Gather to Glow: Designing an Autonomy-Supportive Game for Parent–Child Digital Co-Play

ABSTRACT

Parent–child digital co-play raises a design challenge in which caregiver involvement can unintentionally become parental dominance, potentially undermining children's autonomy. Drawing on Self-Determination Theory (SDT), we present Gather to Glow, an autonomy-supportive game that integrates Parental Autonomy Support (PAS) guidelines to scaffold caregiver participation while ensuring child-led play. The system operationalizes autonomy through three mechanisms: (1) asymmetric roles that secure child-led exploration and decision authority, (2) diegetic and visual feedback designed to sustain intrinsic motivation, and (3) choices-as-collectibles with AI customization. We detail a four-phase loop—explore, conversation, cooperation, and reflection—and discuss pilot observations illustrating how this structured interaction preserves child volition through autonomy-supportive parenting guidelines while also creating moments in which children enact agency in play and families begin to co-construct child-led co-agency.

Author Keywords

Parent-child interaction; autonomy; child-centered design; joint media engagement; game design.

CSS Concepts

• Human-centered computing • Empirical studies in HCI.

INTRODUCTION

Joint media engagement (JME) has become a common form of parent–child interaction. Prior HCI research describes co-use and co-play as meaningful family practices through which parents participate in children's digital activities and use shared interaction to support family connection and communication [1, 2]. However, recent work highlights recurring co-play challenges in which parental involvement can drift toward control rather than support. For example, Wang et al.'s cross-cultural observations [3] report that parents frequently direct interaction or take over device control, patterns that limit children's opportunities to lead. Consistently, the KOALA Hero Toolkit research [4] warns that such parent-led approaches can undermine children's autonomy, indicating that constructive engagement does not follow automatically from sharing a device. Instead, dynamics of parental dominance often impede the quality of shared interaction by shifting the experience from collaborative play to adult-driven direction. This creates a critical design challenge:

"How can co-play systems scaffold caregiver involvement while keeping children in the lead and preserving autonomy during play?"

We argue that meeting this challenge requires attending to both sides of the co-play system: (1) game mechanics that preserve child-led exploration and autonomy, and (2) guidance for caregiver involvement that helps parents support rather than control. We therefore ground our approach in Self-Determination Theory (SDT), framing autonomy as volitional, self-endorsed action [5,6], and integrate established autonomy-supportive game affordances—such as meaningful choice, customization, and open-ended exploration—that can support autonomy experiences in play [7,8]. In parallel, we draw on Parental Autonomy Support (PAS) as an alternative to controlling involvement, operationalized through three guidance principles: offering meaningful choices, providing rationales, and acknowledging children's feelings and perspectives [9,10].

To explore how integrating autonomy-supportive game affordances with PAS-guided caregiver participation can keep children leading co-play while supporting their autonomy, we developed Gather to Glow, a two-controller parent–child co-play game. We investigate:

RQ1: How do children experience perceived autonomy (volition and choice) and enjoyment across the game's key mechanisms?

RQ2: How do parents enact PAS during co-play, and how do families perceive the resulting interaction quality?

RQ3: What design insights does Gather to Glow offer for developing parent–child co-play systems?

We contribute (1) an autonomy-supportive co-play system that integrates PAS-guided caregiver participation into gameplay, (2) a set of concrete design mechanisms and a structured co-play loop that preserves child-led interaction while enabling caregiver support, and (3) early empirical insights and design implications from a pilot with parent–child dyads.

THE GAME DESIGN OF GATHER TO GLOW

Design Objectives

The development of Gather to Glow was guided by three objectives: (1) to preserve child-led autonomy during co-play; (2) to scaffold parental autonomy support (PAS) and involvement in situ; and (3) to foster children's intrinsic motivation through visual and diegetic progress feedback.

From Narrative to Mechanism: The Design of Gather to Glow

Game Narrative

Gather to Glow is a collaborative journey set in the Crayon Spirits' world, where a child and parent work together as the Crayon Angel and Guardian Angel to collect shattered, grey Wish Lamp fragments, restore their colors, and ultimately reglow the lamp—making it glow again.

- *The Wish Lamp of Crayon Spirits*

- *The Lamp Shattered into Grey Fragments*

- *A Collaborative Journey to Reglow the Lamp*

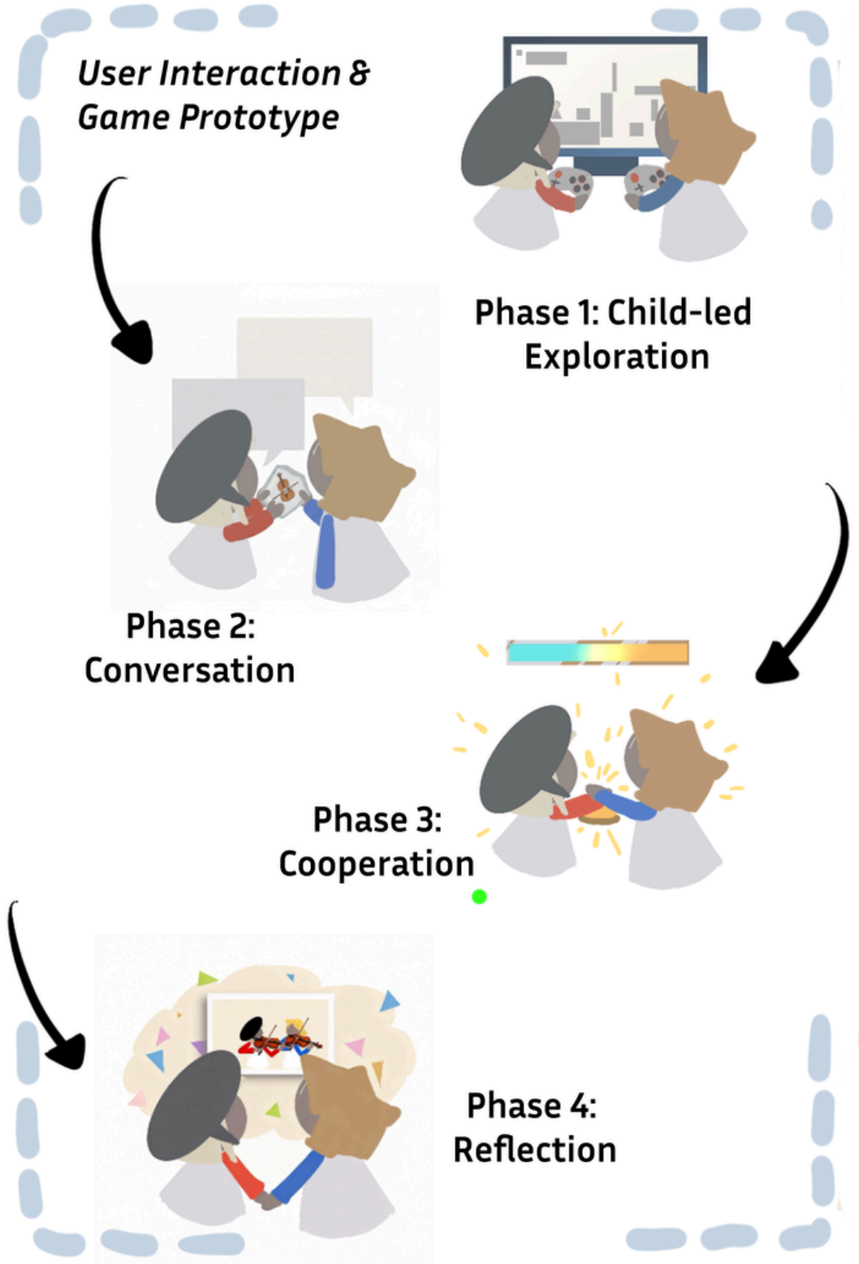
Game Mechanisms

Asymmetric Roles. To mitigate parental dominance in digital co-play, Gather to Glow uses asymmetric two-controller roles that preserve child-led exploration and decision authority. The **child controls the red "Crayon Angel"** and exclusively confirms fragment pickup (X), retaining decision authority over which fragments to collect and where to go. The **parent controls the blue "Guardian Angel"**, restricted to support actions such as double-jump (A) and hand-pull (Y), enabling scaffolding without overriding the child's direction.

Choices-as-Collectibles. To ground autonomy in meaningful domains, the game encodes children's interests as primary gameplay choices. Through interest exploration, collected "wish fragments" represent developmentally relevant activities based on the Theory of Multiple Intelligences. Furthermore, AI-guided personalization allows children to create unique fragments reflecting self-defined intents. This shifts interaction from selecting predetermined options to expressing intent through creation, supporting personalized choices while preserving the child's decision authority.

Diegetic Progress Feedback. This frames progress inside the story world rather than as external evaluation. In Gather to Glow, families restore the Wish Lamp from grey to color by collecting and transforming fragments, emphasizing meaningful restoration and shared accomplishment instead of scores or rankings—helping sustain intrinsic motivation without becoming controlling.

The Game Loop of Gather to Glow



Phase 1: Exploration

Grey Fragments

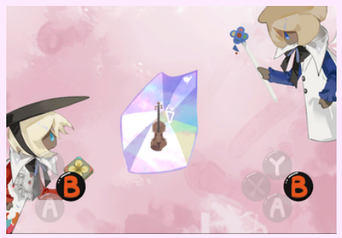
Families start in a selectable scenario where the child freely explores and selects any wish fragment (PAS: offering meaningful choice). The parent supports navigation without directing goals. An NPC later prompts the parent to offer one optional suggestion plus a brief child-facing rationale (PAS: providing rationales) and to invite the child's input before committing. Progress stays low-pressure (no required count); the child advances after choosing one, with micro-interactions (e.g., sound cues; movement platforms) sustaining curiosity.

Phase 2: Conversation

Magic Rewards

Co-play moves to the Magic Book dialogue space. The child selects one collected fragment to discuss and uses cards to describe its meaning and label a feeling. The parent responds with structured cards that acknowledge the child's feeling/perspective (PAS: acknowledging feelings and perspectives) and offer autonomy-supportive help (e.g., time, attention, practical support) without evaluating or taking over. Completing the shared collage grants a "magic" reward that unlocks supportive abilities for the next phase.

Phase 3: Cooperation



Colorful Fragments

This phase features a synchronized quick-time event (QTE) requiring precise coordination between parent and child. Both players must respond to on-screen prompts at the same moment to succeed. Each success produces a stepwise color change, fully restoring the fragment's vibrancy after three rounds and creating a concrete moment of shared interactive accomplishment.

Phase 4: Reflection

AI-Personalized Fragments

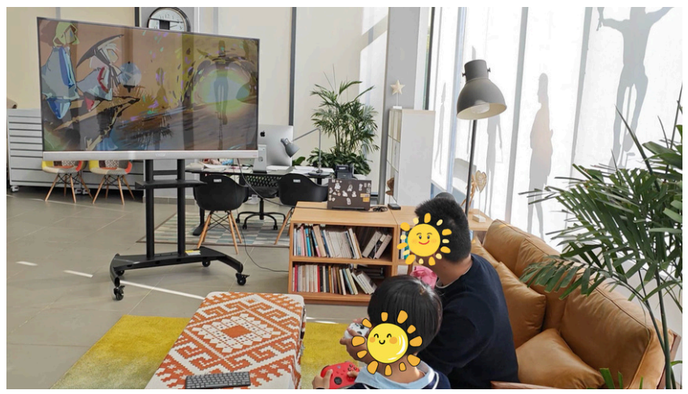
To bridge gameplay with everyday life, an AI-generated "Family Lamp" synthesizes the collected fragments into a future-oriented artifact. It presents optional "what next" family activities grounded in the child's endorsed interests. This reflection supports volitional continuation and provides a shared starting point for deeper family connection outside the game.

USER STUDY

Method. We conducted an exploratory pilot to examine how Gather to Glow is experienced in parent–child digital co-play and to elicit early design insights for autonomy-supportive co-play. Each dyad completed a full session. Data included (i) in-situ gameplay observations and (ii) semi-structured dyadic interviews with the parent–child pair. This study has been approved by the university's Applied Psychology Institutional Review Board (Protocol: EF20260112001).

Participants. Four parent–child dyads with children aged 6–7. Caregivers included two fathers and two mothers; children included two boys and two girls. Families reported limited prior digital co-play experience. Quotes use dyad/role codes (D1–D4; C = child, P = caregiver).

Procedure & Analysis. Sessions were conducted in person. Dyads played while we recorded audio/video and took field notes on co-play behaviors (e.g., who initiates decisions, how support is offered, when caregivers step in, coordination strategies). Post-play interviews focused on children's experiences of choice and enjoyment, caregivers' understanding and enactment of PAS, perceived interaction quality, and design suggestions. We analyzed data via a mechanism-to-evidence mapping approach, synthesizing intended function, observed behaviors, representative evidence, and design implications for each mechanism



RESULTS

Choices-as-Collectibles supported children's volition and enjoyment. Across dyads (n=4), fragment selections were often self-endorsed and personally meaningful. For example, when collecting a basketball-related fragment, one child explained: "I want to choose this one because I also picked basketball as my extracurricular this semester." Children also described fragment collection as the freest part of play, and two explicitly named it as the most enjoyable phase (D1–C; D4–C). In observation, one child exclaimed: "Wow—I can jump really high to get the fragments! It feels like a trampoline—super fun!" (D1–C). These observations suggest that the exploration phase supported self-endorsed choice and enjoyment.

Asymmetric roles helped caregivers support without taking over. Children often led navigation toward self-chosen fragments: "Dad, come here—I want to collect this one!" (D2–C). Caregivers sometimes tried to pick up a fragment, then realized they could not: "So I can't pick it up, right?" (D1–P). In interviews, caregivers valued that the design required letting the child act; while they might help immediately in real life, in the game, "it has to be handed to the child" (D3–P).

Gameplay revealed moments of children's agency. Gameplay also revealed moments of children's agency. Some children used the game's interest-based elements to direct play and express personally meaningful goals. For example, one child recruited the caregiver into a self-chosen activity: "Dad, come here—I want to collect this one!" (D2–C). Another linked a bicycle fragment to a future goal: "I have a bike too, but it's not like the one in the game—it still has two little training wheels. I picked this bike because I want to take the training wheels off for the New Year" (D2–C).

Conversation scaffolds supported PAS and revealed moments of co-agency. Reflecting on Level 2 conversation, one caregiver shared that her daughter said she had "always wanted to learn ballet," called it "her dream," and had "not dared to say so before" because she felt "too fat." The caregiver realized this was not "just a passing interest" and proposed that "we can sign you up for several trial ballet classes over the winter break." This suggests that Level 2 conversation supported acknowledgment and child-led meaning-making that extended into shared family action, with the child articulating the goal and the caregiver helping move it forward. Yet when asked directly about PAS, most caregivers described it only vaguely.

DISCUSSIONS

Our pilot suggests that Gather to Glow supported autonomy-supportive co-play as intended: children experienced self-endorsed choice and enjoyment, while caregivers were encouraged to support without taking over. The findings also point beyond autonomy alone. Some children used fragments to express meaningful goals and direct play, revealing moments of agency. In Level 2 conversation, caregivers appeared to better understand children's perspectives and sometimes helped extend children's intentions into shared family action, suggesting emergent co-agency. However, caregivers' explicit understanding of PAS remained vague. Practically, Gather to Glow offers design insights for parent–child co-play through child-led mechanics such as choices-as-collectibles, asymmetric roles, diegetic feedback, and structured conversation.

CONCLUSION AND FUTURE WORK

Through the design and pilot testing of Gather to Glow, we found that autonomy-supportive game affordances and PAS-aligned guidance may help mitigate parental dominance in family co-play while supporting children's volition and agency. Next, we plan to formalize a three-stage PAS scaffold: (1) pre-game onboarding for caregivers, (2) in-game AI scaffolding with real-time autonomy-supportive prompts, and (3) family recap to reinforce supportive behaviors beyond play.

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