The effectiveness of inclusive playground usage for children through behavior-setting approach in Tembalang, Semarang city

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Abstract. Playgrounds as urban public spaces are intended to explore cognitive, motoric, and social interaction abilities. Playgrounds must be inclusive as a justice space for children to create effective usage of playgrounds through a behavior-setting approach. In 2018, Semarang City received an award as an Intermediate Child-Friendly City. Tembalang is one of the areas in Semarang City with children growth of about 44% of the total population of Tembalang in 2018. In Tembalang, there are nine playground locations as the focus of this research. This research aims to examine the effectiveness of inclusive playground usage for children through the behavior-setting approach in Tembalang. The research method is quantitative descriptive. It is conducted by interviewing children as users to assess playground effectiveness usage based on the connection with nature, physical activities, and social interaction aspects. Based on the analysis, it shows that the playgrounds are not effective based on the connection with natural aspect; 40% children cannot see animal activities (such as flying birds, swimming fish, and jumping frogs) and they cannot play with natural responsive material (such as playing sands, fishing, making tree music, and throwing stones into the water). On the other hand, the playgrounds have already been used effectively based on the physical activities aspect; 51% of children can run around, jump around, and play in the playground zone. Likewise, based on the social interaction aspect, it is indicated that the playgrounds have already been used effectively; 53% of children can create meeting ground and space for children's learning to greet each other. As a result, the effectiveness of inclusive playground usage in Tembalang still needs to improve to be sustainable to accommodate children's activities in urban public spaces.

1. Introduction
The urban public space is expected to improve citizen's quality of life through physical and social activities to socialize [1]. The park's existence as an urban public space requires inclusive design for all users because citizens with all conditions have the same right to access the park as a principle of justice [2]. Therefore, an inclusive park design must have given users an easy way to move inside the park, especially specific needs such as children [2]. Children using parks have a notion as their way to interact with nature since they lack space in their house [3]. Children need space to play informally and freely to move and make noise as a form of their expression in exploring the world [4]. Playing for children is as social interaction ways with other communities; it can do at playground [5]. In urban areas, children need natural playgrounds not found in their residential environments [6]. In the public space context, children can learn some essential abilities such as how to socialize, make decisions, overcome with
problems, and sense of belonging [7]. Therefore, the effectiveness of playgrounds for children must be able to accommodate physical activities, social interactions, and play in nature. One way to assess the use of the effectiveness of playgrounds for children is through a behavior-setting approach. Behavior-setting is a behavioral theory for designing an urban public space by encouraging users’ positive behavior through social approaches and functions [1]. Children as urban public space actors are the key players in increasing the effectiveness of playgrounds. Through a playground design, the behavior-settings context is intended to encourage physical activity and environmental quality for children in urban public spaces. In 2018, Semarang City received an award as an Intermediate Child-Friendly City. Tembalang is one of the sub-district in Semarang City, which has increased children’s number under 44% or 49,733 children of the total population by age group in 2018. This amount must be balanced with the provision of playgrounds for children. Several locations of playgrounds in Tembalang have been built both by the government and housing developers as a form of children's accommodation in urban spaces. There are nine playgrounds in Tembalang as the focus of this research. Hence, the research question is “How is the effectiveness of inclusive playground usage for children through the behavioral-setting approach in Tembalang?” This research aims to examine the effectiveness of inclusive playground usage for children through the behavior-setting approach in Tembalang.

2. Playground As an Inclusive Public Space for Children
The playground is defined as a place for children to play, run around, and play football. Therefore, a playground must be able to provide facilities such as cycling trails, wide fields, comfortable lanes, or outdoor activities for children so that they are attracted to visit it [8]. Outdoor playgrounds must be creative and a free environment to improve children's understanding and physical exploration [9]. Playgrounds as outdoor recreation help children grow to improve their sports skills, study the outside world, maintain physical and mental health, and build interactions with the environment intellectually (physically and mentally) and socially [9]. The main principle in designing a playground is inclusive for children to improve children's social and emotional abilities [10]. Hong Kong is one of the cities that strives to develop inclusive playgrounds for children. Supply and management of playgrounds done by the Leisure and Cultural Services Department (LCSD), Housing Authority and Housing Department, or private sectors. From 105 playgrounds in Hong Kong, most playgrounds still consist of composite materials such as slides, climbing facilities, swings, rocking chairs, seesaws, climbing facilities, and merry-go-rounds. Some playgrounds also include cognitive games such as tic-tac-toe. This facility is still considered not fulfilling an inclusive playground criteria context. There are also still difficult to reach by children with disabilities [10].

![Figure 1. Inclusive Entrance in Hong Kong’s Playgrounds.](image1)

![Figure 2. Composite Play Structure as Inclusive Facilities in Hong Kong’s Playgrounds.](image2)
The utilization and placement process of park forms is a tendency of user behavior where urban designers very much need the psychological aspects in creating a park that suits the needs of users [1]. The integrating process of psychology and user behavior in contemporary design creates a diverse and thriving public space by the physical environment, functions, and activities in it [11]. The playground is accommodation for children's behavior in urban public spaces. It affects the provision of physical space characteristics that are configured into complex and challenging playground equipment, outdoor area, and the interrelationships between playground equipment [5]. Behavior-setting is an understanding of effective park site use and the relationship between the size of the setting and the investigated behavior. Behavior settings tried to connect between user behavior with time and space uses [12]. Behavior settings also connect between the built environment and the user's physical activity. The effectiveness of playgrounds usage must able to increase awareness, interest, and motivation for children's sustainability to explore their homes where there are three crucial things. First, connecting with nature can contribute to children's cognitive development. Second, physical activities can improve gross motor development. Third, sharing games with a group of children can improve children's social development [7].

| Table 1. Component of Effectiveness Assessment for Playground Usage Through the Behavior-Setting Approach |
|-------------------------------------------------------------------------------------------------|
| Component | Sub-Component |
| A. **Connection with Natural (Wildlife)** (8,12,13) | **A1. Engagement with natural** |
| A.1. seeing butterflies and birds flying |
| A.1.2. seeing animal activity |
| A.1.3. hearing the chirping of birds, blowing the wind, shaking the air |
| A.1.4. seeing fish and frog in water or wetlands |
| A.1.5. seeing the sky and clouds freely |
| **A2. Playing outdoor with responsive material** |
| A.2.1. playing freely in nature |
| A.2.2. throwing stones at water |
| A.2.3. playing sands |
| A.2.4. fishing in the pond |
| A.2.5. making music with tree media |
| A.2.6. availability of natural games for children to play |
B. Physical Activities (8,9,12,13)
- B1. children can run around
- B2. children can jump around
- B3. children can climb
- B4. children can climb stairs
- B5. children can play soccer
- B6. children can ride bicycles
- B7. children can play scooters/ skateboard
- B8. children can use playground area

C. Social Interaction (3,5–7,14)
- C1. creating meeting ground
- C2. availability place to gather and relax
- C3. creating space for children's learning
- C4. plaza availability
- C5. creating spaces for greeting each other

4. Research Methodology
This research uses a quantitative approach with quantitative descriptive analysis technique. It is because this research uses perceptions of children to assess the effectiveness of inclusive playground usage in Tembalang. Research locations are nine playgrounds at Tembalang. They are Citra Grand Park, USM Park, Graha Wanamukti Park, Meteseh Park, Waduk Park, Tembalang Regency Park, Graha Candi Park, Rusa Park, and Villa Tembalang Park. The sampling technique used is accidental sampling that involves children as the target as a user of the playground at Tembalang. Data collection is done by distributing questionnaires to respondents. The analysis is carried out with three variables to assess the effectiveness of inclusive playground usage based on the connection with nature, physical activities, and social interaction. This assessment produces the effectiveness of inclusive playground usage based on the Guttman scale. The effectiveness level of the inclusive park of each aspect is as follows:
  - Effective level: 0%-49.9%
  - Ineffective level: 50-100%

Table 2. Nine Playgrounds in Tembalang as Research Area

| Location                | Area (m²) | Location          | Area (m²) | Location            | Area (m²) |
|-------------------------|-----------|-------------------|-----------|--------------------|-----------|
| A. Citra Grand Park    | 12.250    | B. Waduk Park     | 5.650     | C. Villa Tembalang Park | 75        |
| D. USM Park            | 2.450     | E. Tembalang Regency Park | 75        | F. Graha Wanamukti Park | 230       |
5. The Effectiveness of Inclusive Playgrounds Usage for Children through Behavior-Setting Approach in Tembalang

5.1. Effectiveness of Playground Usage Based on Connection with Natural Aspect

The effectiveness of inclusive playgrounds in Tembalang based on the connection with the natural aspects contains eleven aspects. Based on the data, that is as follows:
Figure 6. Diagram of Effectiveness Playground Usage in Tembalang Based on Engagement with Nature

Figure 7. Diagram of Effectiveness Playground Usage in Tembalang Based on Playing outdoor with Responsive Material

Table 3. Condition of Playground in Tembalang Based on Connection With Natural Aspect

| Aspects | Effectiveness Level | Effectiveness Description |
|---------|---------------------|---------------------------|
| A1. Engagement with natural |
| A1.1 seeing butterflies and birds flying | 94% effective | Almost playground in Tembalang is still very shady and located far from the crowds, so there are much new vegetation for animals to come to, such as at Graha Candi Park. |
| A1.2 seeing animal activity | 44% ineffective | Only in Rusa Park, children can interact with deer animals such as feeding and seeing deer activity. |
| A1.3 hearing the chirping of birds, blowing the wind, shaking the air | 100% effective | All over playgrounds in Tembalang are still very shady so children can hear the sound of birds, wind gusts and shaking water like in the USM Park. |
| A1.4 seeing fish and frog in water or wetlands | 11% ineffective | Only in Waduk Park, children can see swimming fish and jumping frogs because there are artificial lakes. |
| A1.5 seeing the sky and clouds freely | 100% effective | All over the playgrounds in Tembalang are an outdoor area without any obstacles so that children can enjoy the sky view freely as in Graha Candi Park. |

A2. Playing outdoor with responsive material
Based on the results, the effectiveness of inclusive playground usage in Tembalang based on the natural connection with eleven sub-aspects is still not effective (40%). It seems that children have not been educated about the connection with nature. It shows that children can not see animal activity in an ecosystem. Apart from that, there are no nature-based activities such as throwing stones into the water, climbing trees, playing with sand, and fishing.

5.2. Effectiveness of Playground Usage Based on Physical Activities Aspect
The effectiveness of inclusive playgrounds in Tembalang based on the physical activities aspects contains eight aspects. Based on the data, that is as follows:

| Aspects                  | Effectiveness Level | Effectiveness Description                                                                 |
|--------------------------|---------------------|-------------------------------------------------------------------------------------------|
| A.2.1 playing freely in nature | 56% effective       | Most of the playgrounds in Tembalang have provided a wide field for children to play in nature, like in Citra Grand Park. |
| A.2.2 throwing stones at water | 11% ineffective     | Only in Waduk Park children can play water like throwing stones in water.                 |
| A.2.3 playing sands       | 6% ineffective       | Almost playgrounds in Tembalang do not have facilities for children to play with the sand. |
| A.2.4 fishing in the pond | 11% ineffective      | Only in Waduk Park, children can fish with their parents.                                |
| A.2.5 making music with tree media | 0% ineffective | All over playgrounds in Tembalang still lack trees and shady vegetation so children cannot play tree music. |
| A.2.6 availability of natural games for children to play | 6% ineffective | Almost all playgrounds in Tembalang cannot facilitate children to play and interact with the whole nature. |

40% (INEFFECTIVE)

Figure 8. Diagram of Effectiveness Playground Usage in Tembalang Based on Physical Activities Aspect
| Aspects                        | Effectiveness Level | Effectiveness Description                                                                                                                                 |
|-------------------------------|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| B1 children can run around    | 67% effective      | Almost all playgrounds in Tembalang already have facilities for children to run both paving pavements and green grass. One of them is at Grand Citra Park and Graha Candi Park, a vast green field. |
| B2 children can jump around   | 78% effective      | Almost all playgrounds in Tembalang already have facilities for children able to jump both paving pavements and green grass. One of them at Meteseh Park has the facility to play a numeric board played by jumping. |
| B3 children can climb         | 44% ineffective    | Most playgrounds in Tembalang have no facilities for climbing children except those that already have playgrounds such as in USM Park. |
| B4 children can climb stairs  | 33% ineffective    | Only a few playgrounds in Tembalang have provided stair facilities for children, such as Graha Wanamukti Park. |
| B5 children can play soccer   | 44% ineffective    | A few playgrounds in Tembalang, such as Meteseh Park and Citra Grand Park, have provided a field for football. |
| B6 children can ride bicycles | 44% ineffective    | A few playgrounds in Tembalang, such as Meteseh Park and Waduk Park, have provided special lanes for cycling. |
| B7 children can play scooters/skateboard | 33% ineffective | Only in Citra Grand Park has provided rental and space for children to skateboard. |
Based on the results, the assessment effectiveness of playground usage in Tembalang in terms of physical activities is still effective (51%) based on eight sub-aspects of assessment. It shows that children can do some physical activities freely, such as running around, jumping around, climbing, playing soccer, riding bicycles, playing scooters, and/or skateboarding.

5.3. Effectiveness of Playground Usage Based on Social Interaction Aspect
The effectiveness of inclusive playgrounds in Tembalang based on the social interaction aspects contains eight aspects. Based on the data, that is as follows:

![Diagram of Effectiveness Playground Usage in Tembalang Based on Social Interaction Aspect](image)

**Table 5. Condition of Playground in Tembalang Based on Social Interaction Aspect**

| Aspects       | Effectiveness Level | Effectiveness Description                                                                 |
|---------------|---------------------|------------------------------------------------------------------------------------------|
| C1 creating meeting ground | 100% effective     | Almost all of the playgrounds in Tembalang have created a space for social interaction such as a gazebo, sitting group area, and green grass. |

![Creating Meeting Ground](image)
| Aspects | Effectiveness Level | Effectiveness Description |
|---------|-------------------|--------------------------|
| C2      | availability place to gather and relax | 22% ineffective | Even though there has been room for social interaction, it is not functioned optimally, especially at night. |
| C3      | creating space for children's learning | 50% effective | Most playgrounds in Tembalang can provide a space for social interaction that accommodates children's learning, such as in Meteseh Park, which provides space for learning to count. In Rusa Park and Graha Candi Park, there are cow statues and giraffe statues to learn about animals. |
| C4      | plaza availability | 0% ineffective | All playgrounds in Tembalang have not yet had plazas as one of the effective spaces for children to interact with each other. |
| C5      | creating spaces that can greet each other | 94% effective | All playgrounds in Tembalang are designed with a wide range of visions. It will create a space for social interaction, such as greeting each other. |

53% (EFFECTIVE)

Based on the results, the assessment of the effectiveness of playground usage in Tembalang in terms of social interaction is still effective (53%) based on five sub-aspects. It shows that children can do social interaction activities, such as meeting new friends, talking, discussing, and getting to know each other. These social interactions can be seen from the presence of a meeting ground and wide space to greet each other.

6. Conclusion
Assessing the effectiveness of inclusive playground usage in Tembalang through a behavioral-setting approach, based on three aspects; connection with nature, physical activities and social Interaction with the following results:

- **Connection with nature**, the result is still not effective (40%). Aspects that have not been effective are seeing animal activities (44%), seeing fish and frog in water (11%), throwing stones at the water (11%), playing sands (6%), fishing in the pond (11%), making music with tree media (0%), and availability of natural games for children to play (6%). Meanwhile, the effective aspects are seeing butterflies and flying birds (94%), hearing the chirping of birds, blowing the wind, shaking the air (100%), seeing the sky and clouds freely (100%), and playing freely in nature (56%).

- **Physical activities**, the result is still effective (51%). Effective aspects are children can run around (67%), children can jump around (78%), and children can use the playground area (67%).
Meanwhile, the not effective aspects are children can climb (44%), children can climb stairs (33%), children can play soccer (44%), children can ride bicycles (44%), and children can play scooters/ skateboard (33%).

- **Social Interaction**, the result is still effective (53%). Effective aspects are creating meeting ground (100%), creating space for children’s learning (50%), and creating spaces that can greet each other (94%) while the aspects that have been not effective are availability place to gather and relax (22%) and plaza availability (0%).

Based on the results, the effectiveness of inclusive playgrounds usage in Tembalang shows that the aspects which have not been effective can be improved, so that they can become a public space. It means that it can accommodate children's activities inclusively and sustainably.

7. References

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