



Designing for Caregivers: *Toward a Caregiver Experience Framework and Design Cards for Inclusive Playgrounds*

Xinzhe Zhao, Jiayi Zou, Zi Yang, Ines Ziyu Yin, and Kin Wai Michael Siu*

School of Design, The Hong Kong Polytechnic University, Hong Kong, China

Designing inclusive public playgrounds requires considering all users, including children and caregivers. Previous studies have focused primarily on children's needs and experiences, but caregivers' perspectives are often overlooked. This study aimed to identify key experience design considerations for caregivers in public playgrounds. To this end, it developed a set of Caregivers Experience Design for Inclusive Playground (CED-IP) cards. The findings contribute to a better understanding of caregiver experiences in the design of public spaces. Semi-structured interviews were conducted with caregivers randomly in Hong Kong playgrounds. Through grounded theory data coding, an evaluation dataset of caregiver experiences with inclusive public children's playgrounds was created. The CED-IP card is generated entirely based on the caregiver's interview data. The results were distilled into the CED-IP cards, which include 9 design consideration headings: safety, comfort, interactivity, playability, inclusivity, service, convenience, supportive, purpose. The results provide discussion on the content and priorities of experience design for playground facilities and environments. The CED-IP cards are worded carefully so that they can be used or adapted for other play sectors. This study further explored and developed a caregiving experience design framework comprising four interrelated experiential elements: Meaning construction, Affective comfort, Perceived ease, and Autonomous control.

Keywords – Inclusive Design, Caregiver Experience, Public Playground.

Relevance to Design Practice – Despite the growth of inclusive design, experience equity for caregivers remains underexplored in practice. This study examines caregivers' experiential needs in public playgrounds and proposes a framework and a set of design cards. These tools support designers in implementing inclusive experience design in a structured way within caregiving contexts.

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Introduction

Inclusive design was initially referred to as accessible design. It aimed to remove environmental barriers that hinder people with disabilities, to prevent discrimination and ensure equal access (Coleman et al., 2003; Persson et al., 2015). However, this definition limited its scope and potential. The concept of universal design, proposed in 1985, expanded this view by advocating for products, environments, and services that accommodate users of different ages and abilities (Clarkson et al., 2013; Coleman et al., 2003; Heylighen et al., 2017). Luck (2018) argued that users' lived experiences in the material world should be placed at the center of the design process. Demirel and Erkiş (2025) suggested that inclusivity is grounded in diversity and dynamism and should address both embodied and social experiences. Similarly, Moore et al. (2020, 2023) argued that inclusive public playgrounds should support equality and dignity in children's play. Overall, the concept of inclusive design has shifted from a focus on physical accessibility to broader concerns with experience and social participation. Nevertheless, in practice, the focus still largely remains on accessibility and usability (Demirel & Erkiş, 2025).

Designers often rely on accessibility regulations or compliance checklists to ensure that products can be used by people with different abilities (Demirel & Erkiş, 2025). However, a product may be technically usable yet still generate

negative experiential outcomes. For example, it may increase cognitive and psychological load for some users (Lazar et al., 2015) and create feelings of stigmatization among older adults (Li et al., 2020). The same applies to public spaces. Even when playground equipment meets formal accessibility standards, children with disabilities may experience lowered self-esteem due to biased gazes and may feel marginalized because of limited social interaction opportunities (Moore et al., 2020, 2023). These cases suggest that design driven only by technical compliance is insufficient to achieve inclusive product experiences.

Inclusive research has increasingly focused on user groups whose needs are often overlooked yet play a critical role in use contexts (Corsini et al., 2022; Pirinen et al., 2022). With population aging and changes in family structures, much caregiving work is undertaken by informal caregivers, such as family members. In public transport systems, caregivers must manage spatial safety, time coordination, and behavioral support for the person they care

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*Corresponding Author: m.siu@polyu.edu.hk

for (Kim, 2025). In healthcare or social service settings, they often act as information mediators and communication bridges (Row et al., 2020). In public playgrounds or community contexts, caregivers function not only as safety supervisors but also as emotional regulators and facilitators of social interaction (Yang et al., 2026; Zhao et al., 2025). These examples show that caregiving extends beyond physical assistance. It involves continuous and dynamic emotional regulation, social interaction, and risk assessment.

Current research on caregivers primarily focuses on caregiving practices in hospital and home settings, with limited attention to their experiential needs in public spaces (Dlamini et al., 2023; Lee & Li, 2022; Moore et al., 2023; Yang et al., 2026).

Xinze Zhao is a Ph.D. candidate at the Public Design Lab, School of Design, The Hong Kong Polytechnic University. Her research focuses on design for wellbeing, inclusive design, and interdisciplinary design. Recently, she has been involved in two Hong Kong Research Grants Council—funded projects on inclusive design and sustainable environments and inclusive public play spaces for children and caregivers, as well as a National Natural Science Foundation of China (NSFC)—funded project on big data-driven creative design education. Her current Ph.D. research explores interdisciplinary co-design of AI-enabled self-help behavioral activation applications to support mental health, aiming to advance more inclusive and human-centered intelligent health design through interdisciplinary design approaches.

Jiayi Zou is a Ph.D. candidate in Design at The Hong Kong Polytechnic University and a visiting Ph.D. research student at Nanyang Technological University. Her research focuses on design education, intelligent design, and inclusive design. She investigates how artificial intelligence can support design learning, creative thinking, reflective practice, and human–AI collaboration. Her work also examines inclusive interaction and multisensory design for people with diverse sensory and cognitive needs. By integrating design research, educational experimentation, and human–computer interaction methods, she aims to develop theoretically informed and practically applicable approaches that foster more personalized, reflective, accessible, and inclusive design practices across educational and real-world research contexts.

Zi Yang is a research associate at the School of Design, The Hong Kong Polytechnic University, where she received her Ph.D. in Design. Her research interests include inclusive design, public design, social design, and resilient public spaces. She is particularly interested in participatory approaches, stakeholder engagement, and the role of design in addressing complex social and environmental challenges. Using mixed-method research, she examines public environments, community participation, service design, and multi-stakeholder collaboration. Her broader academic interests center on socially responsive and context-sensitive design practices that recognize diverse experiences, support shared use, and improve the inclusiveness of public and community settings.

Ines Ziyun Yin is a Ph.D. candidate at the School of Design, The Hong Kong Polytechnic University. She received an MA in User Experience Design from the University of the Arts London and a bachelor's degree in communication (Media, Arts and Design) from Beijing Normal–Hong Kong Baptist University United International College. Her research focuses on participatory design, co-design, speculative design, and human communication, with particular interests in family connectedness, human–AI relationships, and techno-social transformation. During her doctoral studies, she has been involved in a Hong Kong Research Grants Council project on inclusive public play spaces for children and caregivers. Her research employs qualitative, mixed-method, and research-through-design approaches to explore how design can foster more inclusive, collaborative, and socially sustainable futures.

Kin Wai Michael Siu is Chair Professor of Public Design and Eric C. Yim Professor of Inclusive Design of the School of Design, The Hong Kong Polytechnic University. He is Leader of Public Design Lab. Professor Siu is a fellow of numerous professional engineering and design organizations. He has been invited as a visiting professor and scholar by several prestigious universities, including the Massachusetts Institute of Technology (Fulbright Scholar), the National University of Singapore (ASIA Fellow), the University of Cambridge, and UC Berkeley (Visiting Scholar). His research interests include public design, design policy and management, user reception, inclusive design, and FlexiDesign. He holds more than 50 US and international patents and design registrations, as well as over 50 major international invention and design awards. He has published more than 500 refereed journal papers. As chief supervisor, he has successfully supervised over 100 Ph.D. and MPhil students.

Playgrounds are a common form of public space, bringing together multiple user groups for shared activities. They have a dual character. On the one hand, they support children's physical development, creativity, and social interaction (Moore et al., 2023; Cohen et al., 2023). On the other hand, they are key settings where caregivers perform supervision, support, and companionship roles (Yang et al., 2026). Caregivers' experiences concern not only their physical and psychological well-being. They may also influence children's length of stay, the quality of interaction, and overall play experiences. Studies on caregivers' experiential design elements and related design tools remain limited (Siu et al., 2022; Yang et al., 2026).

Experience Design

Experience design is a central topic in contemporary design research—Dewey (1980) conceptualized experience as arising from continuous interaction between individuals and their environment. Experience is therefore understood as a dynamic process of construction. Crilly et al. (2004) extended its structure in design contexts and identified three response types: aesthetic impression, semantic interpretation, and symbolic association. Early user experience research moved beyond usability and foregrounded affective and meaning-related dimensions, establishing the foundation for experience-oriented design (Norman, 2004). Hassenzahl (2007) further argued that experience is not determined solely by product functionality. It emerges when products support psychological needs, including autonomy, competence, and relatedness, thereby eliciting positive affect. Desmet and Hekkert (2007) systematized product experience theory and proposed a framework comprising aesthetic pleasure, meaning construction, and emotional response. An aesthetic experience involves sensory pleasure and novelty. Meaning experience involves symbolic associations and value construction. Emotional experience concerns affective responses triggered by evaluative processes. Wright and McCarthy (2010) emphasized the processual and situated nature of experience. Accordingly, design should focus on the ongoing construction of meaning in interaction, rather than isolated moments of use.

Building on this theoretical foundation, experience design research has gradually developed in multiple applied domains. In tourism, experience refers primarily to processes of meaning construction in specific contexts. Research in this field emphasizes strategic positioning, value propositions, opportunities for meaning, contextual foundations, and storytelling (Tussyadiah, 2014). In education, learner experience is understood as subjective, contextual, and dynamic. It emerges from the interaction between individuals' internal states, technological characteristics, and the contexts in which these interactions occur (Schmidt & Huang, 2022). In healthcare, patient experience refers to the quality of interactions and relationships during service encounters. Research focuses on emotional experience, participation and co-creation processes, and the doctor–patient relationship (Bate & Robert, 2023; Jones, 2013). These studies demonstrate that experience is interpreted differently across contexts. Each field highlights distinct dimensions. Therefore, this study integrates interview data and relevant literature further to identify an experience design framework for caregiving contexts.

Design Tools

Experience design research has proposed a range of tools to support more structured design processes. These include personas, customer journey maps, user stories, and the value proposition canvas. Personas help design teams build a shared understanding of users and identify the characteristics of different user groups (Miaskiewicz & Kozar, 2011; Pruitt & Adlin, 2010). Customer journey maps visualize touchpoints and pain points across an entire task process, showing how users interact with a product or service at different stages (Endmann & Keßner, 2016; Howard, 2014; Walter, 2022). User stories are widely used in agile development to clarify user needs and to support early ideation and rapid iteration (Celikoglu et al., 2017; Gruen et al., 2002). The Five Elements of User Experience provide a comprehensive framework that links abstract concepts to concrete design decisions (Garrett, 2011; Sauer et al., 2020). The value proposition canvas aligns user needs with product value and supports the exploration of market demands and value refinement (Osterwalder et al., 2015). These tools are effective in task-oriented settings. However, caregiving contexts involve dynamic interactions among people, products, and environments. These interactions are unstructured, goal-directed, and often spontaneous. As a result, existing experience design frameworks and tools do not fully address the needs of such contexts.

Design projects that involve dynamic and interactive contexts require flexible, reconfigurable design media. In response to this need, this study adopts design cards as the primary medium. Compared with structure- or process-oriented design tools, cards present design knowledge in modular units. This allows ideas to be combined, compared, and reconfigured across different contexts (Casais et al., 2016; Lucero & Arrasvuori, 2010). Physical cards can translate abstract concepts into tangible form. They also support flexible combination and prioritization of design elements. This format helps clarify ideas and expand creative exploration. It can further establish a shared language among team members and external stakeholders, thereby improving collaboration (Beck et al., 2008). Cards provide practical support for the evaluation and selection of ideas (Lucero et al., 2016). For these reasons, this study selected design cards as the design medium.

This study focuses on inclusive caregiving experiences in public playgrounds, defined as caregivers' user needs and experiences when interacting with care recipients, facilities, and the surrounding environment in public spaces, encompassing both embodied and social dimensions. This research aims to develop a set of design cards to enhance caregivers' experiences in inclusive playgrounds (CED-IP) and to identify experience design elements that address caregivers' needs. The study is guided by the following three research questions: (1) What key characteristics of facilities and spatial features shape playground experiences? (2) What are the experiences and needs of caregivers? Moreover, (3) What are the elements of inclusive experience in caregiving contexts?

Methodology

This study employed a semi-structured interview approach. Field surveys were conducted in real-life settings to capture authentic user experiences better. The research focused particularly on

caregivers, who serve both as direct users of playgrounds and as observers of children's behaviors. This decision was informed by ethical and practical considerations concerning children's consent, attention, and comprehension (Christensen & James, 2017; Huser et al., 2022). Although children were not directly consulted, caregivers' accounts provide valuable proxy insights into children's play behaviors, comfort levels, and engagement patterns. Previous research (e.g., Arts et al., 2022; Varni et al., 2007; Wengrovius et al., 2022) has shown that caregivers' observations are a valid and informative proxy when direct participation of children is constrained.

Three researchers conducted field observations and assessed the inclusiveness of 40 playgrounds designated as inclusive by the Hong Kong government. Six playgrounds—Tuen Mun Park, Quarry Bay Park, Kowloon Park, Tiu Keng Leng Sports Centre, Wan Chai Park, and Yuet Wah Street Park—were selected as interview sites. These playgrounds represented different geographic areas of Hong Kong and covered a wide range of inclusiveness scores (from below 20% to above 80%). Interviews were conducted randomly across these six sites.

This study received ethical approval, and all participants provided informed consent. Conducting semi-structured interviews in playground settings helped participants accurately recall past experiences (Adeoye-Olatunde & Olenik, 2021). The semi-structured format allowed researchers to ask flexible questions based on the interview guide, enabling the collection of richer data (Kvale & Brinkmann, 2009). Researchers also observed interactions between caregivers and children to enhance the depth and contextual validity of the interview data.

Interview Plan

Interactions and experiences were documented through photographs and audio recordings. Participants were randomly selected on the playground. The interview has three focused stages:

1. **Children's play experience:** Caregivers described children's play behaviors, preferences, and activities, highlighting both positive and negative experiences. They explained what made certain play encounters enjoyable or unsatisfactory, including experiences involving caregiver participation.
2. **Caregiving Experience:** This phase examined caregivers' personal feelings, challenges, and rewarding moments while supervising children. Participants reflected on how playground equipment and environmental features either supported or hindered their caregiving role.
3. **Suggestions for Improvement:** Caregivers evaluated existing physical facilities and environmental conditions, identifying strengths and limitations. They provided specific recommendations for enhancing both play value and caregiving experience.

Selection of Participants

A total of 35 participants were randomly recruited from six playgrounds. Their demographic characteristics are summarized in Table 1. All participants were regular caregivers

at public playgrounds. The caregiver group comprised parents, grandparents, and domestic workers who cared for children in two common age groups: 0-6 years and 7-12 years.

Table 1. Interview participants.

Participant	Participant Type	Gender of Children	Age of Children
P1	Father	Female	2
P2	Grandma	Male	1
P3	Mother	Male	8
P4	Mother	Male	4
P5	Mother	Male	8
P6	Mother	Female and Female	4 and 6
P7	Mother	Female	6
P8	Father	Male and Female	4 and 2
P9	Domestic Helper (Female)	Female and Female	5 and 6
P10	Father	Male	7
P11	Grandma	Male and Female	5 and 3
P12	Father	Male	5
P13	Father	Male	3
P14	Mother	Male	3
P15	Domestic Helper (Female)	Male	8
P16	Grandpa	Male	2
P17	Father	Male	12
P18	Father	Female	7
P19	Mother	Female	8
P20	Mother	Female	4
P21	Mother	Female	5
P22	Mother	Female and Female	3 and 5
P23	Mother	Female	8
P24	Mother	Male	2
P25	Mother	Female	7
P26	Grandpa	Male	3.5
P27	Mother	Male	3.5
P28	Grandma	Male	5
P29	Grandma	Male	2
P30	Mother	Male	3.5
P31	Father	Female and Male	6 and 10
P32	Domestic Helper (Female)	Female	9
P33	Domestic Helper (Female)	Male	2
P34	Domestic Helper (Male)	Female	2

Cards Development

This study derived the components of cluster, heading, concern, and code through systematic coding and analysis of the original interview transcripts. Examples and explanations were then developed by integrating the interview and observational data. The examples and explanations provide detailed insights that help designers better understand user experiences and needs.

These cards fall under the category of Human Insight Cards, capturing caregivers' perspectives and offering insights into their behaviors and emotions. Such cards can support practitioners in developing better user experiences (Hsieh et al., 2023), enhancing caregivers' experiences in playgrounds and promoting more inclusive environments that foster caregivers' well-being.

Each card includes key insights along with selected detailed data, as the cards are intended to be used across two stages (Hsieh et al., 2023). In the research stage, the examples and explanations sections provide information and conceptual foundations to guide design decisions. The card sets used at this stage tend to be more fact-based and data-driven. In the Evaluation stage, the heading and code sections summarize the key points, helping design decision-makers reflect on whether their design proposals align with user needs. After the initial development of the cards, a workshop was conducted involving six designers (see Figure 1 and Table 2). Through a specific design task, participants used the cards and provided feedback regarding their effectiveness, strengths, and areas for improvement. Based on this feedback, the researchers refined the cards, and the updated version is presented in Appendix 3.

Table 2. Workshop participants.

Participant	Gender	Design experience (years)
P1	Female	6
P2	Female	7
P3	Female	8
P4	Female	6
P5	Male	8
P6	Male	5



Figure 1. Workshop to evaluate cards.

Data Preparation and Analysis

Participants' responses were transcribed from audio recordings and compiled into a document that was subsequently imported into NVivo 14 for analysis. This process enabled collaborative and iterative coding, helping to minimize researcher bias (Zamawe, 2015). Participants' reflections on relevant themes were documented, identifying key issues and suggestions related to their playground experiences.

The recorded data were hierarchically categorized and analyzed. Analysis was conducted using content analysis (Krippendorff, 2019) and emergent open coding (Saldaña, 2021) within the general framework of grounded theory. Applying grounded theory in user experience research facilitates the uncovering of users' authentic perspectives while minimizing researcher bias.

Caregiver interview data analysis was conducted in four iterative phases (results are presented in Appendix 1 and Appendix 2).

Analysis Level 1: Raw Transcript to Codes

During Level 1 of analysis, coding was conducted by repeatedly reading, labeling, and coding individual participant transcripts in accordance with grounded theory. This process continued until a set of internally consistent codes was established. For instance, provisional codes focused solely on readability and integration were removed and replaced with codes that reflect interactivity, experience, meaningfulness, and physicality. These were designated as the initial first-level subcodes ($n = 77$).

Analysis Level 2: Codes to Core Points

At Level 2, the initial codes were synthesized and refined to distill the most critical and noteworthy ones. This process involved identifying key dimensions of playground play and caregiving experiences within each participant's dataset. By extracting overarching concepts from these grouped codes, we developed the second-level codes. This entire level of analysis was built upon the foundational codes that emerged from Level 1 ($n = 26$).

Analysis Level 3: Codes to Headings

Level 3 coding involves categorizing, summarizing, and condensing the codes generated in Level 2 to identify overarching themes within the data. This iterative process ultimately produces

headings applicable across the entire dataset. Level 3 coding is conducted within a framework of terminology commonly used in product, interaction, service, and experience design. These headings primarily provide a design-oriented structure for organizing data and reporting results, focusing on the overall playground experience rather than on novel aspects or specific experiences of play or caregiving.

The frequency of headings is an important consideration in the analysis process. However, the total number of occurrences of a heading within a single participant's data is not a valid measure of frequency, as it does not account for individual differences in response style. To address this, a special assignment frequency indicator (f) was calculated for each heading, based on the number of participants who mentioned a specific heading rather than the total number of times it was coded. Using this indicator, draft headings with less than 10% assignment were removed, and subcodes were reassigned.

Analysis Level 4: Headings to Clusters

Level 4 organized conceptually related headings into clusters ($n = 4$) to communicate the results in an organized manner. Three specification-oriented clusters are defined using design terms, namely: infrastructure support (including *safety and comfort*), Interactive engagement (including *interactivity, playability, and inclusivity*), and basic experience (including *supportive, convenience, and service*). A separate cluster, experiential goals (*purpose*), was defined.

Dataset Overviews

Figure 2 provides statistics for the analyzed data, including headings, coding frequency indicators, and allocation frequencies within each participant's data set (columns P1-P34), caregiver needs frequency and child needs frequency under each heading, expressed as total number of participants ($f\#$) and percentage of participants ($f\%$). Headings are color-coded by the cluster they belong to. The overall mean (M) of the allocation frequency indicator is 77%; the difference between $f\%$ and M is indicated for each heading. Figure 3 illustrates the title allocation for each card.

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21	P22	P23	P24	P25	P26	P27	P28	P29	P30	P31	P32	P33	P34	<i>f</i> (#)	<i>f</i> (%)	<i>f-M</i> (%), <i>M</i> = 77%
Safety	1	2	2	1	2	3	2	4	1	1	2	4	3	1	3	1	2	1	2	1	6	4	3	1	3	0	3	1	2	2	2	5	1	1	33	97%	20%
Purpose	4	3	7	5	6	5	2	0	4	1	3	4	6	3	2	3	2	2	2	4	3	4	1	2	5	2	3	1	1	5	3	1	2	1	33	97%	20%
Supportive	3	4	1	1	0	1	1	2	2	0	1	1	3	2	2	3	1	1	1	1	2	1	1	1	1	1	1	4	2	4	2	2	2	0	31	91%	14%
Interactivity	4	3	4	1	2	4	3	2	1	1	0	2	1	1	0	2	0	4	2	2	2	3	0	1	5	1	0	5	3	2	2	2	4	1	29	85%	8%
Comfort	3	3	5	8	1	2	6	4	4	7	5	4	0	2	0	2	4	2	0	3	0	6	1	1	4	0	2	8	3	3	3	0	3	2	28	82%	6%
Playability	9	6	6	2	4	15	3	0	5	2	2	1	1	1	2	1	2	2	0	0	2	1	1	0	1	0	0	1	2	0	2	1	0	2	26	76%	-1%
Inclusivity	1	3	6	2	1	5	0	1	2	1	2	0	1	1	0	0	0	0	4	6	2	1	0	1	2	1	6	4	1	2	3	0	0	24	71%	-6%	
Convenience	2	1	3	1	4	2	1	1	1	0	2	0	0	1	0	0	1	0	0	1	1	0	1	0	0	2	0	0	1	0	1	0	0	18	53%	-24%	
Service	4	1	0	0	1	2	2	0	0	0	0	0	0	0	0	1	2	0	2	0	2	2	0	2	0	0	0	0	1	0	1	0	0	13	38%	-39%	
Basic Functions Interactive Engagement Basic Experience Experiential Goals																																					

Figure 2. Assignment of headings across the full dataset.

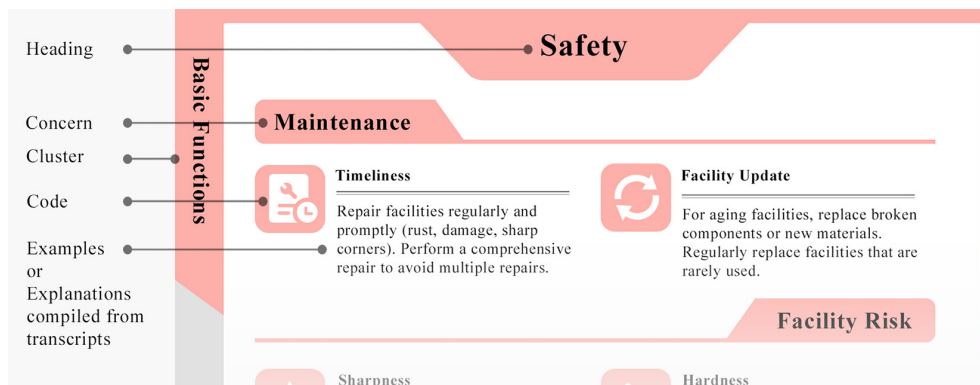


Figure 3. Assignment of headings across the full dataset.

Results

Basic Functions Cluster

The basic functions cluster contains a most coded heading (Safety, $f = 97\%$, $M + 20\%$) and an average heading (Comfort, $f = 82\%$, $M + 6\%$). Safety and comfort are caregivers' main concerns in a playground. Participants associated safety with interactive behaviors and comfort with the experience of the physical facility.

Safety

Figure 4 provides an CED-IP card for safety. The goals of playground safety are to reduce the probability of children getting hurt and the probability of caregivers stopping quarrels and fights. Playground safety refers to a dynamic state of low risk achieved through deliberate design, maintenance, and supervision within a controlled environment (Little & Wyver, 2008). It seeks to minimize the likelihood of severe or irreversible physical injuries while simultaneously supporting children's development through opportunities for risk-taking, exploration, and trial-and-error play. Safety needs refer to factors that caregivers, based on prior experience, perceive as potentially harmful to children, and therefore expend excessive physical and mental effort to prevent, ultimately leading to a decline in their own well-being.

Playground safety encompasses risks associated with equipment, potential human-related hazards, and the level of effort required from caregivers to ensure children's safety. Caregivers perceive interpersonal conflict as the primary safety threat. The design process should aim to promote positive social interactions through spatial arrangements and functional integration, thereby reducing resource-related conflicts and aggressive behaviors while encouraging cooperative skills among children (59%). As one caregiver remarked, "I tell you, the danger comes from the children... Last time I saw a child pinching that little white girl" (P5). Another caregiver concern, "I am afraid that some boys will hit others. Some kids are more domineering and think this is their territory" (P22).

In assessing playground safety, material quality, ground safety, and the predictability of risks are also critical considerations. Such risks include abrasions (6%), falls caused

by loss of balance (15%), physical collisions (12%), and falls from height (15%). One caregiver shared, "She herself fell once on this kind of ground, and the cracks would get her feet stuck when she ran" (P21). Maintenance should go beyond dealing with rust, physical damage, and timeliness issues (8%) to include the systematic replacement of aging components and targeted upkeep of rarely used play equipment (15%). For instance, as one interviewee noted, "It will rust, because sometimes children will be scratched, and if they are injured, will they be more likely to get tetanus?" (P21).

Caregivers report that both facility maintenance conditions and playground scale influence safety. Safety risks can be effectively reduced through facility redesign and updates. Specifically, play equipment should be designed to support both individual use and group participation. Interactive and cooperative play facilities should be introduced to foster children's emotional engagement and reduce risks associated with insufficient supervision. Caregivers also recommend using non-toxic, odorless, and environmentally sustainable materials, along with bright and vivid colors to enhance visual appeal (9%).

Comfort

Figure 5 provides a CED-IP card for comfort. Comfort is a pleasant state or a feeling of relaxation in an environment. People who lack comfort feel uncomfortable or unwell (Vink & Hallbeck, 2012). Comfort is a subjective experience that is influenced by physiological, physical, and psychological factors (De Looze et al., 2003; Yardım & Pedgley, 2023). The goal of playground comfort is for children and caregivers to feel physically comfortable, and for caregivers not to expend extra energy or effort to keep children safe.

Caregivers' sense of comfort depends not only on physical amenities and environmental hygiene, but also on spatial layout and visibility that support ease of supervision. Unfavorable environmental conditions negatively affect the comfort of both children and caregivers (82%). Hot weather intensifies discomfort during waiting periods, particularly in rest areas without adequate shading (45%). As one caregiver explained, "In the hot weather, children easily suffer from heatstroke or catch a cold after playing" (P28). Maintaining cleanliness across the playground is essential for ensuring comfort and positive experiences (24%). Caregivers

mentioned, “Sometimes it’s too wet and dirty to play” (P9), and “Any water must be wiped away before use” (P34). Mosquito bites require caregivers to put in additional effort to prepare and apply medication for their children (21%). As some participants noted, “We are afraid of bringing home ants” (P3), and “So many mosquitoes” (P4). Wet and unclean facilities will evoke negative emotions and increase housework for caregivers. In addition,

most caregivers need children to be always within their sight, and overly dense facilities will block their sight, forcing caregivers to change positions frequently. Therefore, when designing a children’s playground, to ensure comfort, an appropriate number of parasols, rain shelters, and mosquito repellents should be installed. It is also necessary to reduce visual obstruction through appropriate facility density and layout design.

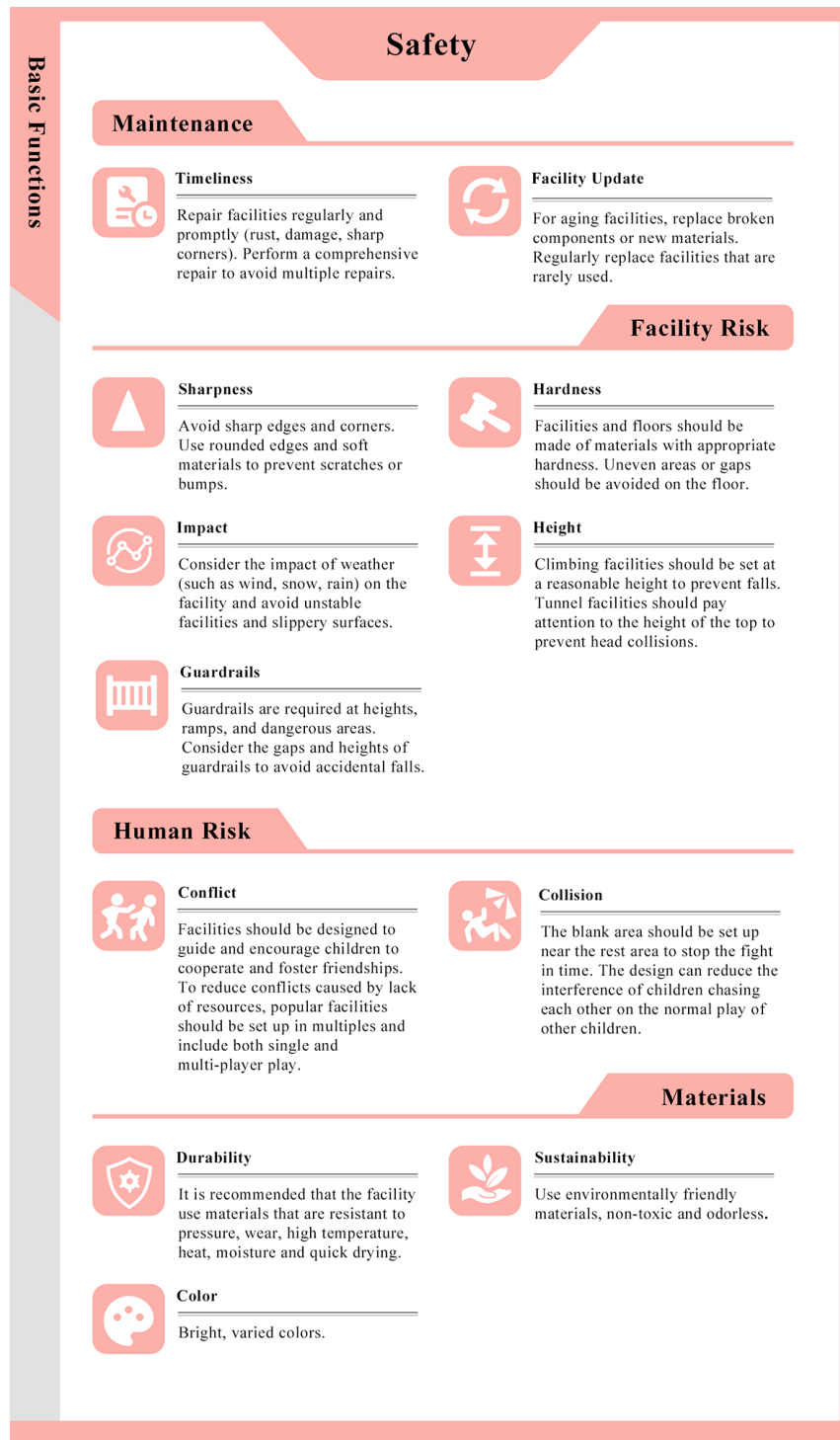


Figure 4. CED-IP cards: Safety.



Figure 5. CED-IP cards: Comfort.

Interactive Engagement Cluster

The interactive engagement cluster includes Interactivity ($f = 85\%$, $M + 8\%$), occurring at a higher frequency than average. It also includes playability ($f = 76\%$, $M - 1\%$) and inclusivity ($f = 71\%$, $M - 6\%$), both with lower frequencies than the average. The interactive experience under this cluster includes not only interactions between children but also between children and caregivers.

Interactivity

The CED-IP card for interactivity is shown in Figure 6. In the field of design, embodied interaction has been proposed as a relatively new concept. Embodied interaction refers to people creating, manipulating, and changing meanings as they experience objects

or environments (Dourish, 2001; Höök & Löwgren, 2021). The goal of playground interactivity is to provide diverse, comprehensive, and fun interactions.

When designing facilities, designers should consider all types of interactions, including individual children, individual caregivers, children and facilities, caregivers and facilities, and caregivers and children. Designing diverse forms of interaction can foster both cooperation and competition during group play. Designers should consider the specific needs associated with the caregiver's role, including education (18%), assistance (15%), and companionship (59%). For example, caregivers stated: "I teach him what a sailboat is to inspire him" (P16); "I tell her how to climb up and then slide down" (P20); "When he is on the swing, I help by giving him a push" (P25); and "I enjoy playing ball with him" (P4). However, some facilities restrict

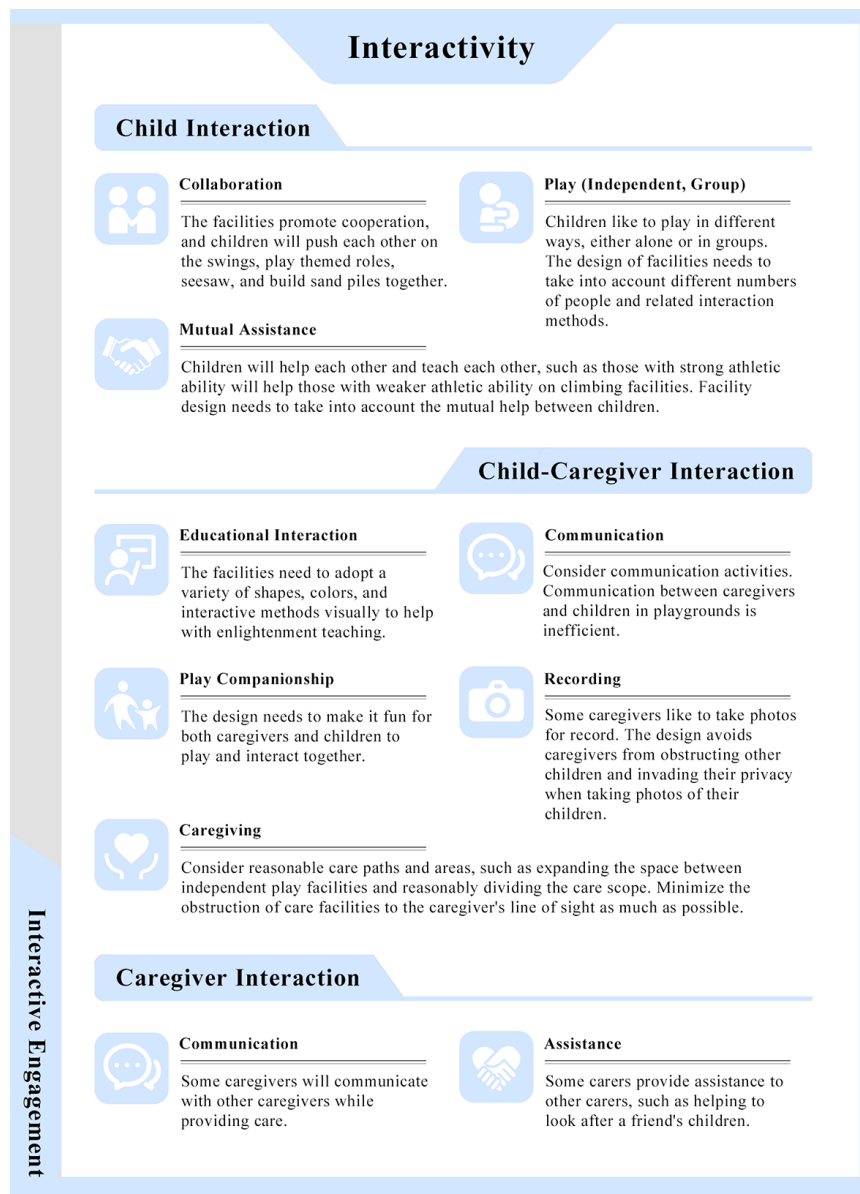


Figure 6. CED-IP cards: Interactivity.

shared participation—"I don't play with him because the slide is too short" (P14). As one parent reflected, "If we, as parents, can play together with them, it will certainly help strengthen family relationships" (P6). Incorporating multiple sensory modalities can further enrich the diversity and enjoyment of interaction. Setting appropriate upper and lower limits on the number of participants in each facility is also essential. Playgrounds should support both solitary play (9%) and group interaction (15%). As some caregivers mentioned, "He doesn't like playing with other children" (P29), while others observed, "She will actively look for other children to play with" (P21). These interactions should be meaningful and fun for both caregivers and children, rather than wasting time or being uninteresting.

Inclusivity

The inclusive CED-IP card is shown in Figure 7. Inclusive design emphasizes design or practice that allows as many people as possible, especially those who have been traditionally marginalized or excluded, to equally participate, access, or benefit (Clarkson et al., 2013).

The inclusivity of a playground depends on meeting caregivers' participation needs, ensuring accessible facilities, and providing age-appropriate equipment for all children. When designing an inclusive children's playground, designers can consider the following dimensions—accessibility and playability for children with limited physical functions. Path and facility design needs to consider children with disabilities. Color design needs to consider color-blind children. Designers should consider situations in which caregivers play with children (36%) or use the facility for exercise or rest (18%). As one participant mentioned, "It would be wonderful if there were more facilities where we could easily play with our kids" (P4). Another noted the lack of proximity, saying, "I can't play with them near the equipment" (P6). Although some playgrounds are divided by age groups, children aged 0-6 are still often observed playing on facilities designed for older children aged 7-12 (18%). Such mismatches can increase safety risks and lead to negative play experiences, which should be carefully considered and avoided in design. As one caregiver noted, "When the facilities are not age-appropriate, younger children may not be able to recognize the risks, as they might act unconsciously" (P21). In addition, some caregivers expressed the desire to document their children's growth (6%), for instance, "I took a photo of him" (P31).

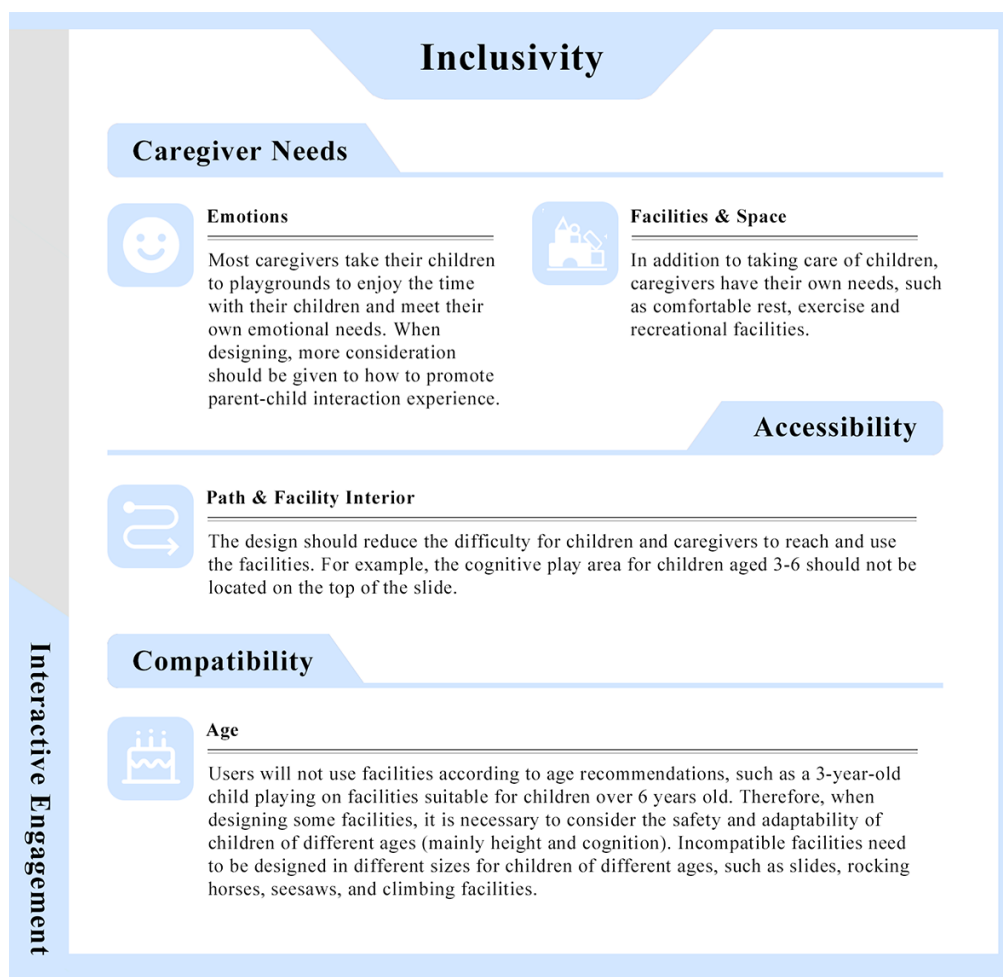


Figure 7. CED-IP cards: Inclusivity.

Playability

The CED-IP card for playability is shown in Figure 8. The design goal of playability is for users to enjoy playing and to immerse themselves in the experience. Playability is viewed from the caregiver's perspective, mainly determining the interactive play they want to engage in, their feelings about the current play style, and their observations of the child's play.

Caregivers' comments illustrate that the modular, flexible, and suitably challenging playground facilities shape children's engagement and enjoyment, supporting the theme of playability. Enhancing the overall playability of playgrounds requires the inclusion of diverse types of equipment, varied play forms, and interactive experiences (36%). As participants noted, "It's fun because there are many different types of equipment" (P3), and

"Seesaws and spinners—those are found in other playgrounds, not here" (P12). Playgrounds with infrequently updated or monotonous equipment tend to make children feel tired and bored (21%). As one caregiver commented, "Except for some special designs, most of them are quite similar" (P6). Similarly, "It hasn't changed for 20 years, and neither have the facilities" (P31). These findings highlight the importance of modularity and flexibility in playground design, suggesting that facilities with lower usage frequency should be periodically replaced or reconfigured. Moreover, introducing an appropriate level of challenge can help children stay more engaged and joyful during play (18%). As participants expressed, "The slide isn't high enough, so it's not very fun" (P6), and "I think it's dangerous, but children always love that kind of thing" (P15). This situation may be because ability and challenge are closely related in the flow experience.

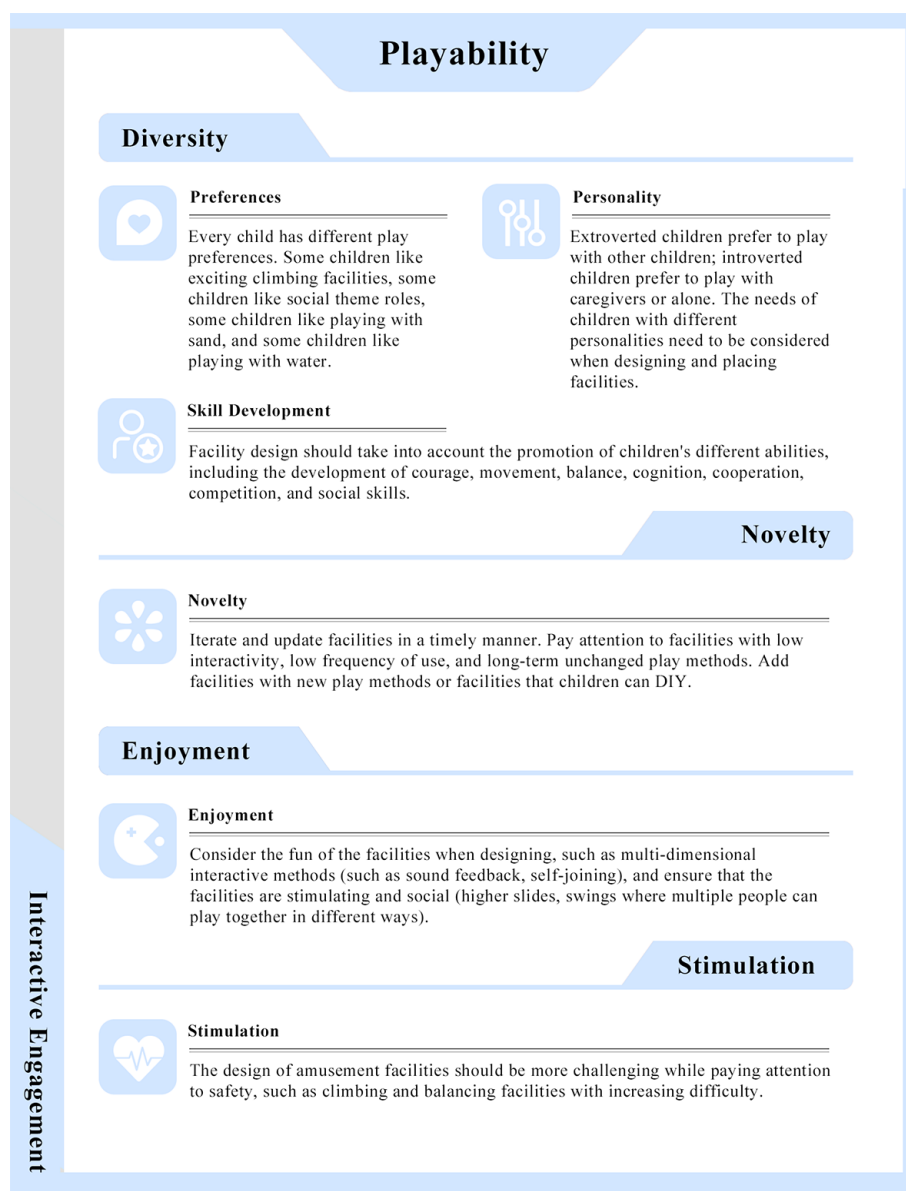


Figure 8. CED-IP cards: Playability.

Basic Experience Cluster

The basic experience cluster contains the lowest frequency of all headings, service ($f = 41\%$, $M - 36\%$), and the second lowest frequency heading, convenience ($f = 53\%$, $M - 24\%$). It also includes supportive ($f = 91\%$, $M + 14\%$), which is above the average frequency. The headings under this cluster tend to be service systems, which are more physical facility requirements.

Service

The service CED-IP card is shown in Figure 9. The concerns and codes (in parentheses) pertain to supporting facilities (restrooms, sinks, water fountains, lockers, seating, mosquito-repellent devices, shelter).

Caregivers report that supporting facilities impact the convenience and comfort of playgrounds. The construction of well-serviced playgrounds requires essential supporting facilities, including toilets (18%), water points (18%), seating (9%), handwashing sinks (3%), and storage lockers (3%). These facilities should be near play areas for convenient access. Toilets and water points primarily address children's needs, for instance, "Every time we come to the playground, my daughter has to go to the toilet"

(P24), while seating and storage lockers cater mainly to caregivers, as one participant noted, "There's nowhere to hang my clothes" (P19). In addition, context-specific facilities may also be necessary depending on the surrounding environment. For example, several caregivers highlighted the need for mosquito-control devices (6%): "Mosquitoes! I think we need mosquito lamps" (P6).

Convenience

The convenience CED-IP card is shown in Figure 10. The concerns and codes (in parentheses) are location (school, home).

Caregivers' comments illustrate the importance of playground location, showing that nearby and easily accessible sites support frequent use and positive experiences. Conveniently located public playgrounds are typically close to home (45%). Caregivers often reported that distant playgrounds pose accessibility challenges: "It takes a long walk to get to the playground" (P5); "This park is large, but not convenient" (P29). Playgrounds situated near schools (12%) were also considered acceptable, as many children visit them after school or upon completing homework. One participant explained, "My son's elementary school is nearby, so we only came here after he finished classes today" (P3).

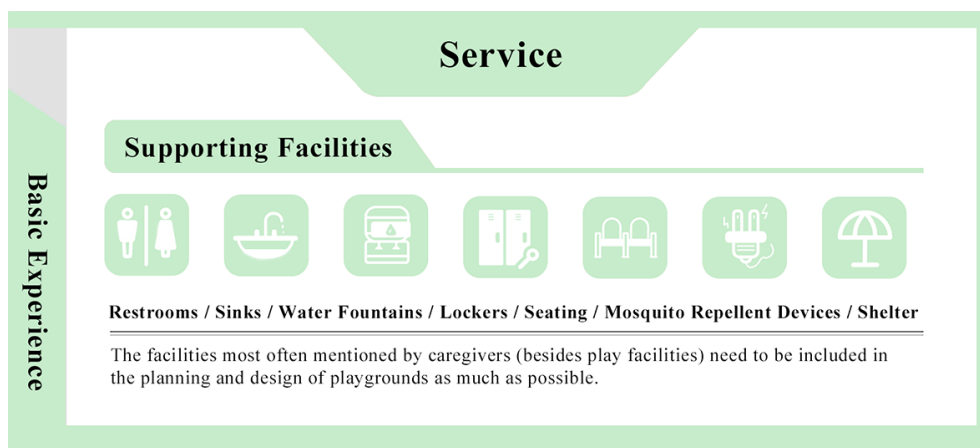


Figure 9. CED-IP cards: Service.

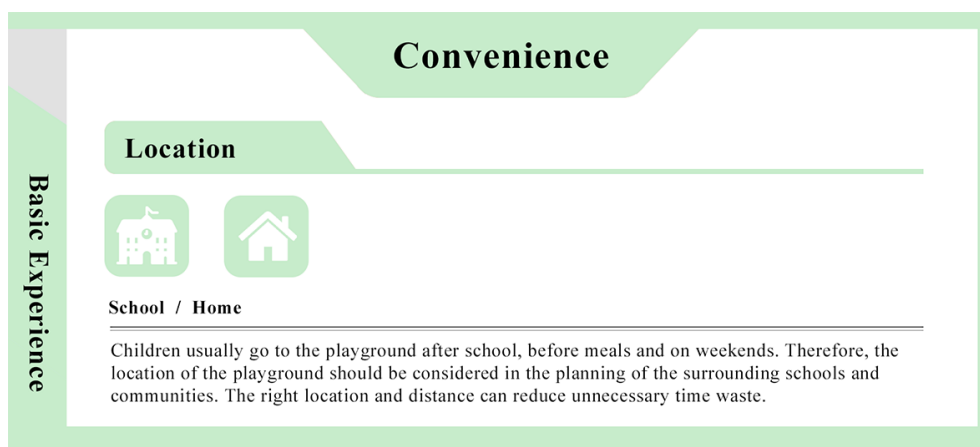


Figure 10. CED-IP cards: Convenience.

Supportive

The support CED-IP card is shown in Figure 11. The support goal is to facilitate caregivers in caring for children more easily and to enable children to play more safely and easily. Supportive needs primarily concern caregivers' need to conserve energy and physical strength when caring for children.

Designers need to consider not only support for children's play and care, but also support for caregivers to rest and relax. Key design focuses on playgrounds include promoting children's development through play, physical activity, and exposure to nature, while simultaneously supporting caregivers in roles such as supervision, companionship, and the management of children's needs (76%). Caregivers highlighted the physical effort required to monitor and assist children: "As a mother, I can't just sit while she plays; I need to help her climb up, so it's exhausting" (P20).

Facilities that encourage joint activities, such as playing and exercising together, can strengthen parent-child bonds (24%). One caregiver noted, "I really cherish this time...I enjoy interacting with my son" (P13). At the same time, playground designs should provide caregivers with opportunities for rest (6%), as reflected in the comment: "I play with my phone" (P1).

Experiential Goals Cluster

The experiential goals cluster contains only purpose ($f = 97\%$, $M + 20\%$) as the highest-frequency heading. This cluster does not provide specific design considerations for the design of the internal facilities and environment of the playground. Instead, it aims to promote designers' awareness of the playground's experiential goals. It also provides designers with creative directions for future playground designs, rather than just improving existing facilities.

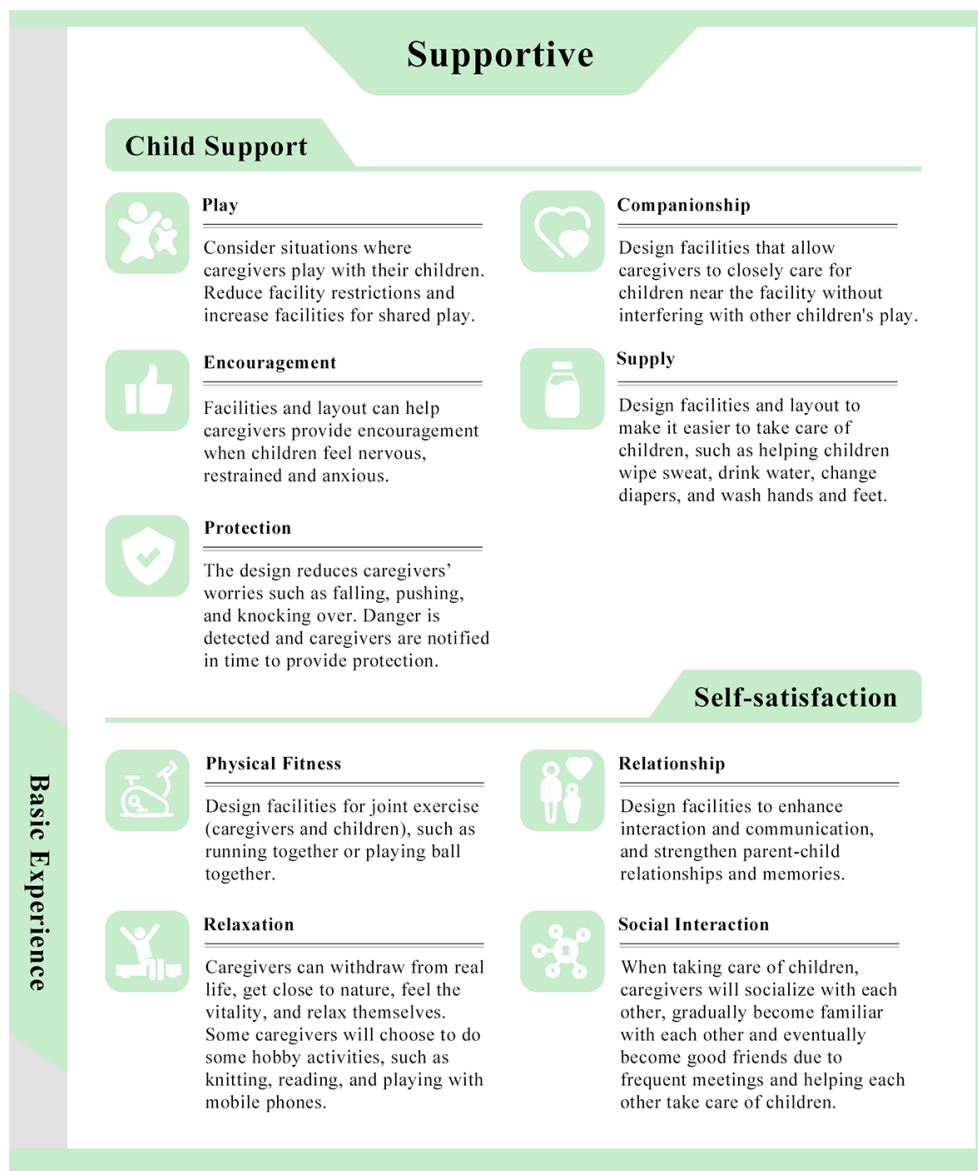


Figure 11. CED-IP cards: Supportive.

Purpose

The purpose of the CED-IP card is shown in Figure 12. The goals of children coming to the playground are mainly to have fun, relieve stress, and make friends. For caregivers, the goals of coming to the playground are to promote children's health and developmental abilities, cultivate parent-child relationships, and relax.

Playgrounds serve multiple purposes, including promoting health, fostering a range of skills, supporting physical activity, and connecting children with nature, thereby shaping comprehensive play experiences. Designers can support the recovery or enhancement of children's physical functions through the design of playground facilities and environments (50%). Participants noted, "Looking at distant objects is also good for eyesight" (P12) and "Children need sufficient exercise and physical activity" (P6). Play

can also foster the development of multiple abilities, including social skills (24%), cognition (6%), learning (6%), communication (6%), balance (3%), and courage (3%). Caregivers described, "I want him to go out and run for a while to take a break" (P3); "It helps establish social interactions with others" (P12). Environmental design can enhance children's exposure to sunlight, fresh air, and plants (30%), as participants remarked, "It's best to go out and get some sunshine" (P2) and "There is fresh air there" (P10). Positive interactions and engaging play experiences can further enhance children's positive emotions and reduce negative emotions (15%), for example, "It helps release some of the pressure from school" (P15). In addition, play can continuously engage children's time, energy, and effort (15%), which caregivers also valued: "The most important thing is that he expends his energy, then goes home and sleeps—this is better for me" (P14).

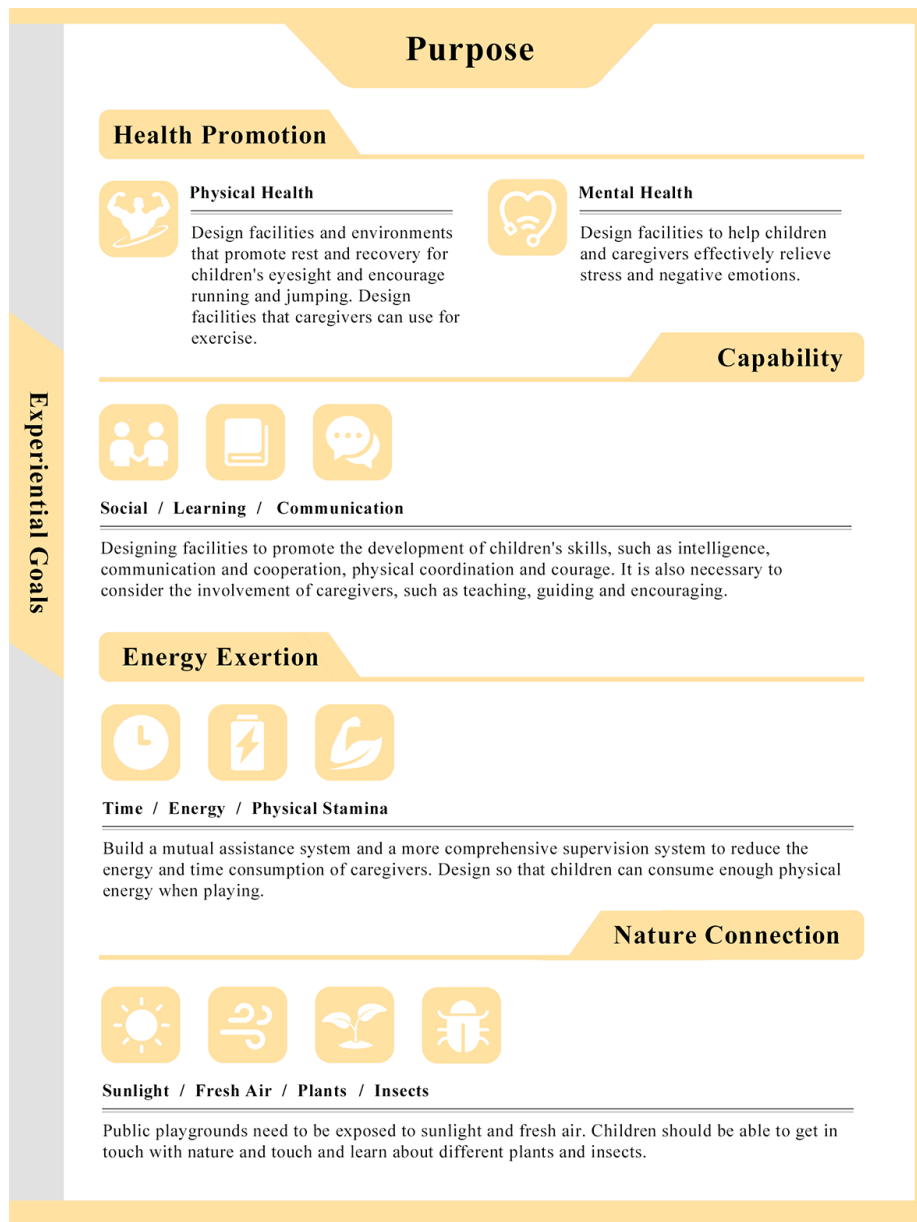


Figure 12. CED-IP cards: Purpose.

Evaluation and Development of CED-IP Cards

Three overarching themes emerged from the designers' reflections on the design toolkit. Based on the designers' feedback, the CED-IP cards were subsequently redesigned (see Figure 13). First, design elements were categorized by facility type, and priorities were assigned based on coding, retaining only the core needs to indicate their relative importance. Second, links to national standards and materials references were incorporated to enhance practical applicability.

Provides Clear and Comprehensive Design Considerations

Designers generally acknowledged the toolkit's capacity to offer a clear and comprehensive overview of design considerations. It allowed them to reflect on previously overlooked issues and encouraged a more systematic approach to design. "There were several aspects that I realized I had previously overlooked" (P2). "The concerns addressed by the toolkit differ from those I typically focus on as a designer" (P6).

Lack of Professional Guidance

Participants emphasized that the lack of professional guidance limited the toolkit's usability in practical design processes. Specifically, they pointed out insufficient references to relevant materials and structural solutions, as well as the absence of suggestions for incorporating emerging technologies. For example, "regarding slip resistance, what are the available material options on the market? You could list them all" (P1); "If you want to address the issue of not being able to see children, you need to

provide structural references" (P4); "There is no technical guidance at all... For instance, computer vision could be applied to detect children entering hazardous areas" (P5). In addition, designers emphasized the need to include relevant national standards in the toolkit. "There should also be industry standards" (P2); "It's absolutely necessary—when we start working in a company, the first thing we do is study the national standards" (P1).

However, the large volume of data made it challenging to incorporate such detailed content directly, reflecting a tension between conceptual comprehensiveness and technical depth. Some designers suggested that this limitation could be addressed through dynamic presentation or the inclusion of external links: "There is a path simulation technique... if this could be dynamic, for example, clicking on an item could expand and show a simulation tool" (P5); "You could also just add links to other relevant websites, such as material databases" (P1).

Lack of Practicality

Participants noted that the toolkit demonstrated limited practicality and adaptability across different design contexts. They suggested introducing a hierarchical structure of design priorities and categorizing needs by user groups, facility types, or design objectives to enhance clarity and usability. "Establishing clear priorities would make it easier to understand" (P1); "Perhaps these needs could be broken down and reorganized" (P3). In addition, participants proposed developing tailored versions of the toolkit for different user types—such as students, professional designers, and policymakers. "Designers could have one version, while policymakers or developers could have another" (P6).

PLAY FACILITIES (CORE NEEDS OF CAREGIVERS)		REST FACILITIES (CORE NEEDS OF CAREGIVERS)	
Safety Human Risk / Facility Risk ★★★★★   (1) To guide and encourage children to cooperate and build friendships through design, thereby reducing conflicts caused by limited play resources. (2) To provide sufficient spacing between facilities to reduce the risk of accidental injuries when children run, chase, or jump. (3) To eliminate sharp edges and corners to prevent scratches and collisions. (4) To ensure proper safety measures for elevated structures to prevent accidental falls caused by unsupervised climbing.		Comfort Shelter / Environment / Space ★★★★★   (1) To reduce visual obstructions caused by play structures through thoughtful design, ensuring that caregivers can clearly observe their children even from resting areas. (2) To design effective shading structures that block direct sunlight and minimize discomfort or heat-related health risks. (3) To incorporate insect-prevention features that protect against bites from ants, mosquitoes, and other crawling insects, and prevent them from entering clothing or bags. (4) To increase the presence of greenery near resting areas or within visible sightlines, ensuring a refreshing and comfortable environment with clean air.	
Purpose Social / Physical Health / Mental Health ★★★★★   (1) To enhance children's social and communication skills. (2) To relieve children's stress, promote visual recovery, and strengthen different body parts through running and jumping activities. (3) To reduce caregivers' physical demands by providing opportunities for exercise. (4) To help caregivers relieve stress and negative emotions, while supporting children's energy expenditure.		Supportive Protection / Relaxation / Physical Fitness / Social ★★★★★   (1) To reduce caregivers' concerns about children falling, pushing, or bumping through clear safety signage and well-positioned seating, allowing them to remain attentive without constant vigilance and to receive timely information in case of accidents. (2) To enable caregivers to engage in personal leisure activities, such as knitting, reading, or using mobile phones, while remaining within the play area. (3) To provide facilities and spaces in the rest area that allow caregivers to exercise while supervising children. (4) To foster opportunities for caregivers to interact and communicate with one another, encouraging mutual support in child supervision.	
Interaction Collaboration / Caregiving / Play Companionship / Assistance ★★★★★   (1) To increase the number of popular play facilities and provide more cooperative play opportunities, reducing conflicts and collisions. (2) To expand the space within and between play facilities and add resting areas, addressing caregivers' spatial and physical needs. (3) To introduce facilities that foster parent-child interaction and are also enjoyable for caregivers, encouraging education and co-play. (4) To facilitate mutual caregiving among caregivers, reducing individual caregiving burdens.		Service Restrooms / Sinks / Water Fountains ★★★★★   (1) To locate restrooms in close proximity to the playground for convenient access. (2) To provide accessible handwashing facilities, especially when sand-based play equipment is included. (3) To provide drinking water facilities in or near the playground for convenient hydration.	
Playability Novelty / Diversity ★★★★★   (1) To introduce diverse types of play facilities, including sand, water, and role-play elements. (2) To provide facilities that support the development of various abilities—such as jumping, balance, judgment, and cognition. (3) To accommodate different personality preferences by offering facilities for solitary, cooperative, and competitive play. (4) To enhance novelty by incorporating more open-ended and creative play opportunities, and by regularly updating outdated or underused facilities.		Purpose Energy Exertion / Nature Connection ★★★★★   (1) To allow caregivers to rest securely in designated areas while children expend sufficient energy during play. (2) To enable caregivers to connect with nature and enjoy sunlight, thereby relieving stress.	
Comfort User Density / Space ★★★★★   (1) To plan the number of playground facilities based on the population of nearby schools and residential areas, and to arrange facilities strategically to prevent overcrowding. (2) To increase the number of popular facilities or allow multiple users to engage simultaneously to reduce waiting times. (3) To incorporate vertical structures and multi-level pathways to alleviate congestion caused by single-route circulation.		Convenience Location ★★★★★   (1) To locate playgrounds near schools or residential areas, ensuring convenient and efficient accessibility for users.	
National Standards (EN 1176)  National Standards (ASTM F1487)  Material 		National Standards (EN 1176)  National Standards (ASTM F1487)  Material 	

Figure 13. Redesigned CED-IP cards. A high-resolution version could be downloaded from [the authors' repository](#).

Discussion

The findings indicate that caregivers' experiences in design practice include a sense of safety, interactive engagement, facility support, and environmental comfort. These needs reflect not only caregivers' actual behaviors in public playgrounds, but also how they allocate attention, invest emotion, and engage in social interaction during caregiving activities. Recent studies similarly characterize caregiving as a highly contextual and relational practice, in which experience emerges through ongoing interaction (Kim, 2025; Row et al., 2020; Yang et al., 2026; Zhao et al., 2025). These findings suggest that a focus solely on physical accessibility and functional usability is often insufficient to address the complexity of real-world use contexts in inclusive design. Existing experience design theories provide a valuable entry point for understanding caregivers' experiences in inclusive playgrounds. When these theoretical perspectives are combined with empirical insights from participants, they can support the development of new theoretical configurations and offer stronger conceptual grounding (Dubois & Gadde, 2002). This research approach has also been widely adopted in design studies (e.g., Goodwill et al., 2021).

Four Elements of the Caregiving Experience

Based on our interviews and existing experience design frameworks, this section outlines four experiential elements manifested in caregiving contexts. We identify these four elements as: sense of meaning and belonging, emotional response, ease and reduced burden, and autonomy and control (see Table 3). They are discussed in the following order.

Meaning Construction

Meaning construction refers to the process through which caregiving actions are assigned value, purpose, and personal identity. It concerns not only whether caregiving produces immediate functional outcomes but also how caregivers understand their roles and how these roles relate to their personal values, family responsibilities, and social identities. In the interviews, some caregivers stated that taking children to public playgrounds is not merely an act of accompaniment. Rather, they described it as an important activity aimed at supporting children's physical and psychological development, promoting well-being, and strengthening parent-child relationships. Meaning construction arises not only from individual psychological identification, but also from the support and quality of

interaction provided by the environment and its facilities. Meaning generation is context-dependent (Kintsch & Mangalath, 2011) and inherently relational (Cunliffe, 2008).

Caregivers' meaning construction is shaped by spatial design and social norms (Ehrlich et al., 2017; Yang et al., 2026). For example, Applebaum et al. (2022) found that through meaning construction and psychological support, caregivers of cancer patients strengthened their role identity and improved their psychological well-being. Similarly, the "moral identity" of family caregivers carries important ethical implications in caregiving practice. It strongly shapes caregivers' understanding of their responsibilities and the value of their roles (Kropf & Schmidhuber, 2024). Therefore, when design solutions strengthen the value of interactions between caregivers and care recipients, and support caregivers in achieving personal goals and forming role identity, they can enhance a sense of meaning.

Affective Comfort

Affective comfort refers to a sustained positive psychological state during caregiving that helps prevent caregivers from remaining in prolonged tension. It includes not only positive emotions such as joy and satisfaction (Desmet & Hekkert, 2007), but also ongoing emotional support structures, such as relaxation, reassurance, and opportunities for psychological respite. As Hassenzahl et al. (2010) noted, experience does not arise solely from functional performance. It also depends on the continuous fulfillment of emotional and psychological needs. Similarly, interviewed caregivers reported that green plants in caregiving environments helped them feel relaxed. This aligns with research on restorative environments (Collado et al., 2016; Ulrich et al., 1991). The interview data also showed that sharing caregiving tasks with peers or observing children's play while resting on seating increased caregivers' sense of safety and reduced psychological stress.

Specifically, improved crowd flow and optimized spatial guidance can increase facility capacity, reduce physical congestion, and shorten waiting times. Such measures can effectively reduce negative emotions and enhance experience (Norman, 2013). Public space should ensure accessibility and usability and include comprehensive supportive facilities. These design strategies can foster positive caregiving experiences (Zhao et al., 2025). Finally, when care recipients use facilities, adequate safety buffers, health safeguards, tolerance for error, and timely feedback mechanisms are essential. These measures can prevent caregivers from remaining constantly alert and anxious about safety concerns (Lindeman et al., 2020). By supporting emotional relief, design can promote a more positive and sustainable caregiving experience.

Table 3. Four elements of the caregiving experience in relation to literature and interview results.

Experiential Elements	Interview themes	Literature
Meaning Construction	Supportive; Purpose; Playability	Role Identification (Applebaum et al., 2022; Kropf & Schmidhuber, 2024); Contextuality (Kintsch & Mangalath, 2011); Relationality (Cunliffe, 2008); Experience of Meaning (Desmet & Hekkert, 2007).
Affective Comfort	Comfort; Supportive; Safety	Emotional Experience (Desmet & Hekkert, 2007); Psychological Needs (Hassenzahl et al., 2010); Restorative Environments (Collado et al., 2016).
Perceived Ease	Convenience; Service; Inclusivity; Interactivity	Easy to Use (McLellan, 2000); Relational Conflict (Nielsen & Bjerck, 2022).
Autonomous Control	Safety; Inclusivity; Supportive	Autonomy and Competence (Hassenzahl et al., 2010); Self-determination (Ryan & Deci, 2000).

Perceived Ease

Perceived ease refers to a low-burden, highly fluent experience of caregiving across physical, cognitive, and relational dimensions. It includes not only ease of use, but also smooth interaction between individuals and environments, as well as among individuals. Together, these aspects create an overall sense of effortlessness. In the interviews, some older caregivers reported that limited physical strength made it difficult to carry out certain playground-related caregiving activities. Some younger caregivers also stated that taking a restless child to the playground could be more exhausting than doing housework. Facilities should not only be easy to use, but also support effective interaction and communication between caregivers and care recipients. This helps create a more relaxed and seamless caregiving experience.

At the physical level, products should be designed according to ergonomic principles to enable comfortable, effortless operation. Examples include one-handed operation, appropriate height settings, and facilities that are easy to use and interact with. This concept is closely related to usability and can help reduce physical effort and activity load in caregiving (McLellan, 2000). At the cognitive level, clear spatial organization and predictable use logic are essential. In such conditions, caregivers can continuously monitor care recipients and anticipate potential risks. This reduces decision-making pressure and the burden of constant vigilance. At the relational level, design should minimize friction between people and facilities, as well as between people, to reduce antagonistic interactions. Effective design can encourage cooperation from care recipients, thereby reducing the need for repeated instructions or persuasion. Such friction occurs not only between individuals but also between individuals and tasks (Lee et al., 2015; Nielsen & Bjerck, 2022). Therefore, Perceived Ease involves not only improving functional usability and efficiency, but also reducing cognitive load and relational conflict.

Autonomous Control

Autonomous control refers to caregivers' perceived sense of autonomy and control over the caregiving process and its outcomes. It includes the agency and decision space caregivers have when interacting with products, environments, and care recipients. This sense of control is reflected in caregivers' ability to choose their level of involvement. It aligns with the concepts of autonomy and competence in self-determination theory (Hassenzahl et al., 2010; Ryan & Deci, 2000). Interview data show that some children prefer to play alone. However, certain facilities require cooperation, which leads to frequent requests for help. These requests can limit caregivers' opportunities to rest. At the same time, some caregivers reported that they enjoy interacting with children, as it strengthens parent-child relationships. This suggests that Autonomous Control concerns not only whether to participate, but also how to participate. Participation may be voluntary or imposed. Design should ensure that when caregivers choose not to participate, care recipients can still use facilities safely. When caregivers choose to participate, such involvement should create value and meaning for both parties.

Perceived control also depends on whether facilities and environments provide inclusive support for caregivers with diverse abilities. Differences in physical strength, age, and mobility directly influence how caregivers interact and how much control they perceive. For example, some older caregivers may be unable to assist with activities such as climbing due to physical limitations, leading to passive withdrawal from interaction. Therefore, design should offer diverse modes of caregiving support. These may include low-intensity interaction options, assistive structures, or alternative ways of engagement. When design supports both the choice to participate and the feasibility of participation, caregivers are more likely to maintain a sense of autonomy and control during interaction.

Interrelationships among the Four Experiential Elements

It is important to note that the four experiential elements are not independent in actual use contexts (see Figure 14). Rather, each element directly contributes to the overall caregiving experience while simultaneously interacting with the others, forming a dynamic and interdependent structure. These elements permeate the entire caregiving process, but their relative salience shifts across situations. For example, when children are younger, and accompaniment plays a greater role in their development and in strengthening parent-child relationships, Meaning Construction tends to become more salient, framing caregiving as a purposeful and meaningful practice. In contrast, in contexts characterized by intensive activities, environmental complexity, or heightened challenges, Affective Comfort becomes more critical, as emotional regulation directly affects caregivers' ability to sustain a relaxed and manageable experience.

At the same time, the elements are mutually reinforcing. Higher *perceived ease* can reduce physical and cognitive burden, thereby supporting *affective comfort*. *Autonomous control* enhances caregivers' sense of safety and agency, providing a foundation for emotional stability. *Meaning construction*, in turn, motivates caregivers to invest time and effort, further strengthening the other experiential elements. Overall, rather than operating in isolation, these four elements jointly shape caregiving experience through both direct contributions and ongoing interactions, enabling sustained participation and engagement in public playground contexts.

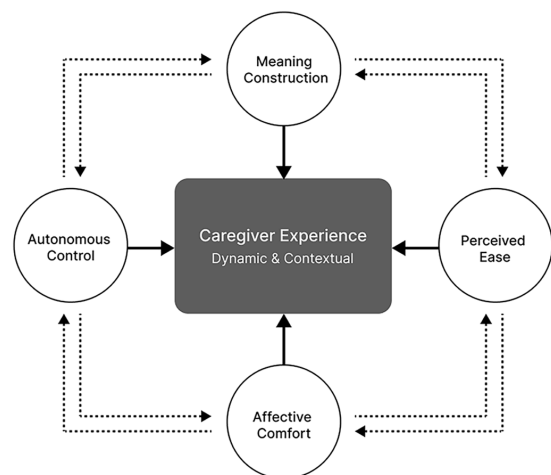


Figure 14. Caregiver experience design framework.

Reflexivity: Attending to Experiential Equity in Inclusive Design

Differences in individuals' physical abilities, psychological states, and social roles lead to varied experiences of the same environment. Inclusivity is not only about whether an environment is "accessible," but also about the experiential relationships that continuously emerge among people, contexts, and material settings (Demirel & Erkiş, 2025). It should therefore be understood as a dynamic concept that is experiential, relational, and evolving within specific contexts. Similarly, Bianchin and Heylighen (2018) argue that inclusive design should not only ensure equal access to products and environments, but also enable individuals to participate equally in both the design and use processes. Designers thus need to adopt a reflective perspective, continuously considering accessibility, usability, and the evolving experiential needs of diverse users throughout the design process. This shift in perspective foregrounds both experience and participation in inclusive design.

Through reflective practice, designers can identify potential differences in user experiences at an early stage, thereby avoiding decisions that may unintentionally diminish the experiences of marginalized groups. For designers, this requires recognizing their own positionality in framing problems and making decisions. In contexts involving multiple user groups, design should not focus solely on primary users. Designers also need to shift perspectives to consider marginalized users, such as caregivers, cleaners, and managers. As Haraway (1988) argues through the concept of "situated knowledge," all knowledge is positioned, and no perspective is fully neutral.

Designers need to continuously reflect on how their design choices shape the evolving experiences of different user groups. As Schön (2017) notes, design is a process of "reflection-in-action," requiring ongoing examination of underlying assumptions during practice. Inclusive design, therefore, is not only about addressing diverse user needs, but also about critically examining the design process and the situated experiences of different user groups.

Limitations

The factors identified in this study may be influenced by the specific environmental conditions of playgrounds in Hong Kong as well as the broader Asian cultural context. Therefore, when applying this card, designers should consider differences in urban density, climate, cultural norms, and regulatory frameworks. At the same time, this study focused on caregivers' experiences; children and other marginalized groups were not included in the interviews, which may limit a comprehensive understanding of inclusive experiences in public spaces.

Conclusions

This study advances inclusive design theory and practice by centering experience equity in caregiving contexts. Drawing on empirical insights from public playgrounds and integrating experience design theory, we propose a Caregiver Experience

Design Framework comprising four interrelated elements: meaning construction, affective comfort, perceived ease, and autonomous control. The framework reconceptualizes caregiving as dynamic and contextual.

This study developed a highly operational set of experience design cards grounded in interview data. These cards offer practical support for designers and decision-makers seeking to enhance caregiving experiences in public contexts. These cards can also serve as a reference for designing inclusive experiences in other caregiving contexts. Moreover, this research calls for a reflexive and experience-oriented shift in inclusive design.

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Appendix

Appendix 1. Coding of interview data, including Clusters, Themes, Core Points, and Codes.

Level 1 Codes	Level 2 Core Points	Level 3 Headings	Level 4 Clusters
Timeliness, Facility Update	Maintenance	Safety	Basic Functions
Sharpness, Hardness, Impact, Height, Guardrails	Facility Risk		
Conflict, Collision	Human Risk		
Durability, Sustainability, Color	Materials		
Sun Shading, Rain Protection, Visual Screening	Shelter	Comfort	
Queueing, Crowding	User Density		
Pathway, Size, Facility Density	Space		
Sanitation, Temperature, Pests, Plant, Sunlight, Air	Environment		
Collaboration, Play (Independent, Group), Mutual Assistance	Child Interaction	Interactivity	Interactive Engagement
Educational Interaction, Recording, Play Companionship, Communication, Caregiving	Child-Caregiver Interaction		
Communication, Assistance	Caregiver Interaction		
Personality, Preferences, Skill Development	Diversity	Playability	
Novelty	Novelty		
Enjoyment	Enjoyment		
Stimulation	Stimulation		
Age	Compatibility	Inclusivity	
Path, Facility Interior	Accessibility		
Facilities, Space, Emotions	Caregiver Needs		
School, Home	Location	Convenience	Basic Experience
Play, Supply, Protection, Companionship, Encouragement	Child Support	Supportive	
Physical Fitness, Relationship, Relaxation, Social Interaction	Self-satisfaction		
Restrooms, Sinks, Water Fountains, Lockers, Seating, Mosquito Repellent Devices, Shelter	Supporting Facilities	Service	
Sunlight, Fresh Air, Plants, Insects	Nature Connection	Purpose	Experiential Goals
Physical Health, Mental Health	Health Promotion		
Social, Learning, Communication	Capability		
Time, Energy, Physical Stamina	Energy Exertion		

Appendix 2. Themes, descriptions, and illustrative quotes from interview data.

Theme	Description	Supporting quotes / examples
Safety	Maintenance	Caregivers consider the maintenance of facilities (timely repairs, durable materials, and regular updates) to be a key indicator of playground management. "It will rust, because sometimes children will be scratched, and if they are injured, will they be more likely to get tetanus?" (P21)
	Facility Risk	Caregivers consider basic safety design (such as protective flooring and rounded corners) to be the core, and then assess the risks based on the condition and maintenance of the facilities and adjust the level of intervention in monitoring accordingly. "There is a slope, and some children may fall down if they are not careful." (P25) "She herself fell once on this kind of ground, and the cracks would get her feet stuck when she ran." (P21)
	Human Risk	Caregivers perceive human risks—namely, the dangerous behaviors of other children and potential conflicts—as more concerning safety hazards than the facility itself. This constant vigilance regarding the uncontrollable factors in a dynamic social environment significantly exacerbates their guardianship stress and anxiety. "I tell you; the danger comes from the children... Last time I saw a child pinching that little white girl." (P5) "I am afraid that some boys will hit others. Some kids are more domineering and think this is their territory." (P22)
	Materials	Caregivers expect materials to not only ensure safety and durability and provide a comfortable feel, but also to inspire children's play and creativity through vibrant colors and friendly shapes. "The floor is covered with protective materials to prevent children from falling." (P10)
Comfort	Shelter	Caregivers consider effective sunshade a key facility to ensure the usability of playgrounds in hot or rainy weather, as it relates to children and their comfort and directly affects the actual frequency and duration of playground use. "In the hot weather, children easily suffer from heatstroke or catch a cold after playing." (P28) "Any water must be wiped away before use." (P34)
	User Density	Caregivers believe that appropriate crowd density is key to ensuring a good playground experience. Overcrowding not only causes safety issues and significantly reduces the quality of play, but also multiplies their supervision burden. "There were too many people, and most of the children were pushing and shoving each other." (P18)
	Space	Caregivers expect an open environment that is large enough for children to run freely, and that can effectively disperse crowds and reduce waiting and conflict through scientific layout. "The sidewalks could be narrower so that people have more than one passageway." (P7) "There also needs to be plenty of space between facilities." (P10)
	Environment	Caregivers expect to maintain and design a comfortable and hygienic environment through good management. "Sometimes it's too wet and dirty to play." (P9) "We are afraid of bringing home ants." (P3)
Interactivity	Child Interaction	Caregivers who value and encourage friendly interactions between children can foster social skills and enjoy playing together. "He doesn't like playing with other children." (P29) "She will actively look for other children to play with." (P21)
	Child–Caregiver Interaction	Caregivers hope to build emotional connections through shared play and wish to flexibly adjust the manner and extent of their participation according to their own energy levels. "I tell her how to climb up and then slide down." (P20) "When he is on the swing, I help by giving him a push." (P25) "I enjoy playing ball with him." (P4)
	Caregiver Interaction	Interactions between caregivers are social interactions centered around the child, providing practical parenting information and brief assistance, thus alleviating individual caregiving stress. "If there are other parents, I might chat with them or help each other take care of the children." (P3)
Playability	Diversity	Caregivers expect play facilities to avoid monotony and repetition and need to provide a variety of play facilities to continuously stimulate children's interest in play. "It's fun because there are many different types of equipment." (P3) "Seesaws and spinners—those are found in other playgrounds, not here." (P12)
	Novelty	Caregivers hope that playground equipment can be dynamically updated and rotated to prevent children from getting bored due to familiarity. "Except for some special designs, most of them are quite similar." (P6) "It hasn't changed for 20 years, and neither have the facilities." (P31)

Appendix 2. Themes, descriptions, and illustrative quotes from interview data (continued).

Theme		Description	Supporting quotes / examples
Playability	Enjoyment	Caregivers eagerly anticipate that playground equipment will offer interactive and creative play elements that will keep children entertained.	"He's more familiar with the playground downstairs, so after playing for a while, he wants to go back." (P21)
	Stimulation	Caregivers believe that overly safe and unchallenging designs stifle the core fun and developmental value of the game.	"The facilities should be more challenging." (P31) "The slide isn't high enough, so it's not very fun." (P6)
Inclusivity	Compatibility	The facilities are not compatible with the needs of older children or the abilities of young children, and the design style is not compatible with the cognitive characteristics of children.	"It would be wonderful if there were more facilities where we could easily play with our kids." (P4) "When the facilities are not age-appropriate, younger children may not be able to recognize the risks, as they might act unconsciously." (P21)
	Accessibility	Caregivers may find it difficult to look after children in high or cramped facilities and may need to expend effort to help under-resourced children use the facilities.	"But she can't rock climb. So it's difficult for her to get there...It's too tiring for me to help her up every time." (P20)
	Caregiver Needs	Caregivers need a space that not only caters to children of different abilities but also supports their own rest, reduces physical exertion, and promotes parent-child interaction	"I took a photo of him." (P31) "It would be wonderful if there were more facilities where we could easily play with our kids." (P4)
Convenience	Location	Caregivers expect the playground to be integrated into their daily routines centered around home and school.	"It takes a long walk to get to the playground." (P5) "My son's elementary school is nearby, so we only came here after he finished classes today." (P3)
Supportive	Child Support	Caregivers need to easily ensure the child's safety and physical needs and be deeply involved in the child's play.	"As a mother, I can't just sit while she plays; I need to help her climb up, so it's exhausting." (P20) "It's very hot, but I have no choice...he runs here, I run, he runs there, I have to run again." (P28)
	Self-satisfaction	Caregivers need to derive joy from parent-child interactions and enjoy leisure time during breaks in supervision.	"I really cherish this time...I enjoy interacting with my son." (P13) "I play with my phone." (P1)
Service	Supporting Facilities	Caregivers expect facilities to support sustained, comfortable play activities and ensure that children's physiological needs are met quickly.	"Mosquitoes! I think we need mosquito lamps." (P6) "There's nowhere to hang my clothes." (P19)
Purpose	Nature Connection	Caregivers consider sunlight, fresh air, and outdoor spaces with greenery to be key elements of an outdoor playground.	"It's best to go out and get some sunshine." (P2) "There is fresh air there." (P10)
	Health Promotion	Caregivers hope that outdoor play can ensure children's healthy development, mainly through its positive effects on relaxation and eye protection.	"Looking at distant objects is also good for eyesight." (P12) "It helps release some of the pressure from school." (P15)
	Capability	Caregivers expect that outdoor play activities will help children develop social communication skills, improve physical fitness, cognitive abilities, and the courage to overcome difficulties.	"It helps establish social interactions with others." (P12) "Children need sufficient exercise and physical activity." (P6)
	Energy Exertion	Caregivers need an environment where children can fully release their energy in exchange for quiet rest so that they can have their own rest time.	"The most important thing is that he expends his energy, then goes home and sleeps—this is better for me." (P14)