



## Optimization of Playgrounds as a Learning Media for Children in Batam Kota District

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### Abstract

Playgrounds have an important role in supporting children's growth and development. As a public space, playgrounds not only function as a place of recreation but can also be a learning medium that supports children's cognitive, social and motor development. This study aims to analyze the role of playgrounds in Batam Kota District in increasing children's potential as a learning medium. Data were obtained through observation, interviews with parents and literature studies. The results of the study indicate that playgrounds equipped with educational facilities can increase children's interest in learning, creativity and social skills in children. This study recommends the development of playgrounds integrated with interactive learning media in Batam Kota District.

## Introduction

Children's playground is one of the public facilities designed to support children's physical, social and emotional development. However, the use of children's playgrounds in many areas in Batam is still limited, including in Batam Kota sub-district, which is often limited to being a play area. In terms of potential, playgrounds have great potential to be developed as interactive learning media that can improve children's creativity, motor skills and social skills (Tortella et al., 2016; Pawlowski et al., 2023; Yang et al., 2023; Ashwini et al., 2021). In accordance with Government Regulation No. 60 of 2013 concerning the development of early childhood and Batam City Regional Regulation No. 8 of 2017 concerning the implementation and development of early childhood (Tan, 2020).

Batam Kota District, which is also the center of community activities in Batam City, has several playgrounds spread across several sub-districts or in several locations. Unfortunately, based on initial observations, it shows that the parks have not been optimally maintained and have not been optimally utilized to support learning activities. Several playground locations have inadequate facilities and are not child-friendly. None have been integrated with non-formal education programs and there is a lack of open space-based learning and child development (Borisenoka, 2024; Ampartzaki et al., 2024). It is important for Batam Kota District to immediately strive to develop playground facilities and children's learning media. Research conducted by Esti Kurniawati et al. shows the importance of maximizing game-based learning methods.

Early childhood education up to elementary level emphasizes the importance of a fun and hands-on learning process (Wan et al., 2021; Aerila & Rönkkö, 2023; Ginting, 2024; Pellas, 2025; Başaran et al., 2024). Therefore, optimizing playgrounds is a strategic step in creating a learning environment that supports holistic child development (Xia, 2024; Parker & Thomsen, 2019; Lee et al., 2024; Craig et al., 2024). Playgrounds designed with educational elements such as: educational game tools, interactive information boards, interactive discussion areas

can have a positive impact on improving children's cognitive, effective and psychomotor abilities.

This study aims to identify the condition of playgrounds in Batam Kota sub-district. Analyze the potential of playgrounds as learning media and formulate strategies to optimize playgrounds so that they can function as effective educational facilities. Hopefully this study can provide real contributions to the development of child-friendly public facilities. Theoretically, the benefits of this research are: Increasing insight into the role of playgrounds in children's education. The practical benefits are providing guidance for governments and Community in the development of play facilities.

## Literature Review

### Children's playground

The definition of a playground is: an area or open space specifically designed for children so that they can play safely, comfortably, and enjoyably. Playgrounds are usually equipped with play facilities such as swings, seesaws, slides and sand areas and other play equipment that aim to support children's physical, social and emotional activities (El-Kholy et al., 2022; Idrees, 2022; Bunn, 2021). In addition, playgrounds are also provided with educational play equipment, interactive information boards and other creative tools that can stimulate children's creativity and imagination.

In addition to being a play area, the playground also has several functions for children, including: By playing, children will not be stressed, improve their mood, and provide a sense of happiness. Children's emotions will be more prosperous if they interact with nature and the open environment.

Additional educational play facilities, such as number and color games, information about nature so that children can play while playing so that the playground functions as an informal learning medium. Playground facilities are often designed to stimulate children's imagination, such as using castle, ship or other themed play structures. Children can play roles and create according to their imagination.

Playgrounds are ideal places for children to be with their peers. Children can learn to cooperate, share, communicate and resolve conflicts in a fun playful atmosphere. Physical activity through running, climbing, jumping, this opportunity can be done in the playground. This activity helps the development of gross motor coordination and balance of the child's body. Playgrounds are not only for children but also for parents and communities. Parents and communities can be involved in children's play activities and become a space for social interaction between community members.

### Children's Learning Media

The concept of interactive children's learning media is a tool or facility designed to support the learning process by involving active interaction between children and the media. This media not only provides information but also encourages children to participate in exploring and collaborating in understanding certain concepts or skills. In the context of children, interactive learning media must be designed creatively to suit the needs of children's interests and development.

Learning media must actively involve children both through physical manipulation and through critical thinking. Interactive learning media is designed with attractive elements such as bright colors, sound animations or games so that children remain motivated to learn. Media should allow children to learn through multiple senses (sight, hearing, touch, smell) and can be used

in a variety of ways according to the child's learning style. Interactive media must be appropriate to the child's age, abilities and developmental needs, and support relevant and meaningful learning for the child.

Examples of interactive children's learning media concepts are: Such as letter puzzles, number blocks and interactive game boards as basic concepts in reading and arithmetic. In the playground interactive elements such as image-based information boards, puzzle-solving games can integrate learning with physical activity. Digital media such as interactive children's learning applications, animated videos, or educational games help children learn in a fun and independent way. Media such as miniature replicas or simulations (for example, a playground with a profession theme) allow children to learn while playing a role in training their social and emotional cognitive abilities.

### **Children's needs for playing and learning.**

Each stage of development has its own characteristics from sensory exploration in infants to the search for identity in adolescents. Understanding developmental psychology is important to support optimal child growth and development according to each stage of their age. (child development theory). Child development is a complex process that includes various interrelated aspects (Schäfer et al., 2023; Pesaramelli & Sujatha, 2024). The main aspects of child development can be described as physical development, cognitive development, social and emotional development, language and communication development. Child development requires appropriate support from family, educators, and the surrounding environment.

Facilities that are appropriate to the child's development need to be designed to support the child's cognitive, social, emotional and motor development. Ideal facilities for each stage of child development:

At this stage requires a safe, stimulating and exploratory environment. Sensory playground, an area with sand, water, synthetic grass, while interactive panel textured toys with bright colors and sounds. Fine and gross motor play zones, slides, seesaws, large building blocks and simple puzzles. Creativity and imagination space, a mini kitchen play area, small shops, dollhouses, and a chalkboard for writing and a drawing table for drawing. For safety, the floor should be soft and fenced.

Physical play zone and playground challenges include rope bridges, climbing walls, and small sports fields for playing soccer, basketball and mini volleyball. Children's library exploration and education area, small plant and animal education garden for nature learning. Group play zone, tables for educational board games such as chess puzzles and strategy games, open area for hide and seek or other traditional games. Adolescence (13-18 years) Facilities for independence and self-development. At this age, teenagers are more interested in challenging physical, social and intellectual activities.

Sports and recreation areas such as basketball courts, futsal tracks, indoor jogging gyms and light fitness equipment. While the creativity and innovation area is filled with discussion rooms, workshops, and art exhibitions, music studios and mini theaters as a place to develop talents. In addition, technology and education facilities are needed that contain a digital library, computer laboratory area and experimental room. Each stage of a child's development requires different facilities to support their physical, cognitive and social growth. With the right design, facilities can be a means of learning and playing that is optimal according to the child's age.

### **Policy Review**

Policies related to playgrounds and interactive learning media in Indonesia: Article 56 of this law mandates that the government and regional governments are required to provide play

facilities that meet health and safety standards for children. The aim is for children to be able to play and recreate comfortably. This regulation regulates the safety of educational environments including playgrounds in schools or public facilities. This regulation encourages the provision of safe and educational playgrounds for young children. This regulation sets standards for safe and child-friendly playgrounds. Set safety specifications for play equipment to prevent the risk of injury to children.

This regulation regulates the Implementation of Interactive Holistic Early Childhood Development. The regional government has the obligation and responsibility to ensure the fulfillment of children's rights including the provision of safe and educational play facilities. This regulation provides Guidelines for the Implementation of Village Facilities and Infrastructure Development Activities and Empowerment in Villages. The development of facilities and infrastructure at the village level including children's playgrounds is regulated to ensure adequate facilities for the local community.

This regulation regulates the provision of green open spaces and other public facilities including areas for children's playgrounds. This regulation discusses the procedures for organizing Recreation and Tourism Services. This regulation includes standards and operational procedures for recreation areas including children's play areas to ensure safety.

## **Methods**

This study employed a descriptive research design, supported by a mixed-methods approach, combining both qualitative and quantitative methods to thoroughly explore the optimization of playgrounds as learning media for children in Batam Kota District. The descriptive nature of the research allowed the researchers to objectively present the existing conditions of playgrounds, while the mixed-methods framework enabled a comprehensive analysis by integrating measurable data with contextual and experiential insights. This approach was chosen to ensure that the study captured not only statistical trends but also the deeper social and developmental dimensions associated with the use of playgrounds for educational purposes.

The research was conducted within the administrative boundaries of Batam Kota District in Batam City, Indonesia. This district comprises six sub-districts: Baloi Permai, Belian, Sukajadi, Sungai Panas, Taman Baloi, and Teluk Tering. These areas were selected due to their strategic location as central urban zones with public access and existing playground facilities. Furthermore, the demographic density and active community dynamics in these sub-districts made them ideal for studying how urban playgrounds function and how they might be enhanced to serve as informal yet impactful educational environments for children.

The population targeted in this study consisted of individuals who directly engage with playgrounds, including children as the primary users, parents who accompany them, educators who might utilize outdoor settings as informal learning spaces, and playground managers or administrators responsible for maintenance and oversight. To ensure the inclusion of relevant and insightful participants, a purposive sampling technique was applied. This non-random sampling method allowed the researchers to deliberately select individuals based on their involvement and familiarity with the functionality, condition, and educational potential of local playgrounds. By focusing on participants with direct experience, the study aimed to capture authentic and context-rich data.

Data collection was carried out using a triangulation of methods to ensure accuracy, depth, and validity of the findings. Field observations were conducted directly at various playground locations to assess the physical condition, safety, cleanliness, and presence of educational or interactive elements. These observations provided firsthand insights into the current state of

playground infrastructure and how children interacted with the space. In addition to observation, structured interviews were conducted with parents, educators, and playground managers. These interviews were guided by a semi-structured format, allowing the researchers to explore specific topics while also providing space for participants to share their perspectives freely. To complement the qualitative data, questionnaires were distributed to a broader group of respondents. These questionnaires were designed to quantify usage patterns, perceptions of playground functionality, and levels of satisfaction with the facilities provided. Document analysis was also employed, involving the review of relevant policy documents, regional regulations, and planning frameworks related to children's play spaces and informal education infrastructure. This method helped contextualize the field findings within the broader scope of public policy and urban development.

In terms of research instruments, the study made use of an observation checklist to systematically record the features, deficiencies, and educational potentials of the playgrounds being evaluated. An interview guide was developed to ensure that key topics were consistently addressed across different participants while still allowing the flexibility needed in qualitative interviews. The questionnaire was constructed with both closed and open-ended questions, enabling the collection of structured responses as well as elaborative feedback from respondents.

The data obtained from these various instruments were analyzed using both qualitative and quantitative techniques. The responses from the questionnaires were subjected to descriptive statistical analysis to identify trends, frequencies, and common patterns across the respondent groups. The qualitative data from interviews and observations were analyzed thematically. This involved coding the data into categories that reflected recurring themes such as the condition of facilities, safety concerns, educational usage, and user satisfaction. This method allowed the researchers to construct a narrative around the challenges and opportunities associated with playground development. Additionally, the study applied a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis framework to synthesize the findings from both data types and to identify strategic directions for optimizing playgrounds as learning media. This strategic analysis provided a structured overview of internal capabilities and external influences, helping to formulate recommendations for policy, design, and community engagement.

## Results and Discussion

### Condition of Playgrounds in Batam Kota District

The physical condition and distribution of playgrounds in Batam Kota District reveal significant gaps in infrastructure quality, spatial planning, and alignment with child-centered urban development standards. Although several playgrounds exist across the sub-districts—such as those in Baloi Permai, Belian, Sukajadi, and around Dataran Engku Putri—the distribution is uneven and the facilities vary considerably in quality and accessibility. Initial field observations indicate that most playgrounds are situated within housing complexes or open public parks, yet many of these spaces lack inclusive and stimulating features that promote sustained child engagement (El-Kholy et al., 2022; Lee et al., 2024).

Critically, a recurring issue across these playgrounds is poor maintenance. Many facilities, including basic equipment such as swings, slides, and seesaws, exhibit signs of wear, rust, and neglect. Such physical degradation not only diminishes the functional value of these spaces but also poses direct safety risks to children. The absence of regular upkeep and inadequate supervision reflects a broader issue of weak institutional responsibility and fragmented urban management. As noted by Pawlowski et al. (2023), poorly maintained playgrounds can

discourage physical activity and social interaction among children, undermining the developmental benefits typically associated with play environments.

Moreover, these playgrounds are not integrated into any formal or informal learning programs. None of the observed locations in Batam Kota have been certified as *Ruang Bermain Ramah Anak* (RBRA) or child-friendly play spaces, despite the national policy push toward Child-Friendly Cities (*Kota Layak Anak*) as articulated in Indonesian regulations and the UN Convention on the Rights of the Child. The limited presence of interactive educational tools—such as sensory panels, thematic learning boards, or structured learning zones—reflects a missed opportunity to leverage public spaces as tools for experiential education (Borisenoka, 2024; Craig et al., 2024).

Furthermore, the spatial arrangement and environmental design of many playgrounds are not aligned with principles of universal design or inclusive planning. Playgrounds often lack shaded areas, age-appropriate zoning, and accessible paths for children with disabilities. This contrasts sharply with recommendations from international studies that highlight the importance of environmental stimuli, safety features, and developmental appropriateness in urban playground design (Idrees, 2022; Xia, 2024). These design shortcomings reinforce spatial inequality, limiting access for marginalized children and reinforcing exclusionary urban development.

### **Suitability of Facilities to Children's Needs**

An effective playground is not merely a recreational area but a structured environment that supports multiple dimensions of child development—cognitive, emotional, social, and physical. However, the playgrounds in Batam Kota District currently fall short of fulfilling this role. Based on field observations and stakeholder feedback, it is evident that the existing facilities are not sufficiently aligned with the developmental needs of children across age groups. Most playgrounds in the district are limited to conventional, non-interactive structures such as metal slides, basic swings, and see-saws. These facilities, though valuable for general motor development, lack the diversity and complexity required to engage children cognitively and socially in a sustained and developmentally appropriate manner (Pawlowski et al., 2023; Tortella et al., 2016).

Critically, there is a near-total absence of integrated learning media within the playgrounds, such as interactive panels, thematic play equipment, educational murals, or sensory play zones. This reflects a limited understanding or prioritization of playgrounds as informal learning environments. As emphasized by Parker and Thomsen (2019), well-designed play environments offer opportunities for inquiry-based and experiential learning, which is especially crucial in early childhood when play and learning are developmentally inseparable. In the case of Batam Kota, the minimalistic and repetitive nature of available facilities may actually inhibit rather than support children's intellectual and social-emotional growth, especially for children in their formative years (0–8 years), where sensory and exploratory stimulation is critical (Pesaramelli & Sujatha, 2024).

Furthermore, none of the playgrounds examined are certified as Child-Friendly Playgrounds (*Ruang Bermain Ramah Anak*, or RBRA), a designation promoted by the Indonesian Ministry of Women Empowerment and Child Protection to ensure that public play areas meet national standards of safety, accessibility, inclusivity, and educational value. The absence of this certification underscores systemic gaps in planning and regulation. Certification involves not just safety audits but also assessments of whether the facilities meet developmental benchmarks appropriate to different age groups. In comparison, certified playgrounds globally and in other Indonesian cities incorporate components like inclusive play zones for children with

disabilities, nature-based learning elements, and thematic installations that encourage imagination and collaboration (Ashwini et al., 2021; El-Kholy et al., 2022).

The lack of age-appropriate differentiation is another major concern. Playgrounds in Batam Kota do not distinguish between toddlers, preschoolers, and older children. This results in either under-stimulation or safety hazards, as equipment that is too advanced may exclude younger children while overly simplistic structures do not engage older children. Research has consistently shown that age-specific zones within playgrounds significantly enhance both safety and developmental effectiveness (Schäfer et al., 2023; Ginting, 2024). Moreover, the current designs do not address the varying learning styles of children—visual, auditory, kinesthetic, or tactile—which are crucial in creating inclusive and effective learning environments (Pellas, 2025).

Another major limitation lies in accessibility. Playgrounds are not equipped with features that accommodate children with physical or developmental disabilities, such as wheelchair-accessible paths, low-sensory zones, or adaptive play tools. This exclusion not only undermines the principle of universal design but also violates children's rights to equal participation in public life, as articulated in the UNCRC and echoed in Indonesia's policy goals for *Kota Layak Anak* (Tan, 2020; Başaran et al., 2024).

### **Influence of Playgrounds on Child Development**

Playgrounds, when effectively designed and utilized, are not only recreational spaces but vital developmental environments that nurture multiple domains of child growth. In the context of Batam Kota District, however, the influence of existing playgrounds on child development remains severely limited due to infrastructural inadequacies, lack of educational integration, and minimal stakeholder engagement. While the fundamental presence of open play areas does provide children with opportunities for physical activity, these spaces currently fail to support the full spectrum of cognitive, social, emotional, and creative development that high-quality play environments are known to facilitate.

From a physical development perspective, unstructured outdoor play supports the enhancement of gross motor skills, spatial awareness, coordination, and balance. Climbing, running, and jumping activities typically available in playgrounds stimulate muscle development and physical endurance (Tortella et al., 2016; Pawlowski et al., 2023). In Batam Kota, however, the poor condition of facilities—such as rusting metal structures, uneven surfaces, and a lack of soft-fall zones—often discourages active physical engagement and may even pose safety hazards. This reduces the frequency and duration of play sessions, which in turn limits physical benefits. In contrast, well-designed playgrounds with age-appropriate, stimulating equipment can significantly enhance children's physical development, reduce sedentary behavior, and combat rising trends in childhood obesity (El-Kholy et al., 2022).

Social development, particularly in early childhood, is deeply influenced by peer interaction within shared play environments. Playgrounds serve as natural laboratories for children to develop critical social competencies such as cooperation, negotiation, conflict resolution, and empathy. Through role play, turn-taking, and team-based games, children learn to navigate complex social dynamics in informal yet structured settings (Parker & Thomsen, 2019; Craig et al., 2024). However, playgrounds in Batam Kota currently lack the thematic or collaborative structures that foster this kind of interactive play. The absence of multi-user equipment, group-based installations, or storytelling elements significantly diminishes the potential for social engagement, especially among younger children still developing foundational interpersonal skills.

Cognitive development is another key domain influenced by enriched play environments. Research has consistently shown that when play is infused with elements of inquiry, exploration, and problem-solving, children display enhanced memory, executive functioning, and creative thinking (Pellas, 2025; Başaran et al., 2024). Playgrounds that include sensory materials, puzzles, interactive boards, and real-world simulations (such as mini shops or role-play stations) act as platforms for experiential learning. In Batam Kota, however, such cognitive stimuli are virtually nonexistent in current playground designs. The lack of integration between play and learning significantly undermines opportunities for curiosity-driven discovery and inhibits the connection between informal and formal learning trajectories (Borisenoka, 2024; Aerila & Rönkkö, 2023).

Emotional development, particularly the cultivation of self-confidence, risk assessment, and stress regulation, is also heavily influenced by outdoor play. Children benefit from mastering physical challenges, exploring unknown elements, and engaging in imaginative scenarios that stretch their comfort zones. These experiences foster emotional resilience and independence. In environments where playgrounds are perceived as unsafe, unengaging, or monotonous—as is the case in many parts of Batam Kota—children are deprived of the emotional stimuli necessary for adaptive behavior and emotional intelligence (Yang et al., 2023; Schäfer et al., 2023).

Importantly, the synergistic relationship between outdoor play and learning is a central concept in contemporary educational theory. Studies support the idea that learning environments should not be restricted to formal classrooms, but extended to natural and communal settings where children engage holistically with their surroundings (Pawlowski et al., 2023; Xia, 2024). Unfortunately, playgrounds in Batam Kota are not recognized or utilized as extensions of educational space. There are no partnerships between local schools and playground authorities, no integration with early childhood curricula, and no facilitation of guided outdoor learning activities. This disconnect reflects a broader policy and implementation gap in which urban design, child development, and education operate in silos.

### **Playground Development Strategies as a Learning Medium**

Transforming playgrounds into effective learning media requires a multi-dimensional strategy that extends beyond traditional concepts of play to incorporate principles of education, urban design, community collaboration, and sustainability. In Batam Kota District, the current playground infrastructure is largely underutilized, and efforts to optimize it remain fragmented and superficial. To elevate playgrounds as functional educational spaces, development strategies must be intentionally designed to address pedagogical goals, child development needs, and inclusive urban planning.

At the core of this transformation is the reorientation of playground design. Educational playgrounds should integrate game elements with age-appropriate learning tools that stimulate cognitive, sensory, and social engagement. This includes interactive panels that teach basic science or literacy concepts, letter- or number-shaped play structures, and thematic zones that simulate real-life roles or environments (Ashwini et al., 2021; Başaran et al., 2024). Such features have been shown to enhance executive functioning, language acquisition, and critical thinking in early childhood settings (Aerila & Rönkkö, 2023). In practice, this means designing playgrounds not only with traditional climbing and sliding structures but also with spaces for inquiry-based exploration, imaginative play, and hands-on interaction with educational content.

Another key strategy involves the implementation of structured educational programs within playgrounds. These can take the form of guided outdoor classes, storytelling sessions, art and

craft workshops, science corners, or even rotating exhibits linked to school curricula. Such programs encourage purposeful play and make the playground a dynamic learning extension beyond the classroom (Ginting, 2024; Parker & Thomsen, 2019). In Batam Kota District, however, there is currently no institutionalized collaboration between educational institutions and park authorities to develop or deliver such content. To address this, local governments must engage with early childhood education centers, schools, and universities to design and deploy child-centered outdoor programs that are both curriculum-aligned and play-based.

Equally important is community collaboration. The successful optimization of playgrounds cannot rely solely on top-down government planning but must include the voices and participation of parents, educators, local leaders, and even the children themselves. Studies show that when communities are actively involved in the design, programming, and maintenance of playgrounds, the resulting spaces are more relevant, inclusive, and sustainable (Borisenoka, 2024; Xia, 2024). Community engagement can take many forms, including participatory design workshops, volunteer-led play sessions, and parent-educator committees responsible for programming and feedback. In Batam Kota, encouraging such participatory governance structures could bridge the gap between municipal planning and community needs, leading to more child-centered outcomes.

The integration of technology represents another frontier in enhancing the educational value of playgrounds. This does not imply the displacement of physical play but rather the augmentation of outdoor environments with digital learning tools. Mobile applications, QR-code-activated panels, interactive audio guides, and augmented reality (AR) installations can enrich children's learning experiences in public play spaces (Pellas, 2025; Ampartzaki et al., 2024). For instance, a biodiversity trail with AR features could allow children to learn about local flora and fauna interactively while they play. However, the technological interventions must be carefully designed to support, not dominate, physical play, ensuring that digital tools enhance—rather than reduce—movement, imagination, and social interaction.

Sustainability is a final pillar in playground development strategy. The physical integrity, cleanliness, and safety of playgrounds must be maintained through regular inspection, community oversight, and reliable funding mechanisms. In Batam Kota, a major barrier to playground optimization has been the lack of routine maintenance and clear responsibility for repairs and safety audits. Sustainable playground development thus demands an operational framework that includes scheduled equipment inspection, waste management, landscaping upkeep, and anti-vandalism measures (El-Kholy et al., 2022; Idrees, 2022). This must be accompanied by stable financial support, potentially sourced from a combination of government budgets, private sector sponsorships, and community fundraising initiatives.

## **SWOT Analysis**

A SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis provides a structured framework to evaluate internal capacities and external conditions influencing the development of playgrounds as effective learning media. In the case of Batam Kota District, this analysis reveals both promising foundations and critical barriers that must be addressed through strategic, multi-sectoral action.

### ***Strengths***

One of the primary strengths of Batam Kota's playground infrastructure is its strategic geographic location. As a central district in Batam City, it hosts a high density of residential areas and community centers, positioning playgrounds within walkable proximity for many families. Such accessibility is essential for encouraging regular child engagement with public play spaces, particularly in urban settings (Pawlowski et al., 2023; Xia, 2024). Furthermore,

the presence of community support and local government interest—reflected in recent renovations and sporadic beautification efforts—demonstrates an existing baseline of institutional and societal commitment to children’s spaces.

Additionally, playgrounds in Batam Kota possess multi-functional potential. Their open layouts and integration within public parks offer flexibility to host various child-centered activities such as physical education, cultural performances, and community-based learning events. When properly programmed and maintained, these features can support holistic child development by blending recreation with educational and social functions (Craig et al., 2024; Yang et al., 2023).

### ***Weaknesses***

Despite these strengths, the weaknesses of Batam Kota’s playgrounds are deeply structural and systemic. Chief among them is the limited quality and variety of facilities. Most playgrounds offer only basic physical structures without inclusive, interactive, or educational features. This restricts their developmental value and excludes children with special needs or different learning styles (El-Kholy et al., 2022; Ashwini et al., 2021).

A critical weakness is the lack of integration with educational programs. There is currently no formal connection between schools and playgrounds, and no curriculum-linked outdoor learning initiatives. This disconnect means that playgrounds remain underutilized in educational planning, despite their proven value in promoting creativity, executive function, and collaborative learning in children (Pellas, 2025; Parker & Thomsen, 2019).

Compounding these issues is the absence of consistent maintenance and safety protocols. Equipment deterioration, poor sanitation, and inadequate lighting undermine both functionality and user safety. In addition, human resource limitations—including the absence of trained facilitators or supervisory staff—further reduce the effectiveness and sustainability of these spaces. Without a dedicated operational framework, even well-intentioned investments risk falling into disrepair (Idrees, 2022; Schäfer et al., 2023).

### ***Opportunities***

Amid these challenges, several promising opportunities exist. First, there is a growing societal awareness of the importance of holistic child development, driven by evolving educational paradigms and international frameworks such as the Sustainable Development Goals (SDGs). This creates a receptive climate for promoting play-based learning and the expansion of informal education spaces (Borisenoka, 2024; Ginting, 2024).

Batam Kota also has the opportunity to collaborate with educational institutions, NGOs, and private-sector partners. Such partnerships can introduce innovative programming, technical expertise, and funding streams necessary for playground revitalization. For instance, universities can contribute through service-learning projects, while private companies may support through corporate social responsibility (CSR) initiatives focused on community well-being (Ampartzaki et al., 2024).

Another opportunity lies in leveraging technology and creative design innovations. The integration of digital tools—such as educational apps, QR-based learning panels, or augmented reality experiences—can attract a tech-savvy generation of children while reinforcing formal learning objectives in informal environments (Başaran et al., 2024; Pellas, 2025).

Finally, government policy support at both national and municipal levels—such as the Child-Friendly City (KLA) initiative and spatial planning regulations mandating green public

space—provides an institutional foundation for long-term policy alignment and funding for child-centered urban infrastructure (Tan, 2020).

### **Threats**

However, several external threats could undermine these opportunities. The most significant is competition with digital entertainment and screen-based media, which increasingly occupies children's attention and reduces their interest in outdoor physical and social activity (Yang et al., 2023; Parker & Thomsen, 2019). Without innovative programming and modernization, traditional playgrounds may continue to lose relevance among digitally engaged youth.

Another threat stems from urban development pressures, particularly land-use changes that favor commercial or residential expansion over public space preservation. As Batam continues to grow, playgrounds may be marginalized unless their value is protected within city planning frameworks (El-Kholy et al., 2022).

Budgetary constraints also pose a long-term threat. Without sustainable financing mechanisms, playground development efforts may remain episodic and short-lived. Additionally, environmental factors, including exposure to harsh weather, vandalism, and poor waste management, can rapidly degrade facilities in the absence of robust protection and maintenance systems.

Given these findings, the optimization of playgrounds in Batam Kota must be approached strategically. This includes capitalizing on existing strengths—such as location and public interest—while addressing systemic weaknesses through design upgrades, educational integration, and better governance. Opportunities related to partnerships, technology, and supportive policy frameworks must be proactively pursued, and threats from urbanization, budget cuts, and digital competition must be mitigated through advocacy, innovation, and strategic urban planning.

### **Conclusion**

From the SWOT analysis, the following conclusions can be drawn: a) Strengths: The playground has a strategic location with potential for interactive learning, support from local government and the community, and multi-purpose facilities that support various aspects of child development; b) Weaknesses: very limited infrastructure, lack of integration of educational programs, issues of lack of maintenance and security, and limited competent human resources; c) Opportunities: Increasing public awareness of the importance of holistic learning, potential collaboration between educational institutions and the private sector, opportunities for technological innovation and support from government policies; d) Threats: Competition with digital media, urbanization pressures that reduce green open spaces, budget constraints and environmental security challenges.

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