"Hello, Mr Tree": Toying with Playful Conversational AI in the Early Years

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Abstract

The use of generative AI is increasingly integrated into childhood education, primarily with text-to-image generation and older age ranges. This late-breaking work looks at the use of a prototype technology using voiced conversational AI (CAI) to engage young children's interest in nature, through the role-play of a character: the 'Talking Tree'. Using research-through-design, we conducted six interactive sessions with children aged 3 to 5 years. These drove the iterative development of the device and provided insight into how CAI might be applied within the context of early learning. We found that the device operated within children's performative social interactions and within their imagination to prompt recollections of nature and fantastic diversions. We contribute insight into the use of conversational AI for learning in the busy environments of early childhood education centres and the use of CAI-performed fictional characters to build children's connection with nature.

CCS Concepts

• **Human-centered computing** → **Empirical studies in interaction design**; *Sound-based input / output*.

Keywords

Child-computer interaction, design, Early childhood education, Conversational agent, Voice recognition, Digital play, Play-based learning, LLM, AI

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1 Introduction

In the early years, children's social worlds and skills balloon through the careful introduction of new experiences that engage them in the world around them. This critical period shapes identity formation, relationship skill development, and confidence in learning, with these co-constructed by families, educators, and children [9]. This study explores how children of this age can be inspired by conversational AI (CAI) to question and wonder about the natural world, in a way that creates potential for social and playful learning opportunities. Here, CAI refers to systems with and without access to external data sources, recognising the new conversational affordances that generative AI brings [12].

Research on CAIs role in fostering young children's nature connection is sparse, though children have been found to be most interested in asking CAIs questions about animals, plants, and nature [8]. More broadly, digital technologies have been used to build children's nature connection by harnessing their creativity and imagination [6, 13]. For instance, an augmented reality 'elf' prompted children's photography and storytelling in woodlands to build nature connection through emotional, empathetic experiences [7]. Imaginary characters like elves and nature spirits can support social-emotional learning by linking play and fantasy with caring for the natural world, entangling the imaginary and the real [1]. Similarly, perceived intentionality in anthropomorphised beings can evoke a sense of non-human agency [5], which could be produced by CAIs role-playing animals, plants, or mythical beings. Voiced CAIs may also be more suitable for younger children who have only emergent literacy skills.

Studies of children and CAI offer insights for designing playful learning experiences. For example, a study with three- to six-year-olds using a Google Home Mini device found that despite its lack of embodiment some children believed the agent could reciprocate socially and emotionally, perhaps due to speech-related behaviours such as initiating conversations, repeating the child's inputs, and moving the conversation forward when it didn't understand [18]. These behaviours could drive parasocial relationships with CAIs regardless of tangibility or physical expression. However, another study focussing on the design of child-friendly characters, with four-to six year old children, found a preference for imaginative, absurd physical features, and recommended the inclusion of children's nonverbal data (e.g. patting a doll's head) to inform agents' responses [20]. Consequently, an embodied agent was considered a necessity for children's social-emotional learning. However, as the study did not use voiced AI there are open questions about how these might operate conversationally within children's free play. Further study of children's conversation with CAIs in naturalistic settings may better reveal how the social world shapes these exchanges.

CAI also comes with a host of practical and ethical challenges. For example, CAI used in the social space of homes has failed to

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respond appropriately to the context, tailor answers to individuals, or explain at an age-appropriate level [8]. Despite children's interest in using CAI, there is also evidence that models are not well tailored for children's intonation and that the behaviours for successful interactions need to be learned by the child, e.g., pausing to wait for a response [15]. This can prompt adult intervention or encourage children to adapt their communication strategies [2]. Prompt engineering can also produce 'fickle' responses [19]and directives may conflict, for example, within a study finding the Claude 3 Haiku model's built-in resistance to role-playing, likely designed to prevent the misuse of role-play to bypass safety measures [14]. These safety measures are important to reduce the risk of children's exposure to harm, but without contextual knowledge or with incorrect inputs, may be triggered unnecessarily. Greater transparency regarding the mechanisms that trigger actions, including in forms that are understandable to children, would greatly assist the design of age-appropriate AI for play-based learning [16].

Within early childhood educational contexts, learning is co-constructed between children and educators, often through play-based pedagogies in which children lead their learning and engage in imaginative and collaborative ways [10], in a continuum of child-directed to educator-guided play [11]. Guided play requires a clear learning outcome in the mind of an adult providing guidance, which is sensitive to children's interests and engagement [17]. Whether CAI can provide this sensitive playful guidance has yet to be explored.

This study provides insights to guide the design of playful conversational technology within the context of early childhood learning, focusing on instilling nature connection and learning with a whimsical voiced character. However, it remains uncertain how well a CAI can achieve this. Using research-through-design [21] we introduced a prototype CAI to children aged three- to five-years of age at an early learning centre. Initial findings show the importance of children's knowledge performance in their social world, the value of adult facilitation for re-asserting meaning, the impact of fantasy and humour on engagement, and challenges with algorithmic playfulness. We contribute understanding of how CAIs might be used in play-based learning, not so much as 'informed others' but as conversational partners that assert an ecological imaginary. We discuss this and the practical and ethical impacts of introducing these tools into early childhood education.

2 METHOD

This study is part of a larger program of research exploring how technology can engage children in the natural world, which is currently at the stage of producing design activities with the children and proposing prototypes for children's input. The following reports on a research-through-design study of the development and use of a 'Talking Tree' prototype at an early learning centre in an outer suburb of Brisbane, Australia. This study involved six observational, logged (on the device), and audio-recorded sessions of children from 24 October, 2024 to 15 January, 2025 within one centre. Ethical approval was obtained from a university board, with informed consent from parents and educators and ongoing assent from children.

2.1 Site and Participants

The child participants were all located within the one early learning centre, which delivers play-based learning influenced by the Montessori Method and the Reggio approach, with a focus on STEM, catering to children aged 15 months to five years of age. Children within the centre are broadly representative of the wider suburb. Over 67% of people within this suburb have both parents born overseas, and over 58% use a language other than English at home, such as Mandarin, Punjabi, Cantonese, and Korean [10].

Fifteen child participants, 8 girls and 7 boys aged 3 to 5 years, chose to engage with the Talking Tree over 6 sessions, with 3 to 9 children per session. These children were a subset of a larger cohort of 34 children participating in the broader program of research, and the participant IDs reflect this larger group. More than half of the children participated over multiple sessions: 5 sessions (C7), 4 sessions (C21), 3 sessions (C20, C25, C26), 2 sessions (C12, C14, C29, C30), 1 session (C6, C10, C13, C19, C24, C27). These sessions also included children who were not research participants and their data is not included in the analysis.

2.2 Technology Design and Procedure

The 'Talking Tree' is a CAI given the fictitious character of a friendly tree (with a female, Australian-accented voice) that aims to engage children in noticing or thinking about nature. It uses cloud-based services and custom software to record children's voices, transcribe them (AWS Transcribe), process the transcription with a large-language model (Claude 3 Haiku), and convert the response into speech (AWS Polly). AWS was chosen for its Australian service endpoints compliant with Australian data privacy regulations. Also, AWS with GPU acceleration significantly reduced token generation times compared to running on a Raspberry Pi, allowing for faster responses to children's vocalisations.

The Talking Tree was originally envisioned to be used on a living tree, but we decided to test the conversational prototype inside first, where children were simply told that it thought it was a tree. The design evolved to address challenges like ambient noise and to explore different interactions. In order of their delivery over the six sessions, these comprise:

(1) iPad. Real-time web interface for monitoring model logs; insufficient volume for noisy environments.
(2) iPad + headset with mic. Reduced noise interference but limited interaction to one child at a time, with the iPad distracting some children (i.e. they started looking for other applications).
(3) Raspberry Pi in a casing + attached headset with mic. A screenless interface with a cartoon face to give the children a focal point and reduced distractions.
(4) iPad + headset with mic + sock puppet. The researcher used the puppet to animate the Tree's responses.
(5) Raspberry Pi + mic + speaker. Enabled group interactions, used in sessions five and six.

The two most frequently used forms and puppet can be seen in Figure 1.

The model prompts (supplied as supplementary material) were refined over time to better suit the context. Adjustments included narrowing the children's age range, emphasising concise responses

Figure 1: From left to right: C25 with iPad and wearing headset, sock puppet, and C7 with raspberry pi version.

with simple language, and shifting the focus from prompting nature activities – often impractical indoors - to noticing nature (e.g. through windows). The tree's character evolved to be more engaging, and topics of interest such as dinosaurs were incorporated into the model prompt. The first author was stationed on a couch in the storytelling area of the kindergarten room during free-play time. Children approached her, at which point she introduced them to the device, demonstrated its use, and guided them in starting a conversation by saying 'hello'. The device was alternately held by the child, the researcher, or shared between children (e.g. one child holding the device and pushing the button, while another child talks and listens with the headset), with turn-taking actively managed when multiple children wanted to use it. Audio-recorded sessions ranged from 31-53 minutes. Immediately after, the researcher took notes and downloaded logs of the Talking Tree's text inputs and outputs.

2.3 Analysis

Audio-recorded sessions were transcribed, and the Talking Tree logs were added into these at the appropriate timepoints. These transcripts were thematically coded in NVivo by the first author, shared and discussed with the second author, after which the codes were refined further. These were resolved into 22 codes sitting under three umbrella themes.

A combination of inductive and deductive approaches were used as the authors reflected upon the data, the literature, and ontological frameworks. The analysis was framed by an understanding of more-than-human entanglement, particularly between human adults, children, other species, and technologies [3, 4, 7]. Consequently, theming illuminated associations between the imaginative and the real, what children were interested in as well as what they did, and how meaning collaboratively formed or unravelled. The authors have expertise in human-computer interaction and early childhood education. The codebook is provided as supplementary material.

3 FINDINGS

The following themes illustrate how children, the researcher, and the model performed and co-constructed sense and nonsense. *Performing Knowledge* examines the demonstration and co-construction of knowledge in technology interactions. *Lost in Translation* highlights communication breakdowns and repair. Lastly, *An Imaginary of Living Things*, explores how animism, associations, and characterisation link fantasy to reality.

Quotes are identified by either 'C' (child participant), 'R' (researcher) or 'TT' (Talking Tree). Quotes are verbatim.

3.1 Performing Knowledge in Social Play

Children within the centre demonstrated learning and problem-solving abilities that drew upon their experiences in the centre, and with other technology interactions at home. Several children showed that they were already familiar with iPad applications by seeking them on the device they were handed. Virtual and physical button pushing was easily understood, but the lag between cause (speaking) and effect (getting a response) wasn't well tolerated, leading to button mashing and mis-recording (see section 3.2). Opening the device to show the children its parts was also appreciated by children and educators, with C21 recalling that the Raspberry Pi module was a *"computer"* at a later session.

The audio transcripts the device used to formulate a response were often confused because of the loudness of the environment, with many overlapping child and adult voices. Some children demonstrated their awareness of this by asking other children to be quiet. In one case, a very quiet child was encouraged by another child to speak and when they didn't, asked: *"Do you want me to say it for you?"* (C21). They also self-organised turn-taking at times, though this was typically facilitated by the researcher. Very often they would ask the researcher to voice what they wanted to say to ensure that the device would understand. The researcher also facilitated conversations with the device. Children expanded on the initial prompting from *"hello"*, to *"hello, Mr Tree"*, and then *"Hello Talking Tree. What are you doing?"* (P7). Greetings and responses were also used to entertain the other children, such as *"Hello, Mr. Chicken nuggets man"* (C30) and *"Haha, I'm afraid you've got the wrong tree here! I'm Terri, the friendly and lighthearted tree. I don't believe I'm the "chicken nuggets man" you're referring to"* (TT). Toilet humour also had its moment.

Some children's utterances were also often unstructured, such as short statements (e.g. *"Paw Patrol"*), and spoken sounds (e.g. *"googa dooda"*). Additionally, repetition of questions, greetings, and short words or phrases was a key element of the children's interaction with the device. This may be because repetition was the easiest option, or most likely to get laughs. However, children also appeared attuned to whether the device repeated back key words that they stated - in a sense, testing whether the device was listening to them: *"Chicken! Say chicken"* (C21 and other children) and then *"Did it say chicken? One more time. Did it say chicken?"* (multiple children).

Finally, while some children asked questions to be humorous, e.g. *"Do dinosaurs eat pizza and Pidgey?"* (C29), other children appeared curious about the device itself e.g. *"Who are you are?"* (C7), wanting to look inside the Raspberry Pi's casing, and to ask it about other topics of interest, e.g. *"Do you know what dinosaur got very long neck"* (C7).

3.2 Lost in Translation

Very often the model would produce a response that was not relevant to the inquiry, due to a variety of factors: button mashing leading to misrecording, overlapping voices and sounds, and perhaps how words were articulated. The latter was discovered when the researcher repeated terms used by a child, only to have them understood by the model. This led several children to ask the researcher to voice their statement or question for them, and for the researcher to ask some children to try speaking more slowly or not touch the button. Despite this, and even relative quiet, the model could persist in not understanding a child, leading one to say with frustration: *"It doesn't work with us!"* (C7). Poor articulation went both ways, however, as the model was also an unconvincing singer. Upon TT stating: *"The birds are chirping up above, their sweet melodies I love"*, C21 declared *"That was not a song!"*.

Meaning could be rediscovered when the researcher could read the transcript in real time (i.e. iPad version). In this instance, the researcher would say that the *"Tree made a mistake"* and that it was being *"silly"*, leading C21 to repeat *"silly tree"* and *"naughty"* whenever the device didn't respond as hoped. However, a sensible response was less important than providing evidence it heard them: *".. my, my word, I said octopus, and he said octopus to me"* (C30).

The noisy environment could dramatically shift words and meaning between child, model and researcher, e.g. the word *"astronaut"* (C30), was transcribed and interpreted as *"optimise"* (TT), heard and reiterated as *"octopus"* (R), until C30 asserted it was about *"astronauts, like safe- save people under the water"* (C30). While the model could assert boundaries when it misunderstood the child as suggesting something illegal or immoral, these warnings were unwarranted. Its lack of contextual knowledge, or knowledge of the children, as well as its character also led to responses that weren't appropriate for the space (e.g. encouraging the child to explore a park when they were inside a centre), or to the dismissal of phrases such as *"zero, zero, zero"*, which the children had just been taught was the way to call emergency services.

3.3 An Imaginary of Living Things

The device was introduced as a tree that could talk; *"it thinks like a tree"* (R). Conversely, when opening the boxed version, the components were described referencing the human body: "the computer, it's like the brain in our head" (R). Similarly, to prompt some children to talk to the device using words instead of sounds the AI was described by the researcher as *"a little person in a box"*. The children responded by imbuing it with animism, for example looking for it under the couch when it was turned off or explaining its failure to work sometimes as being because it was *"hungry"*, *"scared"*, *"tired"*, had *"died"*, or because it went to *"Garden City"* (a shopping complex nearby that the children often visited).

The researcher thought to encourage this in one session by bringing in a sock puppet, which was used to mouth the words of the Talking Tree while the child had a headset on. In one session, C6 stated a desire to talk about unicorns and fixed her eyes on the puppet while the model encouraged: *"Wonderful! I love hearing about magical creatures like unicorns. As an ancient tree, I've seen my fair share of wondrous things over the years. Tell me, what do you find most fascinating about unicorns?"*. After several interactions, her friend C14 claimed a turn but insisted on talking about her favourite being, the *"T Rex"*. Various fantastical topics of interest like unicorns, dinosaurs, and princesses led to more extended interactions with the model. One of the longest (11 min, 26 seconds), had C25 delivering an unprompted dramatic story about herself that included unicorns (see Figure 1, earlier). The model had overall success in interpreting her words correctly and used this to encourage her response. However, it failed to link the contents of her story to natural elements or its own experience, instead prioritising being supportive and excited for her.

While the device's tree character was largely unexplored by the children, they did recount other trees that they had encountered in real life: a mulberry tree at home, and a *"funny tree"* (C21) that locals have decorated with a face, which the children see on the way to a park. C21 also noted this is what the Talking Tree should look like. The reality of trees and the device, which looked nothing like a tree, were also compared, i.e. trees have branches and *"trees can't talk"* (C21). Regardless, the name of the Talking Tree remained, and children were often yelling it in the background of recordings.

The final slippage between the idea of a talking tree and reality was provided in the last session, when the model started to move in and out of character, stating that: *"I'm afraid I do not have the capability to roleplay as a talking tree character."* This also removed its ability to play along with children's nonsensical questions. While the character of the child-friendly tree would occasionally reassert itself (*"Did you know that the mighty Tyrannosaurus Rex had those silly little arms?"*), the model became increasingly unable to respond until the researcher ended the session.

4 DISCUSSION

This preliminary study indicates how CAIs operate socially at this age, the role of fantasy and imagination, and some current issues with algorithmic playfulness. The following discusses the design implications across the dimensions of learning (4.1) and nature connection (4.2).

4.1 Performance and Learning

Interactions with the device showed challenges and benefits of introducing CAIs into the context of early childhood education. The conversational skills of listening, turn-taking, and formulating responses are within the capabilities of this age group, and interactions with the Tree allowed children to practice these with an informed other. This opened the potential for questioning and self-directed learning, and there was some movement in that direction when children focussed on topics of interest, e.g. dinosaurs. As such, interactions with the Tree had the potential to engage children playfully in a way that they could explore in keeping with their curiosities and interests. Children's reiteration of terms such as the number for emergency services, also highlights opportunities for these agents to reinforce and record children's learning.

Similarly, there was evidence that the children developed more complex greetings over time and engaged in less prompted and longer interactions as they became more familiar with the concept. It seems likely that longer sessions would be helpful in supporting children's playful engagement with the Tree. More complex and interest-driven interactions may also result if the researcher were less foregrounded in the process. This study also highlights that within the context of a childcare centre, where many children are engaged in free play, it is likely that conversation will become performative as the children use the agent to amuse each other. For the agent to meet this challenge and produce playful guidance, the agent will require the ability to 'read the room' through diverse forms of data, as is suggested in other research [20].

Several children were confused by the Tree's responses, likely due to incorrect transcripts of children's speech in the noisy environment, or the model's difficulty maintaining age-appropriate word complexity. This prompted repair strategies such as repetition, adult intervention, and voice modulation [2]. Notably, children seemed to value the Tree's acknowledgement of their words more than knowledge it might provide them. By repeating their words, the Tree entered their social or imaginary world, as evidenced by the longest unprompted conversation in which the Tree acted as a foil for the child's own storytelling (section 3.3). This suggests CAIs can provide forms of social-emotional support despite a lack of embodiment [18]. However, some children had consistent difficulty getting the model to understand them, most likely due to poor transcription of child voices, implying their absence from training datasets. As the primary feature the children enjoyed - repetition of some of their words - was unavailable to them, this absence could eventually leave them feeling excluded and demotivated from interacting with the Tree. Addressing these issues would necessarily require richer data for more accurate social assessments and responses, and possibly, individually identifiable transcripts to tailor responses to different children. However, further discussion is needed to consider the ethics of inclusion versus exclusion of children's voices and other forms of personal data in AI training datasets, particularly those with commercial ties.

It is also possible that moderate levels of accuracy will still provide engaging interactions particularly with skillful adult guidance that can reinforce children's confidence in their own learning and abilities, a key goal of early childhood education [9]. In this way, CAIs could help children to question technology-delivered communications, and form their own opinions based upon their own richer dataset. In tandem, the inclusion of educators in prompt creation could support curriculum-specific learning, e.g. emergency services numbers. Widening the design stakeholders to include educators and parents/guardians may also generate more responsive, meaningful and safer child-CAI interaction. Future CAI design could also be guided by the knowledge that children's learning doesn't happen in isolation but is socially co-constructed [9, 11], and aim to expand child-technology interactions to include supportive adults.

4.2 Talking with trees

Using a character-based CAI with no literal embodiment to engage children's interest in nature showed how linked interests and associations might spring from even limited interactions. It's also possible that the lack of a clearly articulated 'body' for the tree (save for the sock puppet) allowed children to make these associations, including recounting specific trees they knew of. In this way, the Talking Tree became all trees in the children's experience, unlimited by time or space. It is unknown whether the introduction of the idea of a talking tree will infiltrate the children's interactions with real trees, but some children were able to draw a clear line between fantasy and reality, or as C21 put it: trees can't talk. Similarly, the introduction of different forms of representation, for example, through further codesign with the children, may also introduce the possibility of stronger social-emotional interactions [20].

The potential for the CAI's insertion into children's speculative fabulation with the more-than-human was evidenced by the desire of the children to talk with and question it about the creatures that fired their imagination: unicorns, dinosaurs, princesses, cartoons, and more. Imagining with 'nature,' even its technological representations, brings the possibility of fostering nature connection [6]. However, the device's agency to guide conversation and show intentionality [5] varied over the course of the study. Children's interactions with the tree were rarely framed by the tree, but instead were driven by children's imagination, interests and humour. The model's ability to engage with these dynamics and maintain its own character fluctuated due to modification of the model prompts, impacting how much playful guidance it could provide [17]. Though its human-sounding voice led to anthropomorphism by both the researcher and children, and its agency appeared to be aided by the paired animation of the sock puppet, achieving the goal of co-constructed imaginaries [1] requires intentional characterisation, not just adaptation to their interests. This way, CAIs can become partners in the formation of children's social-ecological imaginary and foster both learning and nature connection.

Ironically, the strongest assertion of the model's intentionality was offered in the last session, when it intermittently abandoned the role-play. It seems likely that its safety protocols had been triggered as noted in recent research using it for persona development [14], though it also indicates the need for further work on the model prompt [19]. This acted as a timely reminder that the qualities of algorithmic imagination, whether procedural or generative, are a product of its base code and training, which remains obscure. While guardrails limit harm, their presence in combination with poorly understood child vocalisations, shaped these child-computer interactions. Within the ecosystem of data, it's unclear how much child material is shaping the model's interpretation of its prompt. As such, this study reiterates other calls for greater transparency around the development of these models, including child friendly language to aid the ethical conduct of research and production of child-AI systems [16].

4.3 Limitations and Future Work

As a preliminary study, this research was limited in terms of the number of sessions and child participants it reported and is presenting reflections of a technology mid-way through its development. Further research-through-design will include model prompt and casing iteration including comparison of different physical embodiments (e.g. a tree doll versus strapping a device to a living tree). Embodiment into child-friendly forms may help children express their care and interest in the character [20] and build child-nature connection. The next stage will also seek to learn how educators perceive and might use conversational AI in their practices and what types of prompt inclusions they are interested in. Later field testing may include evaluations as to how well different CAI designs are accepted by children and educators through quantitative analysis of time in use.

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