By tying resolution to relational repair rather than punishment, this prototype models how DEGs can scaffold perspective-taking and normalize physical difference for preschool-aged children.

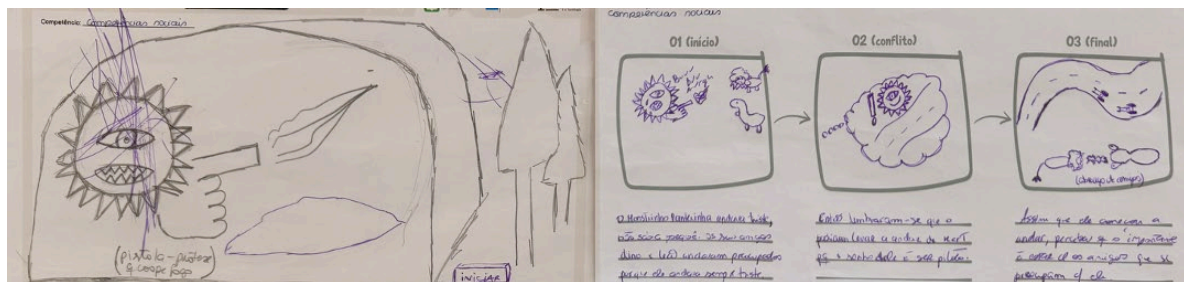


Figure 2: Co-design workshop artifacts for the Relationship Skills (*Competências Sociais*) dimension from the "Emotion Detectives" pilot session, featuring the main character: Little Panther Monster (*Monstrinho Panterinha*)

4.2 Team 2: Popa the Dragon for Self-management (*Autogestão*)

Popa is a 4-year-old, gender-neutral dragon and fire-spitter. They are creative, hard-working and assertive, but prone to stress and volatile outbursts when events don't develop as planned. This profile maps directly onto the intensity of preschool tantrums.

In the storyboard, Popa eats sugared soup, grows angry, and disrupts things with fire. There is a peak of overwhelm represented as heavy black scribbles filling the frame (Figure 3). The game then introduces a cognitive pause, redirecting Popa's volatile impulse into a constructive goal: using their breath to inflate hot-air balloons instead. Self-management is operationalized as reframing an overwhelming reaction into constructive action, reinforcing the idea that intense emotions can be redirected rather than suppressed.

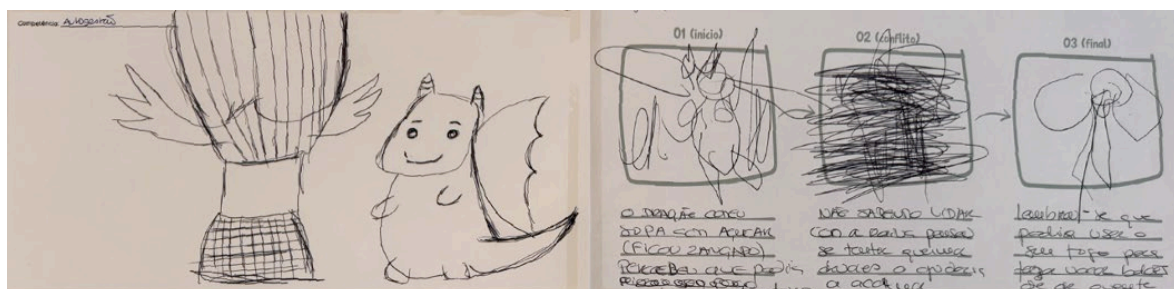


Figure 3: Co-design workshop artifacts for the Self-management (*autogestão*) dimension from the "Emotion Detectives" pilot session, featuring the main character: Popa the Dragon

4.3 Team 3: Teté the Sheep for Self-awareness (*Autoconsciência*)

Teté (Figure 4) is a 25-year-old sheep who works as a herd organizer. She is calm, organized and reflective, and quick to ask for help when something doesn't go to plan.

The storyboard presents a crisis: a peer has fallen into a fast-flowing river. Rather than attempting a solo high-risk rescue, Teté recognizes the limits of individual action and gathers the herd to pull their friend to safety together. In this way, self-awareness is linked to recognizing one's limits and mobilizing social support, aligning with SEL perspectives that frame help-seeking as a strength rather than a deficit.

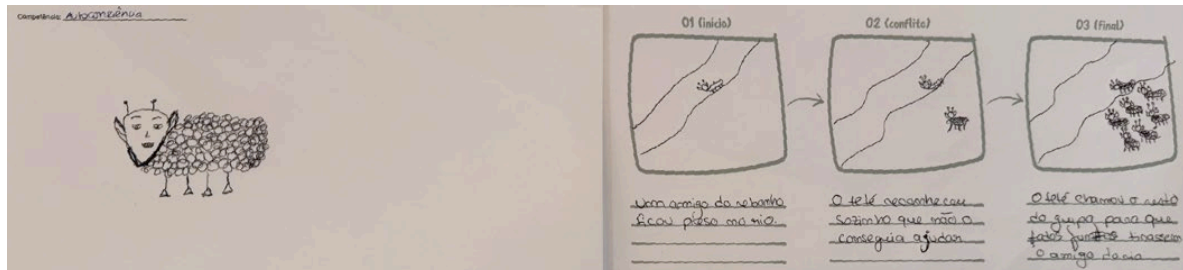


Figure 4: Co-design workshop artifacts for the Self-awareness (*autoconsciência*) dimension from the "Emotion Detectives" pilot session, featuring the main character: Teté the Sheep

4.4 Team 4: Tatá the Wheelchair Princess for Social Awareness (*Consciência social*)

Tatá (Figure 5) is a 16-year-old girl from Brazil who uses a wheelchair. She is described as artistic, curious and an active listener, with the dream of becoming a veterinarian. When frustrated, she regulates herself through breathing strategies.

The interface (Figure 5) depicts an urban street with a large tree blocking the sidewalk and offers three branching choices: cut the tree down (removing shade, creating traffic for everyone); reroute the sidewalk around the tree and add a swing (a positive, inclusive outcome); or have Tatá risk the road. Every path, optimal or not, still ends with Tatá arriving at school, which means that consequences are social rather than punitive. This design uses digital media to scaffold real-life perspective-taking and normalize physical accessibility within a preschool learning space.

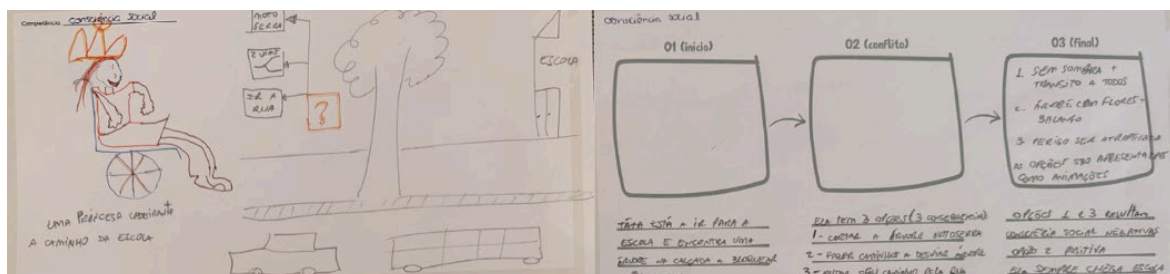


Figure 5: Co-design workshop artifacts for the social awareness (*consciência social*) dimension from the "Emotion Detectives" pilot session, featuring the main character: Tatá

4.5 Team 5: Responsible Decision-making (*Tomada de decisão responsável*)

Capucheto (Figure 6) is a 54-year-old non-binary superhero built around the belief that "everybody eats and everybody poops." The antagonist here is unconventional: processed food, stomach aches, and constipation, which provoke anger and frustration when they arise.

The three-act structure establishes this premise, tasks the player with resolving a digestive blockage, and resolves by guiding the character to a "responsible sanitary target" (diaper, potty, or toilet) visualizing how accumulated dietary choices produce consequences.

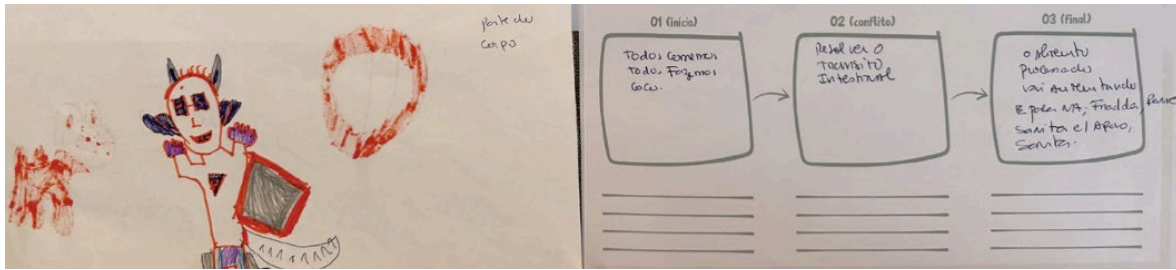


Figure 6: Co-design workshop artifacts for the Responsible decision-making (tomada de decisão responsável) dimension from the “Emotion Detectives” pilot session, featuring the main character: Capucheto Papai

Supplementary child-led drawings (Figure 7) mapped the digestive tract in more detail, reinforcing the link between responsible choices and physical well-being.

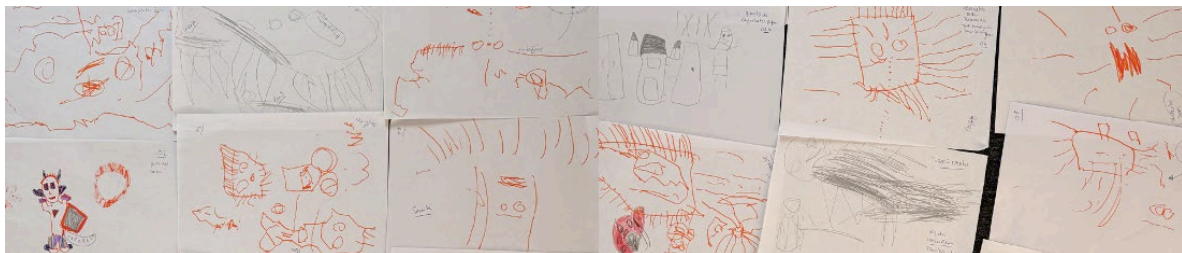


Figure 7: Children's auxiliary concept drawings for the Responsible decision-making dimension prototype. The canvas illustrates digestive processes and helps conceptualize bodily well-being within the game narrative

Overall, the five prototypes suggest that preschool children can contribute meaningful design ideas when the task is broken into concrete, low-fidelity activities and supported by caregiver mediation. Table 1 summarizes the character design, interface, and narrative arc produced by each team.

Table 1: Summary of co-design deliverables by team

CASEL domain	Deliverable 1: Interface	Deliverable 2: Protagonist bio	Deliverable 3: Storyboard
Relationship skills	Character, background, buttons, and system reactions	Little Panther Monster: a 5-year-old monster who is energetic and friendly but struggles with frustration	Alienation → peer intervention → group-hug → relational repair
Self-management	Cognitive pause and rechanneling mechanic	Popa the Dragon: a 4-year-old gender-neutral dragon who is creative and hard-working but easily overwhelmed	Sugared soup → anger/fire → rechannel breath to inflate balloons
Self-awareness	Collective task activation	Teté the Sheep: a 25-year-old sheep who is calm, reflective, and asks for help	Peer trapped in river → recognize limits → call group to rescue
Social awareness	Urban sidewalk, branching choices, animations for outcomes	Tatá: a 16-year-old girl from Brazil who uses a wheelchair and is artistic, curious, and attentive	Barrier in path → choices → consequence-based resolution
Responsible decision-making	Guiding character to sanitary target (diaper, potty or toilet)	Capucheto Papai: a 54-year-old non-binary superhero concerned with bodily care	Dietary choices → blockage → guide to toilet / potty / diaper

5. Conclusions

This pilot study shows that preschool children can contribute meaningfully to co-design when the process uses tangible materials, clear prompts, and a playful workflow. In this workshop, children and caregivers translated abstract CASEL-5 competencies into concrete game ideas, including characters, narratives, interaction flows, and feedback systems.

In relation to RQ1, the findings indicate that preschool-aged children can participate meaningfully as co-design partners when supported by tangible materials, clear prompts, and a playful workflow. Families were able to translate abstract CASEL-5 competencies into concrete design elements, including protagonists, narratives, interaction flows, and feedback systems. This enabled children and caregivers to move beyond the roles of “user” or “tester” and contribute directly to the design process.

In relation to **RQ2**, the thematic analysis revealed recurring patterns across the co-designed artefacts. Protagonists were frequently used as symbolic containers for emotional and social conflicts, creating a safe distance through which children could explore themes such as anger, frustration, inclusion, and vulnerability. Families consistently preferred narrative consequences and animated responses over punitive endings, and accessibility and representation emerged as integral elements of both character design and game worlds rather than as optional additions.

These observations inform RQ3 by supporting four preliminary design principles for SEL-oriented DEGs in preschool contexts:

1. Use non-human protagonists to create symbolic distance for emotional exploration;
2. Design fail-soft feedback systems that support trial-and-error learning through consequences rather than punishment;
3. Embed accessibility and representation from the outset in character, narrative, and environment design; and
4. Ensure balanced coverage of the CASEL-5 framework across the game’s narrative and interaction.

The co-design artefacts extend earlier findings from the systematic literature review and content analysis by showing how preschool children and caregivers can operationalize SEL concepts in concrete design forms (Raminhos Silveira, Tymoshchuk and Veloso, 2025, 2026). Taken together, these findings suggest that preschool children can contribute meaningfully to participatory design when the process is adapted to their developmental stage. More importantly, they show that the exclusion of young children from design is not an inherent methodological limitation, but a consequence of unsuitable methods and assumptions. This study therefore moves the broader project from diagnosing gaps in existing SEL games toward proposing a concrete and replicable co-design approach for developing inclusive digital educational technologies *with*, rather than merely *for*, young children.

6. Limitations

This exploratory study has several limitations that should be considered when interpreting the findings. First, the sample was small and drawn from a single disability support association, which limits the transferability of the results to other social, cultural, and educational contexts. The participants may also have had specific motivations and experiences that shaped the design outcomes in ways that differ from those of more diverse populations.

Second, the study relied on low-fidelity artefacts and researcher field notes, which means that it did not capture children’s real-time interaction with a functional digital prototype. As a result, the data provide rich insight into co-design preferences and imagined gameplay, but they do not yet show how the proposed ideas would work in practice. Future digital implementation will therefore be necessary to assess usability, engagement, and pedagogical impact.

Finally, the workshop reflects an early generative phase of the broader EDR project. The artefacts should be understood as initial design directions rather than finalized solutions. They nonetheless offer valuable insight into how young children and caregivers conceptualize SEL, accessibility, and gameplay when given an appropriate participatory format.

7. Future Research

The next phase of the project will first replicate the workshop with other children, with and without disabilities, in different regions of the country. This will make it possible to examine whether the co-design process remains effective across more diverse educational, social, and geographical contexts.

After this broader replication, the project will move toward the development of a functional digital prototype. Subsequent EDR cycles will test the game in Portuguese preschool classrooms, to assess usability, engagement, and the extent to which the final design supports SEL learning goals in inclusive settings. These later phases will

also allow the research team to refine the preliminary design principles emerging from this pilot and evaluate their relevance for classroom implementation.

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Ethics Declaration: This study involved the analysis of anonymized artefacts produced during a voluntary co-design workshop with children and their caregivers. In accordance with institutional guidelines, formal ethics committee approval was not required for this type of observational research. Nevertheless, strict ethical standards were upheld throughout the study. Verbal consent was obtained from all caregivers and children, and agreement was secured from participating children using age-appropriate explanations. All collected data were fully anonymized prior to analysis to ensure participant confidentiality and privacy.

AI Declaration: During the preparation of this work, the authors used Perplexity to improve grammatical accuracy of the manuscript. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the final text and accuracy of this paper.

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