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1 **Emotions at Play: Children’s Emotional Learning with AI and Tangible Tools**

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17
18 Fig. 1. Images of participatory design sessions: (a) storytelling, (b) empathy game, (c) AI-emotional sticker

19
20 This paper explores how playful learning supports children’s emotional development. We conducted four participatory design sessions
21 with 27 children aged 6–12, using storytelling dice, empathy game creation, and an AI-assisted “emotional sticker” tool to examine
22 how children express, share, and reflect emotions in collective play. Our findings show that children often focus on negative emotions,
23 reframing them as entertaining or manageable through humor and collaborative rule-making. Playful contexts encouraged bravery
24 in sharing vulnerable feelings and transformed emotional challenges into opportunities for connection and co-experience. We also
25 found that empathy was less evident in imagining another’s perspective and more evident in playing, laughing, and experiencing
26 emotions together, often supported by both physical and digital tools. These insights position play not merely as entertainment but as
27 a medium for emotional growth, offering design implications for integrating physical and digital tools that invite curiosity, ownership,
28 and enjoyment in children’s emotional lives.

30
31 CCS Concepts: • Human-centered computing → Empirical studies in HCI.

32 Additional Key Words and Phrases: Playful Learning, Emotional Development, Participatory Design, Collective Play, Human-Computer
33 Interaction(HCI)

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39
40 1 **Introduction**

41 Children today are growing up in a world where the conditions for emotional development are increasingly constrained.
42 Broader social changes, including digitalization, more individualistic lifestyles, and reduced face-to-face interaction,

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53 limit children's chances to practice empathy, negotiation, and emotional regulation in everyday life [27, 33]. These shifts
54 have also reduced children's most vibrant opportunities for outdoor free play, where emotions are naturally expressed
55 and negotiated with peers. While COVID-19 itself may not have been the direct cause, its aftermath heightened parental
56 concerns about socialization, leading many families to limit children's peer interactions beyond formal settings [21, 55].
57 Global organizations such as UNICEF now warn that children's emotional well-being is in crisis, citing rising levels of
58 anxiety, stress, and limited opportunities for empathy and self-regulation [54, 56].
59

60 These environmental changes intersect with developmental challenges. For children under the age of twelve, these
61 constraints overlap with developmental factors. At this age, many are still building the cognitive and linguistic skills
62 needed to recognize, label, and share complex emotions [3, 43]. Limited vocabulary and fear of peer judgment often
63 prevent them from clearly expressing what they feel [43]. As a result, children may hold back or suppress their emotions,
64 which can lead to frustrations such as feeling misunderstood by peers, difficulties resolving conflicts, or being excluded
65 from group activities [13].
66

67 In response to these challenges, play offers a critical pathway for rebuilding emotional experiences in ways that foster
68 embodied [47], relational [2], and improvisational interactions [44]. Through role-play, storytelling, and games, children
69 practice reading one another's cues, negotiating rules, and co-creating meaning in the moment [67]. These activities
70 provide natural opportunities to externalize feelings, experiment with difficult emotions, and reframe experiences in
71 safe and enjoyable ways [42, 67]. Importantly, play is not only an outlet for fun; it is also a social laboratory where
72 empathy, cooperation, and emotional regulation are rehearsed and refined [2, 34, 58]. In this sense, play reintroduces
73 children to the interpersonal dynamics of empathy, negotiation, and emotional reciprocity that are often absent in
74 technology-mediated interactions.
75

76 Despite the recognized value of play, its role as a medium for emotional learning in contemporary childhood remains
77 underexplored. Much of the existing work on children's emotions is either adult-led, emphasizing structured lessons,
78 labeling exercises [32], or narrowly focused on digital games designed with fixed rules and outcomes [11, 20]. These
79 approaches overlook how children themselves use play to transform emotions into approachable, shareable, and even
80 enjoyable experiences. In particular, little is known about how play helps children process understanding emotions
81 and develops through collective processes such as negotiation, humor, and co-experience. Moreover, while children's
82 social lives are increasingly intertwined with digital technologies, existing research on artificial intelligence (AI) and
83 emotion has largely focused on specialized contexts, such as supporting children with autism [50] or addressing AI
84 ethical concerns [30]. Far fewer studies consider how AI might be integrated into the everyday lives of children as a
85 playful, socially shared tool for emotional exploration. This gap leaves open important questions about how play, across
86 both physical and digital contexts, can support children's emotional growth.
87

88 To address this gap, we conducted a series of participatory design sessions with children aged 6–12, creating
89 opportunities to co-build emotional activities through play. Participatory design (PD) provided a methodological
90 foundation for treating children not as passive subjects but as active co-creators of their own emotional learning
91 environments [59]. It also established a peer-to-peer context where children could design and create together as equal
92 partners [63]. In our study, children engaged in three types of playful activities: (PD 1) *Inside Out*-inspired storytelling
93 with emotion dice to spark personal reflection, (PD 2) co-designing and playing empathy-themed games to surface
94 shared experiences, and (PD 3–4) creating personalized "emotional stickers" using an AI-assisted tool to explore digital
95 forms of expression and peer support. Each activity was designed to foreground play as the medium of exploration,
96 whether through storytelling, game-making, or digital creation, while providing children agency to shape the process.
97

98 Guided by an inductive approach, this study asked three questions:
99

- 105 (1) In what ways do children express and reflect on their emotions in playful emotional learning?
106 (2) How does collective play shape children's playful emotional learning?
107 (3) What roles do physical and digital tools play in children's playful emotional learning?

109
110 This work makes three contributions. First, to the learning sciences, it advances understanding of play as a medium
111 for emotional growth, showing how children reframe emotions into playful experiences. Second, to child development
112 research, it extends the notion of empathy beyond individual perspective-taking to include collective processes of co-
113 experience during play. Third, to human-computer interaction (HCI) and design research, it illustrates how participatory
114 design activities can integrate emerging technologies, such as AI, not simply as instructional supports but as playful
115 social objects that spark emotional reflection. Taken together, these contributions position play as a bridge between
116 emotional learning and children's everyday modes of interaction across both physical and digital contexts.
117
118

120 2 Literature Review

122 2.1 Emotional Challenges for Today's Children

123 Children today grow up in social and emotional contexts that differ markedly from even a decade ago. While their basic
124 emotional needs remain constant, the environments in which they practice and express emotions have shifted in ways
125 that present new challenges. As Daniel Goleman's Emotional Intelligence [18] popularized, cognitive intelligence alone
126 is not enough for success in life such as empathy, self-regulation, and emotional awareness are equally crucial, yet often
127 overlooked. Today's children face increasing constraints in developing these abilities. In particular, three interlinked
128 factors, reduced socialization time, increasing digitalization, and developmental limits in emotional vocabulary, shape
129 how many children now experience and communicate feelings.
130
131

132 Firstly, children have fewer opportunities for in-person socialization. Even after the end of COVID-19 restrictions,
133 parental concerns about safety and socialization have continued to limit children's informal interactions beyond
134 structured environments such as schools [55, 56]. Everyday opportunities for spontaneous play, peer conflict resolution,
135 and casual conversation are reduced, leaving children with fewer chances to practice empathy, cooperation, and
136 emotional regulation with peers [26].
137

138 Secondly, children's relationships are increasingly mediated by digital technologies. Communication through texts,
139 emojis, or short videos can be creative and convenient, but these formats often lack the nonverbal cues (e.g., tone of
140 voice, facial expression, and body language) that are crucial for understanding emotions [49, 65]. Experimental studies
141 show that children who spend extended time away from screens demonstrate significant improvements in their ability
142 to read nonverbal emotional cues, suggesting that heavy reliance on digital interaction may hinder the development of
143 emotional literacy [53]. Over time, this reliance on mediated communication may make the natural process of sharing
144 feelings less confident and more easily avoided [46].
145

146 Thirdly, developmental characteristics of children under twelve compound these contextual challenges. During
147 this period, children are still developing the cognitive skills needed for abstract thinking, perspective-taking, and self-
148 reflection [45]. Their emotional vocabulary is often limited, and they may struggle to link inner feeling with outward
149 expression [60]. Without regular opportunities to practice through conversation, play, or creative activities, children
150 may struggle to articulate their emotions accurately, leading to gaps in communication and emotional understanding.
151

152 Together, these factors underscore the importance of creating new opportunities for children to express, share, and
153 reflect on emotions in ways that feel natural, engaging, and socially meaningful. Existing interventions often emphasize
154

157 instruction, but there remains a gap in approaches that leverage children's own modes of interaction, especially play as
158 a foundation for emotional learning.
159

160 **2.2 Play-Based Learning and Emotional Growth**

161 Play is widely recognized as a primary mode through which children learn and make sense of their worlds [47]. Scholars
162 describe play as central to exploration, creativity, and meaning-making, offering opportunities to test ideas, negotiate
163 rules, and construct shared narratives [66]. Importantly, these same qualities also make play a unique foundation for
164 emotional growth. By externalizing feelings in imaginative and playful ways, children can rehearse emotional responses,
165 practice regulation, and reframe difficult experiences in contexts that feel safe and engaging.
166

167 A key mechanism lies in the enjoyment and confidence that play generates [40, 61]. When learning is framed as
168 pleasurable, children are more willing to take risks, share vulnerabilities, and engage with emotions that might otherwise
169 feel uncomfortable or threatening [62]. For instance, in playful learning environments such as game-based classrooms,
170 students are more likely to attempt challenging tasks or propose imaginative solutions without worrying about being
171 "wrong," because the experience feels safe and enjoyable [62]. Enjoyment lowers the perceived stakes of emotional
172 expression, creating empowering conditions for experimenting with sensitive feelings [40, 61].
173

174 Research shows that play helps children show feelings they do not usually talk about or might keep to themselves [25].
175 Through role-play, storytelling, and game creation, children can experiment with fear, anger, or sadness in low-stakes
176 contexts, transforming these experiences into stories or performances that are easier to share [42]. For instance, in
177 the study "My lollipop dropped...", children co-created stories about everyday frustrations like losing a treat as a
178 way to express deeper feelings of disappointment and sadness, while also building empathy and emotional regulation
179 through shared narratives [64]. Similarly, digital tools such as Scratch have been used to support children in designing
180 stories about characters facing dilemmas, which encouraged ethical discussion and collective problem-solving [57].
181 Co-designing games around social issues, such as bullying prevention, has also been shown to create space for children
182 to discuss fairness, empathy, and conflict resolution [36].
183

184 These studies highlight how play provides a foundation for emotional growth. Play-based contexts are interactive,
185 relevant, and child-centered, allowing children to exercise agency while exploring emotions in authentic ways [42, 44, 66].
186 When children set rules, act out roles, or build shared games, they are not only practicing their social-emotional skills
187 but also shaping the conditions of their own emotional learning. As a result, the element of fun is particularly significant
188 in play: by making difficult emotions enjoyable to explore, play acts as a moderator that can transform negative feelings
189 into positive, manageable experiences [14, 42].
190

191 Although play clearly supports emotional growth, research rarely examines how children themselves use play to
192 transform emotions into approachable and shareable experiences. Much of the literature on emotional development still
193 focuses on individual skill training or structured curricula, leaving less attention to children's own playful strategies
194 for exploring feelings. This gap points to the need for deeper study of play as a foundation for emotional learning,
195 particularly in contexts where children face growing emotional challenges.
196

197 **2.3 Advantages of Play-Based Learning**

198 Play offers more than entertainment; it is a dynamic context in which children build relationships, negotiate meaning,
199 and co-construct emotional and social understanding. Unlike structured lessons, play emphasizes process over outcome,
200 fostering creativity, spontaneity, and collaboration. Scholars have highlighted that its benefits extend beyond individual
201 growth to collective forms of learning, where emotions and knowledge emerge through shared activity and interaction
202

[44, 58, 62]. In this sense, play is not only a medium for skill development but also a social infrastructure for empathy, coordination, and mutual recognition.

First, play creates natural opportunities for collective learning. When children negotiate rules, co-create stories, or perform emotions together, they are not only practicing social awareness but also coordinating perspectives, recognizing commonalities, and regulating responses in social situations [44]. The improvisation, debate, and co-construction in these moments are as valuable as the outcomes themselves. From a sociocultural perspective, understanding develops through joint activity and shared attention, where both knowledge and emotions are distributed across the group rather than held individually [31, 58]. In this sense, the process often matters more than the product: children learn from the act of engaging with others.

Second, toys and shared objects can act as focal points around which playful learning unfolds. Thornburg [52] uses the “campfire” metaphor to describe this dynamic: just as people gather around a fire to share stories and build connections, children’s learning can emerge from shared artifacts that spark conversation, humor, and reflection [51]. In this view, the significance of tools lies less in their content than in their ability to generate social energy, shared imagination, and collective experience.

Lastly, empathy in play is often expressed less through abstract perspective-taking and more through embodied co-experience. Traditional models conceptualize empathy as an individual cognitive skill, the ability to imagine another person’s perspective [12]. Davis [10] defined empathy as “responsivity to the experiences of another.” Yet developmental research suggests this framing may be too narrow for younger children. Instead of consistently “putting themselves in another’s shoes,” children often empathize by co-experiencing moments with peers. For example, laughing together, responding jointly to a story, or collaborating on a shared task [5, 19]. These collective forms of empathy highlight the social and affective dimensions of play.

Although the benefits of collective play for collaboration and problem-solving are well documented [62], its role in supporting empathy and emotional learning remains underexplored. Much of the literature continues to emphasize empathy as an individual act of perspective-taking rather than as a collective practice that unfolds in playful activity [10]. This gap underscores the need for research that investigates how children experience and express empathy not only by imagining others’ feelings, but by co-attending, co-laughing, and co-creating meaning together through play.

2.4 Play and Emotional Tools

Children’s emotional expression is often supported by tools that translate inner experiences into visible, tangible, or symbolic forms. These tools, whether physical or digital, offer children concrete ways to represent, share, and experiment with feelings that may be difficult to express verbally.

One important category is physical tools, which have a long history in education and therapy as supports for emotional learning. Emotion stickers, wheels, and dice provide children with ready-made cues for identifying and communicating feelings [14, 37, 48]. For example, Mannay and Staples [28] showed how stickers encouraged dialogue and reflection around children’s emotions. Creative practices such as drawing, crafts, music, dance, and role-play also act as emotional tools by giving children indirect ways to surface feelings that might otherwise remain hidden [35]. Puppets, masks, and storytelling props are commonly used to help children explore fear, anger, or sadness in playful, manageable ways. The materiality of these tools, their ability to be touched, displayed, and exchanged, anchors emotional experiences in concrete forms and gives children a sense of ownership over their expression.

In addition to tangible tools, digital tools have expanded children’s emotional repertoires into peer cultures and online spaces. Emojis, GIFs, and memes provide quick, remixable symbols for signaling feelings, while interactive games

and storytelling platforms allow children to construct characters, scenarios, and narratives that encode emotional dilemmas [23]. Research on Scratch, for example, shows that children create stories about characters facing moral or emotional challenges, sparking ethical discussion and collaborative problem-solving [57]. Similarly, co-designing digital games around issues such as bullying has given children structured opportunities to practice empathy, fairness, and conflict resolution [36]. Even AI tools fit into this category. They are often designed as tutors or companions [6], they can generate surprising outputs that invite laughter, questioning, or improvisation. These moments of unpredictability position AI not only as a learning aid but also as a playful social object that can spark new forms of emotional interaction [44].

Together, these studies show that both physical and digital tools mediate how children articulate, negotiate, and reinterpret emotions. Yet most research still examines these forms in isolation, leaving open questions about how children move between them or use them together during play. This gap underscores the need for closer study of emotional tools as part of children's broader playful ecologies, and how they may foster new possibilities for emotional growth.

3 Methods

3.1 Participants

A total of 27 children participated in this study. Table 1 lists participants using pseudonyms. Children were recruited through mailing lists, posters, and snowball sampling. Participation was voluntary, and both parental consent and child assent were obtained prior to involvement.

Across four Participatory Design (PD) sessions, between 16 and 21 children participated in each session, depending on their availability. Participants ranged in age from 6–12 years old. They were supported by undergraduate, graduate, and doctoral student volunteers who served as facilitators. Facilitators were not the children's parents, ensuring a neutral yet supportive environment for collaboration. All child and adult participants were affiliated with intergenerational design research group TheDesignChildren (pseudonym).

The child participants represented a diverse mix of genders (15 boys and 12 girls) and ethnic backgrounds. To account for potential bias, we considered gender balance in the sample across all design sessions, ensuring representation from boys and girls. Attendance varied, with some children participating in a single session and others contributing across multiple sessions (see Table 1).

3.2 Participatory Design Sessions

We conducted four participatory design (PD) sessions: the first (PD1) during the TheDesignChildren (pseudonym) 2024 summer camp, the second (PD2) during the 2024–2025 school year, and the third (PD3) and fourth (PD4) during the 2025 summer camp. Each session allowed us to explore children's emotional expression, empathy, and AI-assisted reflection. The first two sessions emphasized physical and playful activities for recalling and sharing emotions, while the final two sessions introduced an AI-powered emotional sticker tool to support self-expression and peer empathy.

Each PD session lasted 90 minutes and followed a consistent structure: 10–15 minutes of circle time for introductions and a “question of the day”, 50–60 minutes of design activities, and 10–15 minutes of debriefing and reflection. Sessions were held in a university classroom setting across the academic year.

Table 1. Participant Demographics and Session Participation

ID	Name (Pseudonym)	Age	Gender	Ethnicity	Sessions
P1	Jackson	8	M	Asian / White / Middle Eastern	PD1, PD3, PD4
P2	Sarah	9	F	Asian	PD1, PD2, PD3, PD4
P3	Eric	9	M	Asian	PD1, PD2, PD3, PD4
P4	Adam	8	M	White	PD1
P5	Daniel	10	M	Asian / Black	PD1
P6	Victor	12	M	Latino (Mexican parents)	PD1, PD3, PD4
P7	Anna	10	F	Asian / Black	PD1
P8	Emily	7	F	Asian / Black	PD1, PD3, PD4
P9	Jasmine	7	F	Asian / White / Middle Eastern	PD1, PD3, PD4
P10	Rachel	7	F	Asian / Black	PD1, PD2, PD3, PD4
P11	Linda	10	F	Asian / White	PD1, PD2, PD3, PD4
P12	Sally	7	F	Asian	PD1, PD2
P13	Julia	8	F	Latino (Mexican parents)	PD1, PD3, PD4
P14	Robert	10	M	Asian / White	PD1
P15	Isaac	11	M	White	PD1, PD2, PD3
P16	Beth	11	F	White	PD1, PD2, PD4
P17	George	11	M	Asian / Black	PD1, PD2, PD3, PD4
P18	Abigail	11	F	Black / White	PD1, PD2
P19	Thomas	9	M	Asian / White	PD1, PD2
P20	Paul	10	M	Asian / White	PD1
P21	Hannah	11	F	Asian / White	PD1, PD2
P22	Samuel	6	M	Asian / White	PD3, PD4
P23	James	8	M	Asian / White	PD3, PD4
P24	William	6	M	Asian / White	PD3, PD4
P25	Lucas	7	M	Indian / Southeast Asian	PD3, PD4
P26	David	10	M	Asian / White	PD4
P27	Laura	10	F	Asian / White	PD2, PD3, PD4

Children were organized into 4–6 small groups depending on attendance, with each group typically consisting of 2–4 children and 1–2 adult facilitators. This structure encouraged collaboration, peer-to-peer discussion, and hands-on engagement.

Across the study, four PD sessions were conducted: (PD1) storytelling for emotional recall, (PD2) empathy game design, and (PD3–PD4) two AI-assisted emotional sticker creation activities (see Table 2). From here, children will be referred to by their IDs (e.g., P1, P2). The following sections provide detailed descriptions of each session.

3.2.1 PD1. Storytelling. The first session introduced children to emotional reflection through the *Inside Out* Dice activity. This activity was inspired by design research of social skills [24]. This activity was inspired by one of the social emotional learning activity [24]. In small groups, children brainstormed meaningful emotional moments from their own lives and illustrated them on large sticker sheets. These illustrations were then attached to the six sides of jumbo inflatable dice, each side representing one of the core *Inside Out* characters (Joy, Sadness, Fear, Disgust, Anger) or an additional character from *Inside Out 2* (Boredom/Ennui).

Children took turns rolling the dice to prompt storytelling about past experiences connected to the displayed emotion. This format encouraged spontaneous recall, self-expression, and group sharing. Some groups extended the activity

³⁶⁵ by inventing new rules, transforming the dice into mini board games, or writing “cheer-up” messages in response to
³⁶⁶ different emotions. These variations demonstrated children’s creativity and agency in adapting the activity to suit their
³⁶⁷ personalities.
³⁶⁸

³⁶⁹
³⁷⁰ 3.2.2 *PD2. Empathy Game Design.* The second session shifted from individual reflection to shared emotional un-
³⁷¹ derstanding. To support empathy-building, we adapted the activity with an added element called “SUPERSTAR!” by
³⁷² Berkeley Greater Good Science Center [1]. In small groups, children co-designed empathy-focused games, collectively
³⁷³ referred to as the “You Are Not Alone” games.
³⁷⁴

³⁷⁵ The design process began with children sharing personal emotional experiences. Each group of children then
³⁷⁶ identified emotions they had in common and selected a game format (e.g., cards, dice, Jenga blocks, or spinning wheel)
³⁷⁷ to transform those emotions into a collaborative activity. For instance, in one game, a child began by sharing, “I was
³⁷⁸ nervous before public speaking.” Peers who had felt similarly were invited to perform an action, such as jumping
³⁷⁹ twice. In this way, children realized that others had gone through the same emotional situations, fostering recognition,
³⁸⁰ connection, and empathy through playful interaction.
³⁸¹

Table 2. Overview of Participatory Design Sessions

Session	Description	Tools	Activities
PD1 (Storytelling)	Children reflected on their emotions through characters from <i>Inside Out</i> ^a and <i>Inside Out 2</i> ^b (called the <i>Inside Out Dice</i> activity).	Dices	Emotion-themed dice rolling Narrative storytelling Drawing emotional experiences
PD2 (Empathy Game Design)	Children co-designed games to support emotional sharing and recognition among peers (called the <i>You Are Not Alone</i> activity).	Cards, dice, jenga blocks, spinning wheel	Designing empathy-oriented games Peer playtesting Guided emotional reflection
PD3 (AI Emotional Sticker – Self)	Children generated AI-assisted stickers to represent their own emotions (called the <i>Feel Better Sticker</i> activity).	AI-assisted emotional expression tool ^c	Individual emotional reflection Generating AI-based stickers
PD4 (AI Emotional Sticker – Peer)	(same as PD3)	(same as PD3)	Representing peer narratives through stickers Comparative reflection and discussion

⁴¹² ^a *Inside Out*: Pixar film featuring characters that personify core emotions (Joy, Sadness, Anger, Fear, Disgust). See <https://www.pixar.com/inside-out>.

⁴¹³ ^b *Inside Out 2*: Pixar film expanding the cast of emotions to include Anxiety, Ennui, Envy, and Embarrassment, in addition to the original five. See <https://www.pixar.com/inside-out-2>.

⁴¹⁴ ^c Details of the AI tool and its technical implementation are provided in Appendix C.2 and C.3.

417 3.2.3 *PD3 and PD4. AI-Emotional Sticker Creation.* PD3 and PD4 focused on designing emotional stickers. Insights from
418 PD1 and PD2 showed that children enjoyed using emoji stickers as a way to express emotions (e.g., “I love the sticker
419 piece” in PD1; “Give me more stickers” in PD2). Building on this preference, the final two sessions introduced Feel-Better
420 Stickers, an AI-assisted design activity that invited children to explore emotional reflection and empathy through digital
421 media using a custom-built web-based AI tool. The process involved the following five steps (see Appendix C.2):
422

- 423 (1) **Drawing a personal feeling story.** Each child began by recalling an emotional moment from his/her own life
424 and illustrating it on an activity sheet. Along with the drawing, the child wrote a short description of the situation
425 and selected one of five target emotions (sad, angry, scared, worried, lonely). This step grounded the activity in
426 children’s authentic experiences.
427
- 428 (2) **Sharing the story with AI.** Each child then uploaded a photo of his/her drawing, selected his/her emotions, and
429 typed his/her description into the AI tool using a laptop. The web app then sent the drawing, the selected emotion,
430 and the description to online AI models. This step translated the child’s personal story into digital form, preparing
431 it for AI-assisted transformation.
432
- 433 (3) **Generating a comforting sticker and message.** The AI models combined the child’s drawing and description to
434 produce a “feel-better” sticker along with a short, encouraging message (e.g., “It’s okay to feel upset when friends
435 run away. Take a deep breath and tell them how you feel.”) and an explanation of the emotion the child might be
436 feeling. The sticker, the message, and the explanation offered comfort and validation while representing the child’s
437 emotion visually and in text.
438
- 439 (4) **Regenerating the sticker/message (optional).** The child could refine the outputs by asking AI models to
440 regenerate the image, adjust the message, or modify stylistic elements. This step allowed them to explore how
441 technology interpreted his/her emotions while giving the child agency over the final design.
442
- 443 (5) **Printing and customizing.** Once satisfied, the child selected his/her preferred stickers and printed them. The child
444 could then further personalize the sticker designs using additional materials (e.g., stickers, colored pencils, scissors).
445 The printed stickers served as tangible artifacts to keep, share, or use as prompts for reflection and discussion.
446

447 In PD3, each child focused on self-expression. Each child recalled a personal emotional moment, represented it in a
448 drawing, and identified a target feeling (sad, angry, scared, worried, or lonely). The app then transformed the input into
449 a personalized sticker and a comforting message. This activity supported emotional recall and reflection.
450

451 PD4 extended the activity to empathy with peers. Each child listened to a peer’s emotional story and used the app to
452 create a sticker and message for the peer. Finally, each child compared his/her self-generated design (PD3) with the
453 sticker created by the peer (PD4). This side-by-side reflection prompted discussion about empathy, perspective-taking,
454 and how emotions can be understood differently by self and others. Some outputs from PD3 and PD4 can be found in
455 Appendix C.1; a technical review of the app is in Appendix C.3.
456

457 3.3 Data Collection

458 Three types of data were collected in this study: video recordings, facilitators’ notes, and children’s design artifacts.
459

460 First, all sessions were video recorded. The research team used built-in iMac web cameras and Zoom to capture
461 children’s activities during PD1 and PD2. While each group had a recording, some audio data was lost when children
462 moved away from the microphones. To address this limitation, facilitators wore body cameras in PD3 and PD4, which
463 ensured higher-quality audio capture.
464

469 Second, adult facilitators completed structured activity sheets during each session. These included prompts and
470 questions to guide discussion with the children. Facilitators also took notes of key observations and documented
471 memorable quotes from participants. These notes provided contextual insights into how children engaged with the
472 design activities and expressed their ideas.
473

474 Third, the children produced physical artifacts, such as sketches, drawings, and prototypes during the sessions. All
475 artifacts were photographed and archived as supplementary data for analysis. Together, these multimodal data sources
476 offered a rich record of both process and outcome in the participatory design activities.
477

478 3.4 Data Analysis

479 Data analysis followed an inductive qualitative approach. Three researchers worked together to ensure rigor and reduce
480 individual bias. The primary researcher conducted initial open coding and wrote analytic memos to capture emerging
481 patterns and insights across PD1–PD4. To enhance reliability, at least two additional researchers cross-checked coding
482 for each session.
483

484 All data, including video recordings, facilitators' notes, and children's design artifacts, were analyzed using Atlas.ti, a
485 qualitative analysis software. The analysis process was conducted iteratively in two cycles. In the first cycle, researchers
486 independently coded the data and documented preliminary observations. The team then met to compare, debate, and
487 refine codes, seeking commonalities across the four sessions. In the second cycle, codes were consolidated into broader
488 themes.
489

490 Through this process, the team developed a codebook that captured three overarching dimensions: (1) play and
491 emotional expression, (2) collective play and interaction, and (3) tools for emotional play (see Table 3). This codebook
492 guided subsequent analysis by identifying consistencies, notable quotes, and recurring patterns in children's engagement
493 with emotions, peers, and play materials.
494

495 Throughout the process, the team held regular meetings to review analytical memos, iterate on coding decisions,
496 and confirm consensus. This triangulated, multi-researcher approach ensured both reliability and depth in interpreting
497 the findings.
498

501 4 Results

502 4.1 RQ1: In what ways do children express and reflect on their emotions in playful emotional learning?

503 **Emotional Expression.** Children expressed and reflected on their emotional preferences. Many gravitated toward
504 negative emotions, framing them as more entertaining or playful than positive ones. P2 (PD1) summarized this sentiment:
505 “Negatives are fun,” while P10 (PD1) proudly declared, “My favorite emotion is disgust.” A facilitator (PD1) highlighted
506 the group’s collective choice: “We chose embarrassment, envy, anger, shame and disgust … because they’re better,” which
507 was echoed by children chanting “angry!” Similar routines appeared in PD2, where groups often began brainstorming
508 with negative emotions before moving on to positive ones. Several participants (P8, P10; P7, PD1) even wished aloud, “I
509 wish to have more negative stickers.” At the same time, not all children shared this preference. One older participant
510 (P19, PD1) pushed back, noting, “I don’t like fear,” suggesting a more selective and nuanced relationship with difficult
511 emotions.
512

513 **Emotional Literacy.** Children’s ability to articulate and interpret emotions revealed clear developmental differences.
514 Younger participants often struggled to verbalize complex feelings like anxiety and relied instead on embodied expression.
515 For example, P8 (PD1) dramatized excitement by flapping her arms and exclaiming, “You know how you are really
516

Table 3. Codebook

Category	Code	Definition
Play and Emotional Expression	Emotional Expression	What kinds of emotions the children frequently mention and wonder.
	Emotional Literacy	How much children understand and interpret emotions.
	Speaking Out	Being brave to share vulnerable or personal emotions in public.
	Fun/Humor	How fun or humor supports emotional learning.
Collective Play and Interaction	Agency	Whether children show ownership during play-based learning (e.g., rule making, game design).
	Collaboration	How children work together and build on one another's ideas.
	Empathy	How empathy is defined and demonstrated in understanding others' emotions during playful activities.
	Social Interaction	Relationship skills, giving compliments, and being good listeners.
Tools for Emotional Play	Opportunity	What children liked about the emotional tools.
	Challenges	What children disliked about the emotional tools.
	Preference	Children's comparisons between tangible and digital tools.
	Improvement	Children's suggestions for improving the tools.

excited and you're like... arhhghgharhhg." Facilitator notes similarly described five- and six-year-olds using gestures or sound effects, while older peers were more likely to label emotions directly. For example, P21 (PD2), an older child, described her understanding of the emotion of "guilt" by describing a time she "got mad at someone and yelled at them, and then realized that they didn't do it". Additionally, P17 (PD2) described the feelings of guilt similarly by saying, "I feel guilty when I do something and I don't say anything about it". This contrast underscores the gradual development of emotional literacy, moving from performance and mimicry toward more explicit vocabulary.

Difficulties in articulation also surfaced in later sessions, where several children described that within the activity, "the hardest part was describing feelings"(P5, PD4). Many resorted to single-word responses or expressed frustration with being asked to explain emotions verbally. These findings suggest that emotional learning designs should be sensitive to developmental stages, offering multiple modes of expression—such as gestures, visuals, or tangible aids—so that both younger and older children can engage meaningfully in ways suited to their abilities.

Speaking Out. Play also encouraged moments of bravery, where children risked sharing personal ways of dealing with strong feelings. When asked how he coped with sadness, P19 (PD1) responded, "Sadness is an emotion for me. I killed her." Although stark in language, his willingness to voice such a thought in front of peers reflected the supportive space that playful contexts provided—where children could reveal vulnerable strategies and be met with curiosity rather than judgment.

573 Fun and Humor. Fun and humor consistently supported children in engaging with emotions that might otherwise
574 feel difficult or intimidating. For example, one group invented a playful rule that if someone in the group rolled a six,
575 the group had to roll the main dice six additional times—a twist P7 that (PD1) described as funny precisely because of
576 its inconvenience: “Inconvenience is equals to funny.” Laughter spread quickly, with facilitators noting that “everyone
577 [was] laughing really hard when they roll a six.” Similarly, P10 (PD1) reflected, “It was really fun because … we all got
578 to do our favorite emotions”. Similar examples were also implemented in the second design activity. For example, P2
579 (PD2) determined that the turn order began by “who last drank water”. To the children, it would provide ways to not
580 only provide humor but to also create unique rules for their games.
581

582 These moments of collective joy often pushed children to extend play beyond the original rules, as facilitators
583 observed that groups “wanted to play more and were eager to play more.” Humor also transformed digital activities into
584 opportunities for bonding, particularly when AI outputs contained odd mistakes or misspellings. As one child put it,
585 “AI was awful but the sticker was funny, misspellings were really funny” (P3, PD3). Across activities, humor functioned
586 as both a coping mechanism and a catalyst for shared energy, reframing frustration or negativity into playful and
587 manageable experiences.
588

589 4.2 RQ2:How does collective play shape children’s playful emotional learning?

590 **591 Agency.** Ownership and agency were visible as children invented new rules and variations, often reshaping the activities
592 to suit their interests. P16 (PD1) described one version of the dice game: “How our game works is … if they get it right,
593 they get one point.” Others introduced twists that emphasized performance, such as P6 (PD1) suggesting, “If they land on
594 a 4 … they have to act out four different types of emotions.” P19 (PD1) explained a volleyball-style adaptation where the
595 emotion that landed had to be acted out and discussed: “Whatever it lands on, that’s the emotion you have to talk about,
596 how you deal with that, and how you’re able to come back.” These rule-making moments gave children ownership of
597 the learning process, showing that the value of the activity was less in fixed outcomes than in the creativity of shaping
598 play together.
599

600 Additionally, when it comes to activities such as PD3 and PD4, children are creating agency for themselves by
601 creating their stickers to match up with their personal interests as well. One child voiced that “I just wanted to have a
602 ton of dogs on a sticker” (P27, PD3), and another “wanted it to have a slide, a garden, and me and P11 on the slide” (P8,
603 PD4). We discovered that children engage with these stickers not merely to convey moments of negative emotion, but
604 also as a medium through which they articulate their creativity and passions.
605

606 In particular, some children found themselves wanting to make more stickers, as not only was the experience novel,
607 but they also enjoyed the opportunity to create something that was personally their own. P8 (PD3), upon seeing her
608 first sticker, said, “I like this one! Can we make another one!?” Additionally, when P23 (PD3) was asked about what
609 made this activity fun, he said, “because we got to make stickers and I never made stickers before. So overall I just like
610 it!”. Our goal of the Feel-Better Sticker activity was to help children reflect and feel better about their emotions using
611 AI. However, a part of the betterment of the children’s feelings was found in the joy they had within the process of
612 creating.
613

614 **615 Collaboration.** Children’s emotional learning unfolded not in isolation but through the dynamics of collective
616 play. Facilitator notes described “lots of debate and negotiation” (PD1), as children argued over rules for scoring, turns,
617 and fairness. These moments of back-and-forth not only resolved logistical issues but also deepened engagement, as
618 children practiced reasoning, compromise, and shared decision-making. Collaboration was equally creative: for instance,
619 P17 (PD1) invented a backstory for his “anger” emotion, which peers expanded on during the game. Such exchanges
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625 highlight how play functioned as a social space where ideas could be tested, refined, and collectively owned, turning
626 emotional exploration into a co-constructed process rather than an individual task.
627

628 **Empathy.** Empathy in children's play emerged less as abstract perspective-taking and more as co-experience. Rather
629 than imagining one another's perspective, children often connected by recognizing situations they themselves had
630 encountered. During the PD4 activity, where participants created feel-better stickers for peers, P16 explained, "It was
631 really easy, because I've had situations that were a bit like that," while P13 noted of a peer, "Because he is a good
632 storyteller." These reflections show how empathy was grounded in familiarity and shared experience. At times, personal
633 relevance also guided empathetic choices; for example, one child explained when choosing a sticker for a peer, "I knew
634 that it would make me feel better" (P5, PD4), drawing on their own emotions to predict what might resonate with
635 others.
636

637 Co-experience also surfaced in more playful, critical forms. When P13 (PD4) remarked, "I would rather have the
638 message saying something dumb than funny or encouraging ... because I want AI to fail," P25 added, "Yeah, AI is so
639 pointless. AI don't understand me." Laughter followed, with children mocking the system as "stupid." These moments
640 of collective humor and critique bonded children together, showing how even disapproval became a resource for
641 empathy. In these ways, empathy was less about abstractly "taking another's perspective" and more about co-laughing,
642 co-attending, and relating through shared emotional experiences.
643

644 **Social Interaction.** Social interaction was sustained through compliments, laughter, and the playful energy from
645 being together. When one child (P24, PD4) shared his creation, P13 (PD4) complimented it by pointing and laughing: "It
646 was very good ... because it looks so funny with a big nose and big pants." P13 (PD4) also noted of another participant,
647 "Because he is a good storyteller." Similarly, children found collective joy in AI mistakes, as P13 (PD3) put it: "AI was
648 failing, and that made me happy." These moments show that humor was not simply amusement but a way of affirming
649 one another, listening actively, and staying socially connected during play.
650

651 4.3 RQ3: What roles do physical and digital tools play in children's playful emotional learning? 652

653 **Opportunity.** Opportunities for emotional engagement emerged when tools felt inspiring, validating, or intuitive to
654 use. AI-generated stickers sometimes provided encouragement, with one child reflecting, "My sticker was inspiring ...
655 it says it's okay to feel angry" (P3, PD3). Others found value in humor, noting, "Well, they were very funny. Some were
656 inspiring. Some were not" (P16, PD3). Children also expressed a preference for intuitive tools such as the wheel, which
657 P21 (PD2) favored because it displayed the full range of emotional scenarios and made outcomes easier to anticipate.
658 These examples highlight that children sought tools that sparked emotion—through encouragement, humor, or clarity
659 of design.
660

661 Personal relevance amplified these opportunities. Many children took home their stickers from PD3 and later reported
662 displaying them in familiar spaces, showing how portable artifacts extended emotional reflection beyond the session. As
663 one explained, "It's cute and you can add onto it afterward" (P5, PD3). Tools that remained open to reinterpretation and
664 personalization offered the richest opportunities, as they supported both in-the-moment play and ongoing interaction
665 in children's everyday lives.
666

667 **Challenges.** Challenges emerged when tools failed to feel authentic or emotionally meaningful. Several children
668 expressed frustration that the AI did not seem to "listen": "AI didn't listen to me at all" (P1, PD3) and "That's why AI is
669 useless sometimes" (P25, PD3). Others critiqued its outputs as "kind of corny" (P16, PD4), "weird" (P2, PD4), or uncaring:
670 "It didn't really care" (P2, PD3). These reactions suggest that the biggest barrier was not technical accuracy but a lack of
671 authenticity—the sense that the system's responses were shallow and disconnected from children's real feelings.
672

677 This design activity also posed challenges, particularly when they did not resonate developmentally. Some older
 678 participants disengaged, remarking simply, “I don’t like stickers” (PD4), or dismissing them as ineffective: “Stickers
 679 does not make me feel better … no, not really” (P1, PD3). These findings highlight that both digital and physical tools
 680 risk alienating children when they feel insincere, childish, or irrelevant.
 681

682 **Preference.** Children expressed clear preferences when comparing physical and digital play, consistently favoring
 683 tangible tools. P16 (PD1) stated simply, “I like physical way,” while P21 (PD2) preferred the wheel because “I can see
 684 everything … and expect what to say.” Facilitator notes reinforced this pattern, observing that “kids love freedom … the
 685 more structured the materials, the narrower the design” (PD1). Physical tools offered flexibility, embodied performance,
 686 and visible cues that made emotional play feel more engaging and authentic than digital interactions. Still, children also
 687 appreciated aesthetically appealing designs. For instance, one participant explained, “It was a yellow bear and it was
 688 cute, just makes me feel happy” (P7, PD4). These preferences suggest that while tangibility was often central, digital
 689 elements could be meaningful if they were visually charming or emotionally relatable.
 690

691 **Improvement.** Children suggested ways to improve the tools, often through playful critique. Some focused on
 692 accuracy and clarity, with P16 (PD3) stating, “Message needs to be improved,” and P13 (PD3) adding, “AI’s messages
 693 are weird.” Others proposed more radical changes, such as P25 (PD4) who asked for it “not to be so pointless,” or P8
 694 (PD4) who jokingly wished, “I want AI to be slow.” These suggestions went beyond technical fixes, reflecting how
 695 children reimagined the tools in humorous, exaggerated ways. At their core, the critiques underscored a desire for
 696 greater accuracy and relevance in AI responses, while also asserting children’s agency in shaping the design process.
 697

700 5 Discussion

701 5.1 Playful Qualities as a Pedagogy of Play

702 Our findings revealed three recurring qualities that shaped children’s emotional play: curiosity, ownership, and
 703 enjoyment. Children showed curiosity by experimenting with dice rules, acting out new variations, or regenerating
 704 AI stickers to see alternative results. They demonstrated ownership by inventing original games, choosing preferred
 705 emotions (especially negative ones), or defending their design choices in front of peers. Finally, they expressed enjoyment
 706 through laughter, eagerness to continue playing, and the shared pleasure of mocking or celebrating unexpected outcomes.
 707 Together, these qualities created a learning environment where emotions were not simply expressed but actively
 708 reimaged.
 709

710 These qualities align closely with the Pedagogy of Play framework developed by Harvard Project Zero, which
 711 conceptualizes playful learning as being driven by curiosity, ownership, and enjoyment [29, 66]. Prior studies have
 712 shown that curiosity sparks deeper exploration and sustained engagement [17], ownership cultivates agency and
 713 intrinsic motivation [22], and enjoyment fosters resilience and openness to experimentation [40, 42]. Our study extends
 714 this framework into the emotional domain. Children used curiosity to probe difficult feelings, ownership to shape
 715 how emotions were represented and shared, and enjoyment to transform potentially heavy or negative emotions into
 716 manageable and socially meaningful experiences.
 717

718 These findings carry important implications for both research and practice. First, they suggest that playful learning
 719 frameworks, traditionally applied to cognitive or creative domains [44, 61], are equally relevant to emotional development.
 720 Second, they highlight how play-based approaches can fill gaps left by conventional, adult-led emotional education,
 721 which often relies on scripted lessons or labeling exercises [14, 32]. Finally, they point toward design principles for
 722 emotional learning tools: designs should invite curiosity through open-ended prompts, allow flexible ownership by
 723

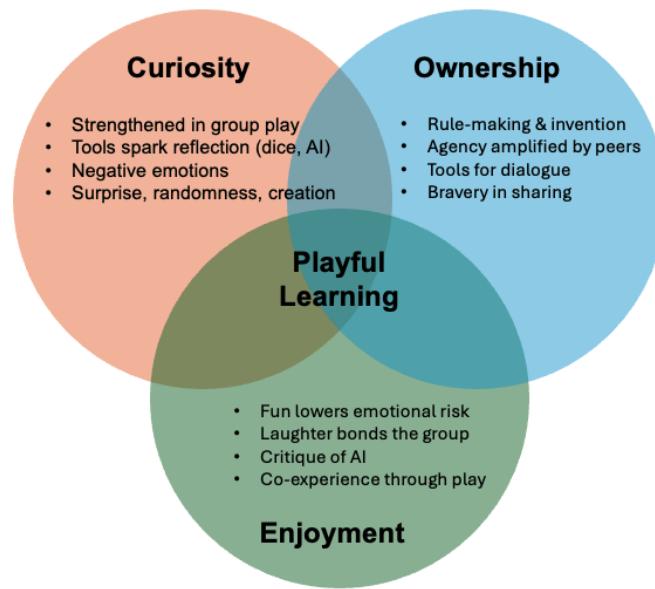


Fig. 2. Playful qualities of emotional learning aligned with the Pedagogy of Play framework.

enabling modification and authorship, and foreground enjoyment as an essential feature rather than a byproduct. In this way, play emerges not only as a pedagogical method but also as a protective mechanism, enabling children to safely approach and reinterpret emotions that might otherwise be avoided.

5.2 Curiosity as a Gateway to Emotional Exploration

Curiosity was often the starting point for children's emotional play. Instead of being drawn only to positive feelings, many participants actively selected anger, disgust, or sadness as their "favorite" emotions to explore. These choices reflected not an unhealthy interest in negative feelings, but rather a recognition that these emotions were more engaging, unpredictable, and fun to explore. Prior research shows that curiosity is strongest when children face uncertainty in a safe setting [17], and our findings suggest this also applies to emotional learning.

Playful tools acted as catalysts that amplified this curiosity. The tools we used, which are dice, games, and AI stickers helped spark children's curiosity. Rolling a random emotion on the dice or seeing a surprising AI output made children stop, think, and react. These tools gave children a reason to ask, "What does this feeling mean?" or "How can I show it?" The unpredictability turned abstract emotions into concrete prompts for play. This aligns with studies showing that playful tools can make complex ideas easier to approach and more engaging [44, 61].

Additionally, curiosity did not unfold in isolation. Children's interest in difficult emotions was magnified in collective play. When one child acted out disgust in an exaggerated way, others laughed and copied them. When another child picked sadness, peers responded by telling their own stories or building on that choice. In this way, curiosity spread through social play. This echoes sociocultural theories that children build understanding through shared activity and joint attention [41, 58].

These patterns show that curiosity can act as a gateway into emotional exploration when paired with playful design. Tools that use surprise, randomness, or creative prompts can invite children to engage with emotions they might usually

781 avoid. In group settings, curiosity turns into a shared energy that helps children open up, compare experiences, and
782 reflect together. In this way, curiosity works both as an individual spark and as a collective process, opening the door to
783 deeper reflection and emotional expression.
784

785 786 **5.3 Ownership and the Campfire Effect**

787 Ownership was another key feature of emotional play. Children did not just follow the activities as given. Instead, they
788 changed rules, made new versions, and bravely shared emotions that mattered to them. This showed that they were
789 active authors of the play, not passive participants. Prior research highlights that ownership gives children agency and
790 motivation in learning [15, 22]. Our findings extend this to emotions, showing how children claimed control over how
791 feelings were represented and shared.
792

793 The objects of play, dice, stickers, or wheels, functioned as more than tools; they became focal points that gathered
794 children's attention and sustained conversation. Much like a campfire that draws people into storytelling, these playful
795 artifacts ignited dialogue, humor, and critique. This resonates with the campfire metaphor in learning theory, which
796 emphasizes how shared prompts foster empathy, trust, and co-presence in communal spaces [4, 8, 51]. The tools
797 mattered less for their accuracy and more for their capacity to spark active engagement and relational exchange.
798
799

800 Ownership also grew through recognition by peers. When one child introduced a new rule or shared a vulnerable
801 emotion, others responded by taking it seriously, building on it, or playfully challenging it. This collective response
802 shows that ownership was both personal and social. It was not only about claiming a voice, but also about having that
803 voice echoed and reshaped in group play. The campfire effect in our sessions made ownership not just about personal
804 control but about co-authoring emotional meaning together.
805

806 For design, this means emotional learning tools should not act like strict instructors but as campfires that spark
807 interaction. Activities should leave room for children to change rules, adapt tasks, and bring in their own ideas. At the
808 same time, designs should encourage group recognition so that children's contributions are taken up and extended by
809 peers. In this way, ownership supports not just individual agency but also collective engagement.
810

811

812 813 **5.4 Enjoyment and Empathy as Co-Experience**

814 Enjoyment was the emotional foundation that kept children engaged. Across sessions, laughter, teasing, and playful
815 jokes were constant. Even when activities became challenging, children stayed with them because they were fun.
816 Enjoyment lowered the stakes, making emotions easier to approach. Prior work shows that fun helps learners stay
817 open, persistent, and resilient [40, 61]. Our findings suggest that this also applies to emotional learning: fun makes
818 vulnerability safer and more approachable.
819

820 Enjoyment also created empathy as a form of co-experience. Instead of imagining what another child might feel,
821 participants empathized by laughing, reacting, and performing emotions together. Joking about an AI mistake or acting
822 out the same emotion made empathy a shared stance, not an individual skill. This challenges traditional models of
823 empathy as perspective-taking [12, 45] and aligns with sociocultural views that empathy grows through joint attention
824 and co-attunement [5, 44].
825

826 The AI tool supported this process by acting as a safe third party. Because its mistakes were funny or "stupid" rather
827 than personal, children could critique it together without feeling exposed. This collective humor created social glue,
828 helping children connect while indirectly working through emotions. In this sense, fun acted as a moderator: it reframed
829 discomfort into manageable, even enjoyable experiences. Similar processes are found in therapeutic and play research,
830 where humor helps reduce the weight of difficult emotions [12, 38, 42].
831

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Fig. 3. Metaphor of campfire effect as playful learning

By embedding emotions in fun, play gave children both safety and agency. They could share without fear of judgment and turn emotions into material for humor and creativity. In doing so, they showed how enjoyment can function not only as entertainment but as a mechanism for reframing—helping children process feelings in constructive and socially connected ways. For design, this means that fun should not be treated as an extra, but as a core ingredient of emotional learning.

5.5 Design Implications

Our findings extend prior work in learning sciences and HCI by showing how children appropriate both physical and digital tools for emotional play. While tangible artifacts are known to support embodied engagement [39, 40], our study highlights their consistent preference over digital-only tools. At the same time, children reimagined digital “failures” as opportunities for humor and bonding, suggesting that imperfection can be as valuable as accuracy. Building on these insights, we propose the following implications for designing emotional learning environments:

- (1) **Prioritize tangible tools.** Physical materials such as dice, wheels, and printed stickers provided children with embodied ways to perform and share emotions. Tangible artifacts anchored emotional play more effectively than digital-only interactions, underscoring the importance of designing tools that can be touched, exchanged, or displayed.
- (2) **Design for freedom and flexibility.** Children’s engagement flourished when activities allowed them to bend rules, reinterpret materials, or create new variations. Highly structured tools constrained their thinking, while open-ended ones supported agency and creativity. Emotional play is best supported by designs that leave room for modification and improvisation.

- 885 (3) **Extend play into personal contexts.** Children valued tools that could travel beyond the immediate session,
886 such as stickers they could take home or use in familiar settings. This suggests that emotional learning is
887 strengthened when designs are portable, personally meaningful, and easily integrated into daily life.
888 (4) **Embrace negative emotions as entry points.** Rather than avoiding difficult feelings, children actively sought
889 them out as playful material. Designing activities that frame negative emotions in approachable ways through
890 humor, exaggeration, or collective performance can make them more engaging and less intimidating.
891 (5) **Leverage playful critique.** Children frequently bonded through collective humor and critique, particularly
892 when digital tools produced unexpected or flawed outputs, especially emotional messages produced by AI.
893 Designing for moments of imperfection, surprise, or playful failure can foster connection and transform
894 frustration into shared engagement.
895

896 6 Limitation and Future Study

900 This study has several limitations. First, the sample was relatively small and drawn from a specific context, which
901 limits how broadly the findings can be generalized to other groups of children [9]. Second, the activities were short in
902 duration and conducted in facilitated sessions, meaning children's engagement with AI and peers may have been shaped
903 by time constraints, adult guidance, or the novelty of the technology rather than reflecting longer-term, peer-driven
904 practices [16]. Third, children entered the study with varying levels of prior TheDesignChildren experience: those
905 familiar with earlier sessions were generally more comfortable contributing, while newer participants required more
906 facilitator support, creating uneven participation dynamics.

907 Future research should extend this work into more diverse cultural and socioeconomic contexts, since children's
908 ways of expressing and interpreting emotions vary across backgrounds [7]. Longitudinal studies are also needed to
909 capture how children's emotional expression and agency with AI tools evolve over time, moving beyond the dynamics
910 of a single session [9]. Building directly on the current study, future work should focus on co-designing new emotional
911 tools with children, analyzing how their design ideas, rule-making, and playful practices can inform the creation of
912 tools that reflect their lived experiences. In this way, children are positioned not only as users of emotional tools but
913 also as co-creators of designs that foster curiosity, ownership, and enjoyment in emotional learning.

914 7 Conclusion

915 This study explored how playful co-design activities can open new possibilities for children's emotional learning.
916 Through storytelling, designing empathy game, and creating emotional stickers with both tangible and AI-supported
917 tools, children expressed complex feelings, shared perspectives, and reframed difficult emotions in safe and enjoyable
918 ways. Playful contexts encouraged agency, as children invented rules and shaped how emotions were represented, and
919 they fostered connection by turning emotional expression into collective, co-experienced moments [42].

920 Our findings highlight that children's social-emotional learning benefits when activities move beyond scripted
921 lessons toward open-ended, participatory practices that value children as co-creators. By positioning tools such as dice,
922 stickers, and AI outputs as "campfires" that spark conversation, we show how play provides a foundation for curiosity,
923 ownership, and shared enjoyment in emotional exploration [15, 29, 51].

924 Moving forward, these insights call for designing emotional tools that combine tangible and digital forms of play
925 and that are developed in collaboration with children themselves. In doing so, children are not only supported as users
926 of emotional learning environments but also empowered as co-designers of practices that make emotions more visible,
927 approachable, and meaningful in their everyday lives.

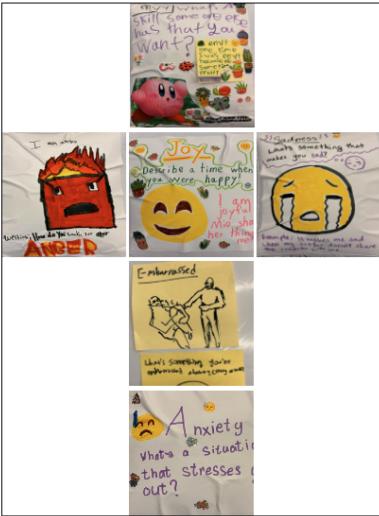
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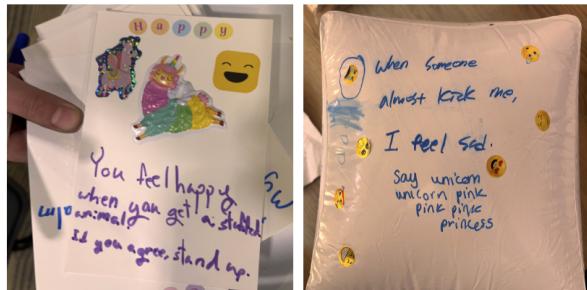
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A Outcomes of Storytelling Session (PD1)



B Outcomes of Empathy Game Design Session (PD2)

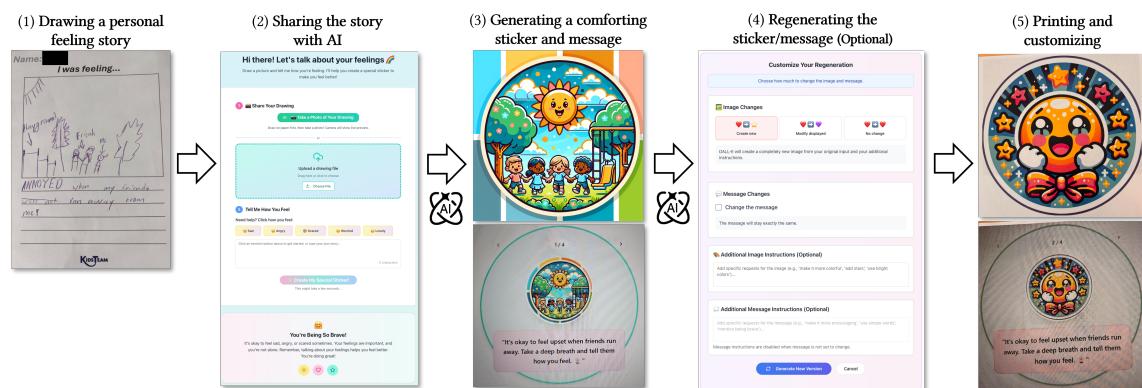


C Outcomes and Further Information on AI-Emotional Sticker Session (PD3 and PD4)

C.1 Outcomes



C.2 Interface Diagram of the AI Tool



This figure visualizes the interface of the AI tool used in PD3 and PD4 with screenshots and actual app outputs in alignment with the steps portrayed in Section 3.2.3. A technical overview of the AI tool—including the exact AI models used—can be found in the next Appendix subsection.

1197 C.3 Technical Overview of the AI Tool

1198 The AI sticker tool was developed as a web-based prototype on Replit, an online
 1199 integrated development environment and web hosting platform. The tool was
 1200 built with React/Node.js and worked as follows on a technical level:

1201 (a) **Uploading a child's input:** After a child participant filled out the activity
 1202 sheet, the child initiated an app session, uploaded a picture of the activity
 1203 sheet, selected the emotion being described in this sheet, and wrote a text
 1204 description of what was going on in that sheet.

1205 (b) **Generating content with AI models:** The uploaded inputs were then sent
 1206 to OpenAI's models using OpenAI's APIs.

- 1207 • OpenAI's ChatGPT 4o model then generated the message for the child, a
 1208 description of the emotion the child is portraying, and an image prompt.
- 1209 • From here, the generated image prompt was sent to OpenAI's DALL-E
 1210 3 model to generate the sticker.
- 1211 • Safety check was done multiple times throughout this step using OpenAI's
 1212 ChatGPT 4o and omni-moderation models.

1213 (c) **Displaying sticker and message:** After the AI models generated the re-
 1214 quired content, the app led the child to the results page and then displayed
 1215 the generated sticker along with the generated message and the description
 1216 of the portrayed emotion.

1217 (d) **Adding regeneration instructions (optional):** If the child hoped to regen-
 1218 erate the sticker and/or the message, he/she could scroll down on the results
 1219 page and initiate a regeneration process.

1220 The child could specify additional instructions for message and sticker regen-
 1221 eration, though these instructions were optional.

1222 (e) **Regenerating content with AI models (optional):** If the child initiated the regeneration process, the app sent
 1223 some of the existing content and the user input to the appropriate AI models using OpenAI's and Google's APIs.

- 1224 • If regenerating the message, the app used ChatGPT 4o to generate another message based on the input from
 1225 (a) and any additional instructions given.
- 1226 • If regenerating the sticker, the user could choose to either...
 - 1227 – **create a new sticker from scratch** in the same way as it was done in (b) with ChatGPT 4o and DALL-E
 1228 3, except with the additional instruction also being part of the input,
 - 1229 – or **modify the sticker being displayed on the results page** with Gemini 2.0 Flash based on the
 1230 displayed sticker and any additional instructions given.
- 1231 • Safety check was done repeatedly throughout this step in the same way it was done in (b).

1232 (f) **Displaying regenerated sticker/message (optional):** After the AI models regenerated the requested content,
 1233 the app scrolled to the top and displayed the regenerated sticker/message.

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