DreamTales: Reframing AI's role in Parent-Child Storytelling through Pre-Post Reflection

Hisako Nomoto*
hisako_nomoto@gse.harvard.edu
Harvard University
Cambridge, MA, USA

Nomy Jianing Yu*
nomyyu@mit.edu
Harvard University
Cambridge, MA, USA

Shohreh Ghorbani*
ghorbani@mit.edu
MIT Media Lab
Cambridge, MA, USA

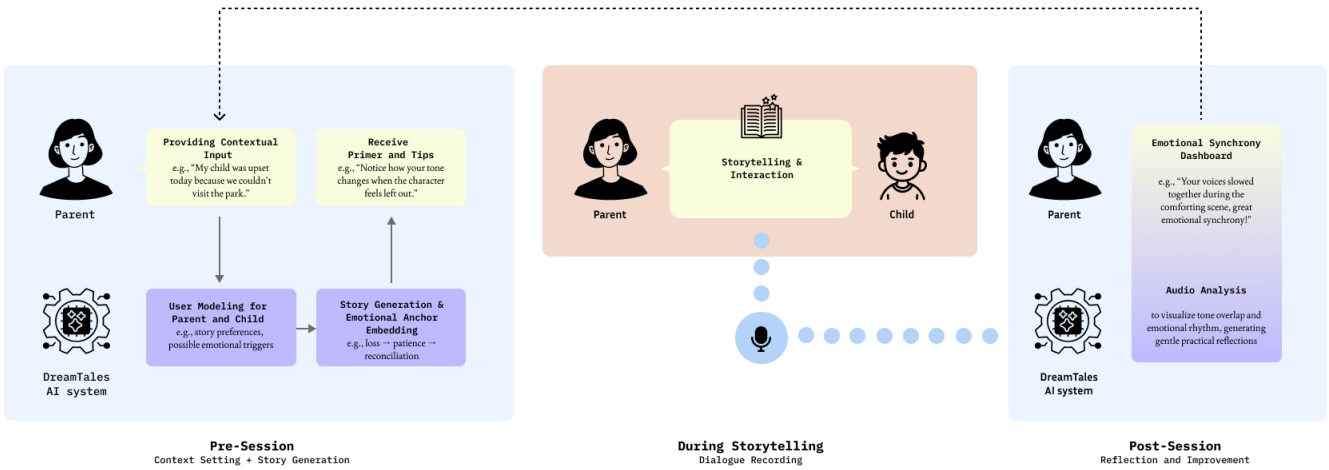

Figure 1: DreamTales reframes AI's role in parent–child storytelling by shifting support away from real-time intervention toward preparation and reflection. Before the session, AI helps parents contextualize the story and primes emotional awareness through personalized story generation. During storytelling, the system remains passively silent, preserving uninterrupted parent–child interaction. After the session, a reflective dashboard visualizes emotional synchrony and offers non-judgmental cues to support parental sense-making and future attunement.

Abstract

Existing AI co-reading systems usually function as In-Situ Mediators that scaffold parent–child dialogue in real time. While such systems can increase short-term engagement, our preliminary study suggests that these interventions may risk diminishing parental agency, authority, and reflective capacity by inserting AI into the live emotional exchange. DreamTales introduces an alternative design approach: an AI-supported Pre–Post Reflection Workflow that positions AI as a **Reflective Companion** for parents. We developed a functional prototype that leverages GPT-4o and DALL·E 3 for personalized, context-aware story generation, passively analyzes reading sessions using a multimodal pipeline (vocal and linguistic synchrony), and provides a non-judgmental Reflective Dashboard after the story. In a pilot study (N=2), parents expressed a strong preference for the reflective workflow over live AI mediation, citing improved preservation of the parent–child dyadic bond. Notably, personalized story generation emerged as a potential catalyst for emotional synchrony. Together, this work highlights the Reflective Companion model as a promising design direction and sheds light on opportunities for further exploration and validation of personalized storytelling as a mechanism for supporting parent–child emotional bonding and parental reflective awareness.

CCS Concepts

• **Human-centered computing** → **Emotional computing**; *Natural language interfaces*; Mobile devices.

Keywords

AI Storytelling, Emotional Synchrony, Parental Reflective Functioning, Pre-Post Reflection, HCI for Caregiving, Attachment Theory

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1 Introduction

Shared storytelling is a foundational practice for parent–child bonding, supporting emotional co-regulation, attachment security, and the development of social–emotional skills. During these intimate moments, caregivers are expected to notice and respond sensitively to a child's subtle affective cues, a capacity often described as attunement. However, in everyday contexts, parents frequently struggle to achieve such attunement due to external stressors, emotional fatigue, or uncertainty about how to navigate feelings-based conversations.

Recent advances in artificial intelligence have motivated a growing number of AI-supported co-reading and storytelling systems that aim to scaffold parent–child interaction. Many of these systems position AI as an in-situ mediator, offering real-time prompts, questions, or guidance during the interaction (e.g., ContextQ [8], StoryBuddy [18]). While such approaches can increase short-term engagement and conversational turns, inserting AI into the live emotional exchange introduces important relational tensions. By directing attention, shaping conversational flow, or performing emotional labor in the moment, real-time mediation can reshape how authority, agency, and intimacy are distributed within the dyad. Prior work has raised concerns about the delegation of intimacy to automated systems [5], a dynamic that may undermine caregivers' sense of competence and reflective capacity. In our preliminary interviews, parents also described in-situ AI interventions as intrusive and disruptive to the natural rhythm of shared storytelling.

In response to these tensions, we explore an alternative role for AI in parent–child storytelling: positioning AI not as an instructor or mediator, but as a *Reflective Companion*. Rather than intervening during the interaction, this design approach shifts AI support to moments before and after the live exchange, preserving the integrity of the dyadic bond while creating space for parental reflection. This reframing draws on theories of parental reflective functioning [14], which emphasize caregivers' capacity to interpret a child's internal states and reflect on their own emotional responses as a foundation for sensitive caregiving. We embody this approach in **DreamTales**, an AI-supported pre–post reflection workflow for bedtime storytelling. Prior to a reading session, the system generates a highly personalized, context-aware story—incorporating the child's interests, recent experiences, or emotional challenges—and provides a brief, non-intrusive reflection primer for the parent. During the storytelling session, the system remains passively silent, capturing interaction signals for later reflection without interrupting the live exchange. After the session, a Reflective Dashboard visualizes key moments of emotional synchrony—the temporal alignment of parent and child vocal and affective patterns—offering non-judgmental prompts intended to support awareness and sense-making rather than prescriptive guidance.

We conducted a formative pilot study with two parent–child dyads to explore how caregivers experienced this reflective workflow in comparison to real-time AI mediation. Although limited in scale, the study surfaced a strong parental preference for non-intrusive, reflective AI support. Parents emphasized the importance of maintaining uninterrupted emotional flow during storytelling and reported that post-session reflection felt more aligned with their caregiving values and sense of agency. Notably, personalized story generation emerged as a potential catalyst for emotional synchrony, providing a shared affective foundation that shaped the subsequent interaction.

This work makes three primary contributions. First, we introduce the concept of AI as a *Reflective Companion*, reframing AI's role in intimate parent–child interactions away from in-situ mediation toward reflective support. Second, we present DreamTales, a functional prototype that integrates large language models (GPT-4o and DALL·E 3) for personalized storytelling with a multimodal analysis pipeline for post-session reflection on emotional synchrony. Finally, through a formative pilot study, we provide early empirical insights that highlight the promise of reflective, non-intrusive AI workflows and point to personalized storytelling as a promising mechanism for supporting parent–child emotional bonding and parental reflective awareness.

2 Related Work

2.1 Shared Reading as a Context for Co-Regulation and Attachment

Bedtime storytelling is among the most enduring early childhood rituals. Beyond literacy, it serves as a critical arena for emotional co-regulation and attachment formation between parent and child [3, 4]. Through tone, rhythm, and proximity, parents help children transition from arousal to calm and model emotional regulation and empathy [16].

Attachment theory situates this process in caregiver responsiveness: sensitive engagement fosters attachment security, which predicts children's reflective functioning—the ability to understand behaviors through underlying emotions [1, 9]. A recent randomized trial comparing parent-led and AI-guided dialogic reading found that while children with an LLM-based conversational agent showed greater behavioral engagement, those reading with parents displayed stronger affective engagement and narrative-relevant vocalizations [17]. These results reaffirm the irreplaceable value of parental attunement in fostering empathy and emotional understanding.

Meanwhile, new computational approaches have begun quantifying the qualities of such interactions. Analyses of behavioral and vocal synchrony show that alignment in body movements, tone, and tempo between parent and child correlates with engagement and relationship quality [2, 12]. However, most "sleep-support" technologies still target behavioral routines rather than the relational mechanisms underpinning bedtime calm. This motivates HCI research that enhances relational attunement rather than automating parental behavior.

2.2 "In-Situ Mediators": AI's Real-Time Intervention in Shared Reading

To address the lack of structured support for shared reading, the HCI community has developed a range of AI-based systems to scaffold parent–child engagement. A dominant paradigm is the in-situ mediator, where AI intervenes during the live interaction to

guide dialogue or manage turn-taking. One form positions AI as a parental prompter. For example, ContextQ automatically generates dialogic questions on a tablet interface to encourage parents to ask open-ended questions and sustain deeper co-reading conversations [8]. Another form casts AI as an active third participant. StoryBuddy introduces a conversational agent as a co-storyteller whose involvement level can be adjusted by the parent, while long-term home deployments of social robots show how robots can coordinate triadic storytelling and cooperative play sessions between parents and children [18]. These systems successfully increase observable engagement metrics such as conversational turns and vocabulary diversity, indicating richer verbal interaction.

However, real-time AI mediation inevitably reshapes the interaction dynamic. When AI assumes partial control of narrative flow or question timing, it reshapes the natural rhythm of parental responsiveness. The parent may become a facilitator of AI prompts rather than an autonomous storyteller. As a result, while the child benefits cognitively, the affective bond and parental sense of authorship can be diminished. Such tensions have led researchers to explore alternative roles for AI that preserve the intimacy and authenticity of the parent–child storytelling experience.

2.3 "Reflective Companion": Reclaiming Agency in Relational AI Systems

The increasing presence of AI in family life raises a central HCI question: ***how should AI technology participate in relational, emotionally charged activities like caregiving?*** Sustained real-time mediation can gradually shift parents from agentic caregivers to operators of automated routines [10]. When AI performs expressive or affective roles, such as telling stories, asking questions, comforting the child, it may displace parental authorship and emotional labor, leading to over-reliance and reduced confidence [5, 15]. Over time, such delegation of care can result in "delegated intimacy": a redistribution of emotional work that weakens empathy and relational authenticity [7].

In contrast, a new HCI paradigm emphasizes reflective support over automation. Instead of optimizing real-time behavior, reflective systems aim to expand users' awareness of their actions and emotions [6]. This repositions AI as a mirror rather than a manager. In educational and wellbeing technologies, post-interaction reflection has proven effective for sustained learning and behavior change [11]. Systems such as eaSEL [13] generate post-viewing summaries of children's emotional moments rather than interrupting the experience, allowing parents to lead subsequent discussions. Similarly, research on dyadic synchrony shows that emotionally salient moments can be passively detected through tone and motion cues [2, 12].

Building on these insights, DreamTales introduces a reflective-companion model that facilitates pre-story preparation and post-story reflection rather than live mediation. The system separates observation from intervention, surfacing patterns of vocal and behavioral synchrony to foster parental reflective functioning, i.e., understanding one's own and the child's internal experiences [9]. The goal is not immediate behavioral optimization but long-term sensitivity and self-efficacy, positioning AI as a scaffold for parental agency and empathy rather than efficiency.

3 Methodology

We adopted a research-through-design methodology to explore alternative roles for AI in parent–child storytelling. Our process consisted of three tightly coupled stages: (1) a formative design exploration to understand parental values and perceptions of AI roles in co-reading, (2) the design and implementation of the DreamTales prototype, and (3) a small-scale pilot user study to probe the reflective workflow in practice.

3.1 Formative Design Exploration

We first conducted a formative study with two families (N=2): a mother with a 4-year-old daughter and a father with a 3-year-old son. The aim of this stage was not to evaluate a system, but to explore parents' existing co-reading practices, relational goals, and perceptions of different AI roles in shared storytelling. We employed semi-structured interviews that combined questions about current bedtime reading routines with a conceptual comparison between two hypothetical AI support models: **AI as In-Situ Mediator** and **AI as Reflective Companion**.

Interview prompts focused on parents' interpretations of high-quality co-reading interactions, sources of stress or discomfort during bedtime routines, and moments they described as emotionally meaningful or synchronizing with their child. Parents were also asked to reflect on how real-time AI prompts or post-session reflection might affect their sense of agency, authority, and emotional connection with their child. This formative exploration surfaced key tensions around the delegation of emotional labor and highlighted parents' desire to preserve a personalized narrative backed by the family's cultural background, which directly informed subsequent design decisions.

3.2 Prototype Design: DreamTales

Guided by insights from the formative exploration, we designed and implemented DreamTales, an AI-supported pre–post reflection workflow for parent–child bedtime storytelling. The system was intentionally structured to separate observation from intervention, positioning AI as a reflective companion for parents. The prototype consists of three stages.

3.2.1 ***Pre-Session: Personalization and Preparation.*** The parent initiates the process by inputting the child's context, including basic information such as name and age, as well as more personal and reflective questions such as his current interests ("loves race cars") and a recent emotional struggle ("was sad we couldn't go to the park"). The personalized story generation pipeline involves both GPT-4o and DALL-E 3 for text and illustration generation:

- **Story Engine (GPT-4o)**: Based on the parent's input, GPT-4o generates a bespoke story text. The prompt is meticulously engineered to enforce constraints crucial for the target age group (3–6 years): simple, low-complexity vocabulary; short sentence structure; and the integration of the child's context as a key emotional narrative element.
- **Visual Asset Pipeline (DALL-E 3))**: To support the visual aspect of the storybook, DALL-E 3 generates consistent, simple illustrations based on character descriptions generated by the LLM.

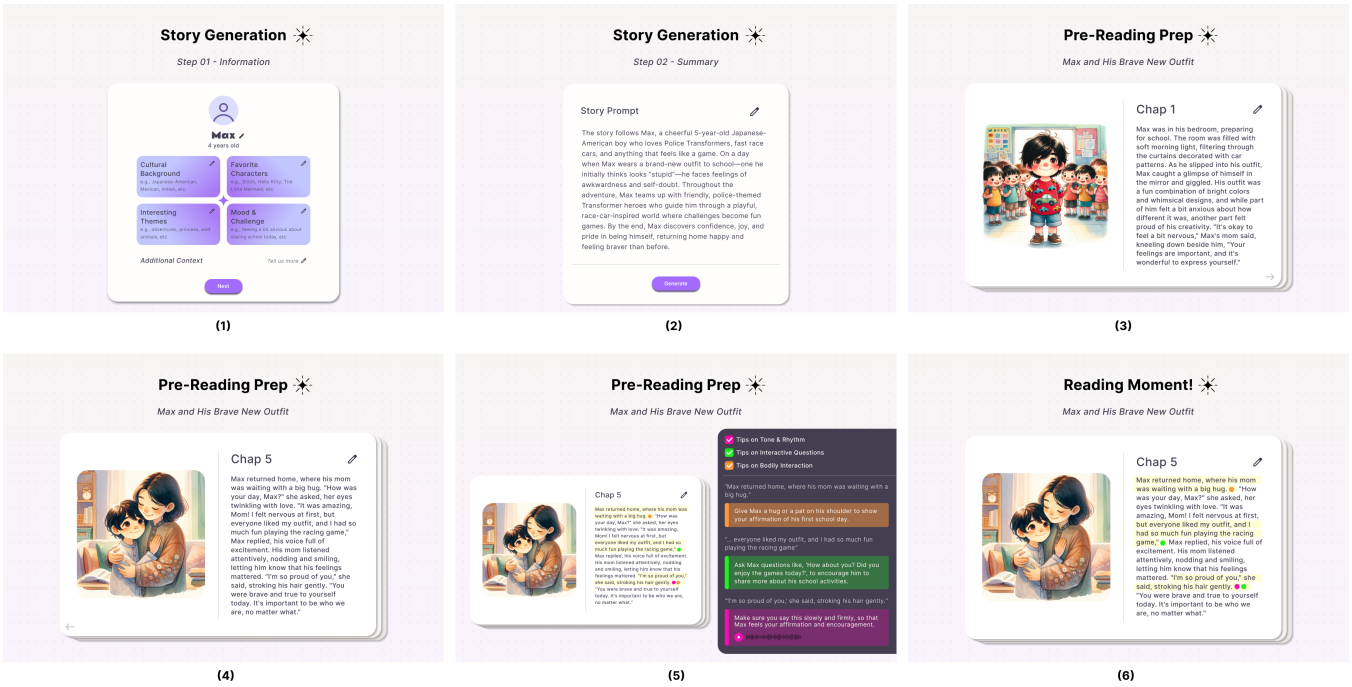

Figure 2: Pre-Story Workflow for Personalized Story Generation and Pre-Reading Preparation. (1) Parents first provide structured contextual inputs about the child, including background, interests, and current emotional challenges. (2) The system synthesizes these inputs into an editable story prompt, allowing parents to review and refine the narrative intent. (3–4) A personalized illustrated storybook is then generated, grounding the narrative in the child's lived experience. (5) Based on the story content, DreamTales produces optional, theme-specific pre-reading tips (e.g., tone and rhythm, interactive questions, bodily interaction), which parents can selectively enable. (6) During reading, these tips are visually anchored to specific sentences or paragraphs and highlighted through color cues, supporting real-time awareness without interrupting the storytelling flow.

The generated 5-6 page illustration storybook is followed by tailored tips and suggestions. We used a specialized lightweight model (GPT-4o-mini) to analyze the generated story content to produce a single, concise pre-reading tip (the Reflection Primer). For example, if the story involves a moment of disappointment, the primer might be: "Before starting, notice where the disappointment appears in your voice..." This primes the parent's emotional awareness without being overly prescriptive.

3.2.2 ***During-Session: Passive Listening (The Invisible AI).*** Crucially, during the storytelling session, the system provides no visible or audible feedback. A concealed microphone passively records the interaction. The passive nature of the recording ensures the natural flow of conversation, preserving the intimacy and integrity of the parent-child dyadic space. The system's purpose here is purely observational, gathering the raw data needed for post-session analysis.

3.2.3 ***Post-Session: Reflective Dashboard and Emotional Synchrony.*** Following the storytelling session, the recorded audio is processed to generate the Reflective Dashboard using a dual-stream multimodal analysis pipeline.

(1) **Multimodal Emotion Analysis Pipeline**

- **Diarization and Transcription.** Speaker diarization is performed using Pyannote to separate parent and child speech turns. Whisper is then used for speech-to-text transcription with word-level timing.
- **Feature Extraction.**
  - **Acoustic Features.** A Speech Emotion Recognition (SER) model is applied to both parent and child audio segments. The acoustic analysis module extracts low-level prosodic features (e.g., pitch, intensity, tempo) as well as interaction-level markers such as turn-taking patterns and vocal synchrony.
  - **Linguistic Features.** Fine-tuned transformer-based language models (e.g., RoBERTa) analyze the transcribed text to estimate moment-to-moment sentiment and emotional valence.

(2) **Valence Stream Computation**

- **Emotion Estimation.** Acoustic features are processed by a pre-trained SER model, while textual segments are analyzed using transformer-based sentiment classifiers (e.g., RoBERTa, DistilBERT).
- **Weighted Fusion.** The system applies a weighted fusion strategy to combine acoustic and linguistic estimates into a normalized valence score (0–100), producing parallel time-series streams for the parent and the child:

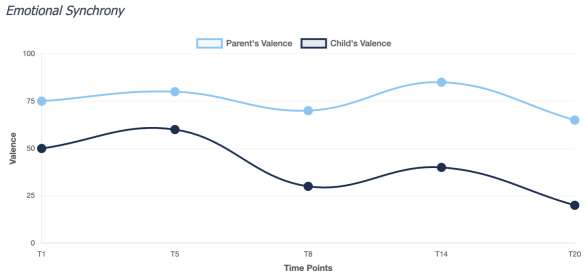

Figure 3: Representative Emotional Synchrony Plot captured during the pilot study (Family B). The blue line tracks the parent's consistent engagement (valence), while the dark line captures the child's fluctuations. The system correctly identified a "Desynchrony Event" at T8 (distraction) and a "Fatigue Drop" at T14, validating the pipeline's ability to map qualitative behavioral states to quantitative metrics.

$$\text{Valence}(t) = (P(\text{Happy})\times 100) + (P(\text{Neutral})\times 50) - (P(\text{Negative})\times 50) \quad (1)$$

(3) **Emotional Synchrony Visualization and Reflective Cues**

- **Synchrony Plot.** The Reflective Dashboard visualizes the temporal convergence of the parent and child valence streams using a Synchrony Plot.
- **Reflective Cues.** Rather than providing evaluative scores, the system highlights moments of high and low emotional alignment and offers non-judgmental, actionable prompts. For example, the dashboard may surface a high-synchrony moment (e.g., shared excitement during a race car story) or identify a potential missed *mirror moment*, where a change in the child's affect was not immediately reflected in the interaction.

$$\text{Synchrony}(t) = 1 - |\text{Valence}_{\text{Parent}}(t) - \text{Valence}_{\text{Child}}(t)| \quad (2)$$

This design explicitly responds to formative insights by prioritizing uninterrupted interaction, minimizing cognitive load during storytelling, and shifting AI support to moments that encourage reflection rather than instruction.

3.3 Pilot User Study

After implementing the DreamTales prototype, we conducted a small-scale pilot deployment with the same two parent–child dyads to probe how the reflective workflow was experienced in practice.

The purpose of this pilot was not just to assess effectiveness or draw generalizable conclusions, but to surface experiential qualities, breakdowns, and early signals of value associated with the reflective companion model. Observations from this stage informed our understanding of how personalized story generation, pre-session priming, and post-session reflection shaped parent–child interaction dynamics, and provided grounding for the key findings and design insights reported in the following section.

4 Key Findings and Design Insights

Across our design process, we identified several recurring themes that illuminate how reflective, non-intrusive AI support may better align with parents' values and expectations in intimate storytelling contexts. Rather than presenting these findings as outcomes of a single study, we synthesize insights that emerged across formative exploration, prototype use, and pilot deployment.

4.1 Preference for Reflection over Real-Time Mediation

Across both the formative exploration and pilot deployment, parents consistently expressed discomfort with AI systems that intervene during live storytelling. Real-time prompts, pop-ups, or instructional guidance were described as disruptive, increasing cognitive load and shifting attention away from the child toward the system. Parents articulated concern that such interventions would make them feel "directed" or "interrupted by a machine," undermining the sense of intimacy and authorship they associate with bedtime reading.

In contrast, the reflective companion model was perceived as more supportive and less evaluative. Parents valued the ability to prepare emotionally before the session and reflect afterward without external interruption during the interaction itself. This preference highlights the importance of preserving uninterrupted, parent-led emotional flow in caregiving contexts, and suggests that shifting AI support outside the live exchange may better respect parental agency and authority.

4.2 Personalized Story Foundations as a Synchronization Catalyst

An emergent insight across the design process was the central role of personalized story generation in fostering emotional alignment between parent and child. Parents reported that the act of co-constructing the story input—discussing the child's recent experiences, interests, or emotional challenges—already initiated a form of pre-attunement before reading began. This collaborative preparation appeared to prime both parent and child for shared emotional engagement.

During pilot sessions, personalized stories anchored in the child's lived context were associated with moments of heightened engagement, mutual excitement, and conversational reciprocity. Rather than functioning solely as content, the personalized story foundation served as a synchronization catalyst, creating a shared emotional reference point that shaped the subsequent interaction. This finding suggests that personalization may play a critical role not only in narrative relevance, but also in establishing the affective conditions for synchrony and co-regulation.

4.3 Value of Non-Judgmental Reflective Cues

Parents responded positively to reflective feedback that emphasized awareness and interpretation rather than evaluation. Visualizations of emotional synchrony and qualitative prompts were described as helpful for noticing moments they might otherwise overlook, such as subtle shifts in tone or tempo that coincided with changes in the child's engagement. Importantly, parents expressed resistance to

numerical scores or prescriptive judgments, which they felt could introduce performance pressure or anxiety.

Non-judgmental cues that framed reflection as an open-ended inquiry—rather than an assessment of success or failure—were perceived as more aligned with parents' caregiving values. This suggests that in intimate relational settings, reflective AI systems should prioritize interpretability and invitation over measurement and optimization.

4.4 Practical Constraints and Breakdown Points

The pilot deployment also surfaced several practical constraints that shaped the experience of the reflective workflow. Story length and linguistic complexity emerged as critical factors, particularly for younger children, with overly long or complex narratives leading to fatigue and disengagement. Environmental setup also played a role: desktop-based configurations were sometimes distracting, highlighting the need for more naturalistic, mobile-friendly form factors.

From a technical perspective, challenges related to child speech diarization and emotion recognition underscored the limitations of applying generic models in noisy, high-pitched, and highly dynamic caregiving environments. These breakdowns informed iterative refinements to both the storytelling prompts and the analysis pipeline, and point to important areas for future technical development.

Taken together, these findings emphasize that the value of reflective AI support in caregiving contexts lies not in real-time optimization, but in carefully designed moments of preparation and reflection that respect the relational, emotional, and situational complexity of parent–child interaction.

4.5 Reframing Evaluation: Personalized Story Creation as a Relational Mechanism

While the current pilot study was not designed to establish causal effects or generalizable outcomes, it surfaced an important reframing of what constitutes "intervention" in AI-supported storytelling. Beyond post-session reflection, the process of personalized story creation itself emerged as a critical site of relational work.

Parents described the act of articulating their child's recent experiences, emotional challenges, and interests—not merely as data entry, but as a moment of anticipatory reflection. In several cases, parents reported that discussing these inputs with their child before reading already initiated emotional alignment, setting a shared affective frame prior to the storytelling session. This suggests that personalization operates not only at the level of narrative relevance, but as a joint meaning-making process that actively shapes parental agency, emotional readiness, and parent–child synchrony.

These observations point toward a shift in how future evaluations of AI-supported storytelling might be framed. Rather than treating post-session reflection as the primary outcome, personalized story creation and its surrounding interactions may serve as both an intervention and an evaluative lens—providing insight into how agency, reflective capacity, and emotional synchrony are cultivated over time.

5 Conclusion and Future Work

This work explores an alternative role for AI in intimate caregiving contexts: positioning AI as a reflective companion rather than an in-situ mediator. Through the design and pilot deployment of DreamTales, we demonstrate how shifting AI support away from real-time intervention toward preparation and reflection can better align with parental values of agency, intimacy, and emotional presence.

Importantly, our findings suggest that personalized storytelling is not merely a delivery mechanism for reflective feedback, but a central relational practice in its own right. The process of collaboratively shaping a story—before it is ever read—appears to foster parental reflection, prime emotional attunement, and create shared affective ground for parent–child interaction. These insights invite a broader reframing of AI-supported storytelling systems: from tools that optimize interaction in the moment, to infrastructures that support meaning-making across time.

5.1 Future Research Directions

Building on these insights, our future work will focus on personalized story creation as the primary locus of intervention and evaluation. We plan to conduct a comparative study contrasting personalized, co-constructed stories with non-personalized baseline stories, examining their differential impact on:

- Parental agency and reflective capacity, measured through post-session interviews and established PRF-based qualitative coding;
- Parent–child emotional synchrony, operationalized through vocal synchrony indices and temporal alignment metrics derived from passive audio analysis;
- Subjective experience of intimacy and naturalness, assessed through parent self-reports and thematic analysis.

In this next phase, elements of the current post-story reflective dashboard will be reframed as evaluation instruments rather than core features, allowing us to isolate the relational effects of personalization itself. Methodologically, this shift enables a clearer examination of how preparatory reflection, narrative relevance, and shared meaning-making shape emotional dynamics during caregiving routines.

More broadly, this work points toward a design agenda for relational AI systems that emphasizes when and how AI participates in caregiving—not as a real-time actor, but as a catalyst for human reflection, agency, and connection.

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Appendix A: Formative Interview Guide

A.1 Current Co-Reading Practices

- Typical bedtime reading routines (timing, duration, book selection)
- Perceived challenges or sources of stress during reading
- Moments parents described as emotionally meaningful or synchronizing

A.2 Perceived Value and Goals of Co-Reading

- Parents' interpretations of the primary purpose of shared reading (e.g., learning, emotional closeness, calming)
- How parents evaluate a "good" reading experience

A.3 Perceptions of AI in Co-Reading Contexts

- Prior exposure to AI-assisted reading tools
- Reactions to hypothetical real-time AI mediation (e.g., prompts, instructions)
- Perceived impact of such systems on parental agency and confidence

A.4 Comparative Reflection on AI Roles

- Preferences between real-time instructional support and pre–post reflective support
- Expectations for AI's role in long-term caregiving contexts

Appendix B: Pilot Study Interview Guide

B.1 Experience of Pre-Session Preparation

- Ease and clarity of providing contextual input
- Perceived emotional preparation before reading
- Reactions to reflection primers or tips

B.2 Experience of the Storytelling Session

- Sense of emotional connection during reading
- Moments of heightened engagement or discomfort
- Perceived influence of the system on parental role and attention

B.3 Experience of Post-Session Reflection

- Interpretability and usefulness of reflective cues
- Preferences among different reflection formats (visual, audio, textual)
- Emotional response to seeing synchrony visualizations

B.4 Reflections on AI's Role

- Whether the system felt supportive, intrusive, or evaluative
- Comfort with using such a system in everyday bedtime routines
- Perceived long-term value or concerns

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