



Affordances of Home-School Journey in the Hinterland Area for Spatial Mobility Patterns

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ABSTRACT

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In children's home-school journey, little is known about the geography of the outdoor environment in coastal areas, particularly in the hinterland area. This study investigates spatial mobility patterns during home-school journeys in the hinterland area through their actualised affordances at Belakang Padang, Batam, Indonesia. In this study, affordances refer to the opportunities and constraints related to physical and environmental factors that influence a child's ability to navigate and move within their surroundings, particularly when travelling to and from school. The study was conducted on forty-three children aged 7-12 who experienced two elementary schools in the hinterland of an island community. The phenomenological approach elicited a dataset of the children's behavioural responses derived from participatory observation, go-along interviews, and GIS mapping. The responses included physical movement, words, and phrases, which suggested their preferences towards the hinterland area settings. This study analysed the data in two stages: firstly, a taxonomy of the affordance of children's outdoor environment involves categorising different types of opportunities and constraints that impact spatial mobility patterns, and secondly, the level of affordances shows how the perceiver shapes and constructs the environment they are perceiving. Spatial analysis and content analyses revealed that the home-school journey offered 11 categories of environmental qualities, with the category of water showing the most affordances. The children's activities were most frequently on the jetty and muddy ground. The results suggest that children's affordances such as observing, recognising, watching, relaxing, scooping, swimming, diving, playing, speaking, paddling, practising, crossing, standing, touching, eating, floating, fishing, stopping, explaining, releasing, mastering, catching, asking, joking, telling, singing, planning, sitting, splashing, pouring, determining, knowing, boating, and standing to gain balance on the jetty and boat are facilitated through physical, cognitive, and social interactions. A deeper understanding of child-friendly places can help increase the affordance of other places in the hinterland area. Therefore, it is recommended that governments implement policies to foster a Child-Friendly City/District (CFC/D).

1. INTRODUCTION

Research has shown that the transportation mode utilized by children during their home-school journey can significantly impact their spatial knowledge. Specifically, children who walked to school or took public transportation independently have demonstrated better abilities to create accurate sketch maps than those who were driven by car or took the school bus [1]. Understanding children's behavior during the home-school journey highly depends on their spatial mobility, particularly for young ones. Understanding their perceptions can help us comprehend their emotions, needs, preferences, and interactions [2]. Over recent decades, there has been a growing focus on examining the impact of outdoor environments on children's daily experiences [3, 4]. This area of research has garnered significant attention as it seeks to better understand how it can influence and shape the lives of young individuals. The involvement of children with the natural world has decreased, while their exposure to

technological forms of entertainment like TV, video games, and computers has increased [5]. The reduced interaction with nature influences their physical, social, and cognitive abilities. Research shows that nature is essential for children's development in the surrounding environment [6, 7].

Three important places are related to children's daily activities: schools, homes, and public spaces [8, 9]. These places have played an essential role in shaping their development. Children's interactions with the outdoors are influenced by the characteristics and opportunities presented by the surrounding environment. The physical characteristics of the surrounding environment shape the child's relationship with the outside environment [10, 11].

Indonesia is home to a significant child population, comprising approximately one-third of its total population, roughly 80 million. This demographic is essential to the country's social and economic development as the world's fourth-largest child population. Notably, Indonesia is an archipelago comprising over 17,000 islands, covering more

than 735,000 square miles and boasting a diverse population of over 1,300 ethnic groups [12]. Indonesia's unique cultural and geographic characteristics underscore the significance of its child population and the need for targeted interventions to support their growth and development. Many children reside in densely populated urban areas, such as Jakarta and Surabaya, where poverty and environmental pollution present significant challenges.

Conversely, some children live in remote, insular regions where accessing basic amenities is a daily struggle. Insular populations exist in various areas across Indonesia, including Maluku, NTT, West Java, South Sumatra, and the Riau Islands province. These populations are defined by their isolation from social, political, demographic, and spatial elements that would otherwise facilitate development efforts [13]. Batam is one of the Cities in Riau Islands Province and comprises twelve districts, three in the hinterland area, namely Belakang Padang, Bulang, and Galang Island. Two districts rely on sea transport to access Batam City from the main island. The islands surrounding Batam, administered by the city government in social, political, demographic, and spatial aspects, have limitations resulting in the hinterland area's developmental lag compared to the mainland.

Primary school children residing in the hinterland use sea transportation, motorcycles, or walking to school. This study focuses on Belakang Padang, a small island with geographical constraints that influence children's mobility. The lack of transportation infrastructure exacerbates the situation, with Belakang Padang having the highest number of school children. Among the various locations that children frequent, schools are a significant place where they spend considerable time [14]. As such, children must travel between their homes and schools on a near-daily basis, making the home-school journey an integral part of their daily routine [8]. The hinterland area on the island, in particular, has been identified as the optimal setting as it provides natural elements that encourage children's performance. These journeys can involve walking, boating, cycling, chatting with friends, and even playing, making them an explorative and self-testing play that stimulates children's physical, social, and cognitive performance [5], thus enhancing their overall development.

Notably, the home-school journey experiences of children residing in rural and urban areas vary significantly. Little is known regarding how culture and geographic location impact the daily outdoor experiences of children, particularly those residing in the hinterland area. Therefore, it is crucial to investigate the spatial mobility pattern factors through actualisation affordances influencing the environment of children's spaces. Specifically, it has been observed that rural children tend to have greater exposure to and involvement with the natural environment relative to their urban peers [8]. It is imperative to broaden the scope of investigation beyond rural land expanses and include varied geographical contexts, including coastal regions, for a thorough comprehension. This study elucidates the impact of the environment on the daily home-to-school commutes of children residing in hinterland areas. Furthermore, it adds to the existing body of literature concerning the advantages of outdoor environments.

2. LITERATURE REVIEW

2.1 Theory of affordances

Renowned for his contributions to ecological psychology

and perception, James J. Gibson formulated the affordance theory, positing that the perception of an environment is rooted in the potential actions and opportunities it presents to individuals. This theoretical framework underscores the interplay between the environment's characteristics, individuals' capabilities, and objectives. This research delivers an in-depth examination of affordances, elucidating how the environment offers possibilities for both percept and action. Additionally, it delves into the significance of perception in recognising affordances [15]. Earlier scholarly work has outlined the cognitive theory of action, encompassing a thorough exploration of affordability [16]. This prior research investigates the impact of affordances on perception, cognition, and action across diverse contexts. Furthermore, the current study investigates the role of affordances in guiding human movement [17]. They investigate how individuals perceive and act upon the affordances of passable openings based on their body size and the aperture dimensions. Next, a study elaborates on the theory of affordances, discussing the concepts of direct perception, information-based action, and the relationship between affordances and ecological psychology [18]. Therefore, affordance views perception as a sensory activity and mobility as a motoric activity, and the division between them disappears [19]. The concept fits within the framework of ecological perceptual psychology, which suggests that people shape and are shaped by their environment [15, 19]. With children, the shaping of the environment depends on the environment's affordances as perceived by the children [10].

The concept of affordances is the most widely referenced in perceptual psychology and is the backbone for much of the research on children's environments. Children's relationship with their everyday outdoor environment is based on what the environment can offer to fulfil their desired intentions in everyday experiences. There has been increasing research interest in understanding how children's outdoor environments have influenced their daily experiences in the past few decades [20-22]. For example, children experiencing the outdoors found that a place's value is not determined by its appearance but by its potential for affording play activities [19]. That is, the functional properties of the environment influence children's perceptions and movements [23]. For instance, the built environment's particular role in children's independence and active mobility has received increasing attention in research and practice. In addition, children understand and interpret the environment not as a form but as a function [24]. However, the complexity of the transactions between children and the environment needs to be understood, focusing on children's use and experiences of the outdoor spaces in a neighbourhood [25].

Affordances in this study explain how the environment influences children's movement and mobility. The influence of environmental factors affects on children's home-school journey. It highlights how the built environment facilitates or hinders children's spatial mobility patterns, such as sidewalks, street connectivity, and traffic safety [26]. Second, it examines how urban sprawl, traffic conditions, and parental concerns influence children's spatial mobility patterns and ability to navigate their neighbourhoods independently [27]. Third, children's perceptions of their localities and geography influence their school travel behaviours. It emphasises the role of perceived opportunities, constraints, and affordances in shaping children's decisions regarding spatial mobility patterns, such as walking or biking to school [28]. The

influence of neighbourhood safety on children's physical activity levels, including traffic safety and crime rates, restricts children's independent movement in the environment [29].

2.2 Level of affordances

The concept of affordances refers to the functional properties of a place that can be perceived, utilised, and shaped [10, 19]. These classifications are refined and determined based on the specific actions, language, and situations encountered during play activities on the home-school journey. The level of affordances can be categorised into three activities: performative, exploratory, and productive. Performative activities involve directing an action towards a particular object, such as jumping into a river. Experimental activities focus more on discovering new properties, such as determining water depth. Productive activities involve transforming a feature into a desired object, such as moulding sand into a sand castle [30]. In the context of home-school journeys in the hinterland area, performative affordances significantly provide safe and reliable transportation for children. The availability of a regular boat service operating on a fixed schedule enables children to reach school on time. Additionally, exploratory affordances are offered to children in a hinterland area with a boat journey to school. They can explore the rich biodiversity of the sea, learning about various fish species and local plants while appreciating the importance of water conservation. Furthermore, productive affordances can be observed when children use boats to get to school across the ocean. They can participate in personal learning to monitor water choppy and contribute to local environmental safety, thus cultivating responsible habits. The level of affordances available varies depending on the place, which offers distinct functional attributes. In addition, each individual perceives, utilises, and shapes the affordances that fit with their personal qualities. The affordances are divided into potential and actualised affordances.

The concept of affordances in this research, as applied to spatial mobility patterns of children's home-school journey, is understood through three levels: perceived, utilised, and shaped. Perceived affordances refer to the opportunities for action children perceive or recognise in their environment.

These affordances relate to a child's perception of the features and properties of the environment, such as pathways, walkways, parks, or transportation options [18]. Perceived affordances are crucial in spatial mobility patterns as they influence children's awareness of available routes, destinations, and possibilities for movement during home-school journey.

Utilised affordances are the affordances that children actively engage with and use in their spatial mobility patterns. These are the affordances that children utilise and incorporate into their daily movement behaviours. Utilised affordances depend on factors such as the child's physical abilities, interests, preferences, and the environment's accessibility on their commute. During movement on the home-school journey, children engage in locomotion motor skills [11], perception [31], socialisation [32], and risk-taking [33] to imbue otherwise meaningless elements, individuals, or situations with significance. For instance, children may utilise affordances such as sidewalks, pedestrian crossings, or public transportation options to navigate their way to school or other destinations [34].

Shaped affordances refer to how children shape or modify their environment to create new affordances or adapt existing ones. Children can actively shape their environment through their movement behaviours and interactions with the physical and social aspects of the environment. They may create shortcuts, informal pathways, or social connections that enhance their spatial mobility options [35]. Shaped affordances recognise the reciprocal relationship between children and their environment, where they better modify the environment to suit their mobility needs and preferences.

2.3 Taxonomy of affordances

According to Heft (1999) in Table 1, the affordability of children's environments based on various observational studies of children's behaviour in the outdoor environment can be categorised into a taxonomy consisting of 10 categories of environmental quality: flat, relatively smooth/rigid surfaces, relatively smooth/rough slopes, graspable/ detached object, attached object, non-rigid, attached object, climbable feature, shelter, mouldable material, water, and aperture.

Table 1. Previous study of functional taxonomy of affordances

No	Functional Taxonomy	Heft (1988)	Kytta (2002)	Said (2006)	Lerstrup & Bosch (2016)	Daniel (2021)	Yusof (2022)
1	Flat, relatively smooth/rigid surfaces	✓	✓	✓	✓	✓	✓
2	Relatively smooth/rough slopes	✓	✓	✓	✓	✓	
3	Graspable/ detached object	✓	✓	✓	✓	✓	✓
4	Attached object	✓	✓	✓	✓	✓	✓
5	Non-rigid, attached object	✓	✓	✓	✓	✓	✓
6	Climbable feature	✓	✓	✓		✓	✓
7	Shelter	✓	✓	✓	✓	✓	✓
8	Mouldable material	✓	✓	✓	✓	✓	✓
9	Water	✓	✓	✓	✓		✓
10	Aperture	✓				✓	✓
11	Affordances for sociality		✓	✓			✓
12	Vegetation and wildlife			✓			
13	Creatures				✓		
14	Fire				✓		
15	Snow					✓	
17	Soundable						✓
18	Windable						✓
19	Edible						✓
20	Ignitable						✓

Studies on children's experiences in an outdoor environment by Kyttä (2002) improve the taxonomy by adding a category of affordances for sociality and play and subtracting the category of aperture. Previous researchers such as Heft (1998); Said (2006); Lerstrup & Bosch (2016); Daniel (2021); Manikam (2022); and Yusof (2022) also improved the taxonomy by adding the affordability categories listed in Table 1. This study, which concerns the affordances of home-school children, extends the taxonomy with environmental affordances that support muddy ground. The taxonomy tells what categories afforded the children the most or fewest functional properties during their journey.

Affordances taxonomy has evolved, and researchers have decided which ones to include or exclude in their studies. Specific research objectives, contextual characteristics, theoretical frameworks, and the evolving understanding of the concept influence these decisions. As a result, the concept of affordances is dynamic and adaptable, and its taxonomy is continuously refined and expanded as researchers gain deeper insights into various settings.

Drawing on an extensive review of affordances in the existing literature and acknowledging the crucial role of environmental factors in shaping children's movement and mobility, this study examines how affordances impact children's spatial mobility patterns during their home-school journey in hinterland areas. The literature review has underlined the importance of environmental factors such as pathways, transportation, and community support in influencing children's perception and utilisation of affordances. Based on this foundation, this study aims to investigate spatial mobility patterns during home-school journeys in the hinterland area through their actualised affordances. The research methodology incorporates qualitative and quantitative data collection techniques, considering the complexity and context-specific nature of children's interactions with their environment. To gain insights into how children perceive, utilise, and shape affordances during their home-school journey, participatory observation, go-along interviews, and GIS mapping will be employed, focusing on hinterland areas.

3. METHODOLOGY

3.1 Subject

The study collected qualitative and quantitative data from two schools in the hinterland of Batam. A total of 43 children were included in the qualitative data collection. The researcher obtained approval for their research proposals and instruments from their academic institution and the destination school. Permission was sought from the principal to conduct research with students. The researcher engaged in additional conversations with the teachers designated by the principal to discuss the research and the children as participants in the study. All participants were notified to provide informed consent before conducting the study. The sample consisted of boys and girls aged between 7 and 12 who attended grade 2 to 5 classes. The teacher recommended the respondents from grades 2-5 based on their abilities and the mode of transportation they use among children who walk boats to and from primary schools in the hinterland area. To capture a range of transportation experiences, these modes present distinct affordances and constraints and are prevalent in different

regions due to the area's geography. Examining these diverse modes helps to comprehend how different affordances impact children's spatial mobility. The selection process was influenced by both geographical diversity and mode of transportation, as well as practical considerations such as the willingness of schools to participate and the logistics of data collection. These practical factors were considered to ensure the study was feasible and efficient.

3.2 Data collection

3.2.1 Participatory observation

In order to ensure that the children perceived the research team as part of them, participant observation was used after developing rapport with the children. Establishing rapport with children, mainly when conducting research with them professionally, is crucial to creating trust, promoting honest communication, and ensuring their comfort. Utilising ice-breaking exercises was an effective method to initiate these interactions. Playing games such as "Two Truths and a Lie" or "Would You Rather?" can be enjoyable and informative, revealing interesting aspects of the child's personality. Children participating in these games will be rewarded with small tokens such as stationery. As part of the scientific method, instruments were used to note the phenomena of their activities using their five senses and record them for scientific purposes [36]. Some examples involving the five senses were swimming, crossing by boat, buying snacks, and walking together.

The utilisation of observation through participation represents a prevalent research methodology, particularly when dealing with intricate and challenging-to-recall behaviours [37]. Participatory observation, a technique researchers employ to gather data from a specific cohort of children, entails actively engaging them in group activities while concurrently observing their conduct and interactions [37]. This method is specifically applied to investigate the spatial mobility patterns of school children in hinterland areas. During participatory observation, the researcher actively joined the children in their daily commutes between home and school, participating in activities such as walking, crossing by boat, purchasing snacks, and engaging with peers. The all-encompassing observations encompassed diverse facets of the children's experiences, including mobility behaviours, social interactions, and safety precautions. Employing all five senses, the author meticulously documented the children's actions, behaviours, and responses to their surroundings, emphasising noting any challenges, constraints, or affordances encountered during their journeys. The participatory observation necessitated direct immersion in the community, enabling the author to witness school children's daily routines and movements. Furthermore, the author actively observed and recorded information pertaining to children's spatial mobility patterns, including the routes taken to school, modes of transportation utilised, travel durations, and destinations. Data collection occurred through participant observation, involving the author accompanying school children on their journeys and recording pertinent details in real-time through field notes, photographs, or video recordings to capture the intricacies of their movements and surroundings.

3.2.2 Go-along interview and mapping

The methodology of Go-along Interviews has been applied to explore the interconnection between individuals and their

surroundings [38]. Go-along Interviews represent a qualitative research approach involving conversational interviews with children while accompanying them in their day-to-day activities [39]. In the data collection process, the researcher follows children, observing their conduct and surroundings while posing questions, making observations, and recording notes to gain deeper insights into children's experiences, behaviours, and perspectives in their natural settings. In the context of this study, the Go-along Interview technique was employed to comprehend children's school journeys in hinterland areas, where they attend school from 07:00 a.m. until noon. This method entails children leading walking tours during their home-to-school journeys, providing brief engagement in a familiar environment and offering a flexible means of data collection for research focused on a specific setting [40]. Various interview methods were employed to ensure comprehensive data gathering concerning the children's viewpoints and conduct throughout their journeys. The selection of the walking interview was deliberate, as it involved the researcher entering a familiar research environment chosen by the children at specific junctures during their journey [41]. In essence, Go-along Interviews are designed to benefit participants, and this approach provides a valuable opportunity to comprehend their perspectives and behaviours within a natural setting.

To gain insights into children's experiences from home to school in hinterland areas, the researcher accompanied them on foot and by boat, meticulously recording observations and taking detailed field notes. Throughout this period, open-ended inquiries were directed at the children, addressing their preferences, safety concerns, social interactions, and encountered challenges. Audio recordings were employed with the children's consent to ensure precision and facilitate subsequent analysis. Following the journeys, a debriefing session allowed for reflection, clarification, and exchanging insights or concerns. This meticulous process yielded valuable information and a more thorough understanding of the children's perspectives.

In this study, the authors conscientiously considered aspects of reliability and validity, particularly within the qualitative research context of Belakang Padang's hinterland area. To establish reliability, the study implemented various measures. Firstly, data triangulation was applied, incorporating diverse data collection methods such as participatory observation, go-along interviews, and mapping. This approach enabled a comprehensive examination of children's spatial mobility, contributing to a more robust and coherent understanding of the research findings. Secondly, the study highlighted disparities between the routes drawn by children and the shortest paths mapped in GIS, acknowledging multiple perspectives and bolstering the research's credibility. Additionally, vivid descriptions derived from the children's exact words were utilised to immerse the reader in the research context, offering a deeper insight into their experiences during their home-to-school journeys.

Furthermore, to ensure validity, the research involved the researcher spending significant time with the children, fostering an in-depth comprehension of the phenomenon under study and reinforcing the narrative's credibility. Including a peer debriefer as a moderator further enhanced the research's validity by incorporating external perspectives beyond the researcher's initial interpretations, ultimately cultivating a more comprehensive and nuanced understanding of the children's spatial mobility patterns in the hinterland area. The

combined application of these reliability and validity procedures fortifies the research's credibility, enhancing the trustworthiness of the findings and providing a more exhaustive and accurate portrayal of the children's experiences within their spatial environment.

3.3 Data analysis

This study employs Geographic Information Systems (GIS) to analyse further data obtained through participant observation, focusing on the processing and analysing of spatial data concerning children's journeys from home to school in the hinterland area. GIS mapping is utilised to generate indicators of their spatial mobility patterns, with data collection relying on shapefile maps provided by BP Batam City, which were subsequently processed for analysis. The initial step in data analysis involves digitising the boundaries of various locations, encompassing children's homes, schools, and stops along the route (such as shops, roads, docks, boats, cemeteries, friends' houses, traditional markets, rickshaws, gates, and trees). Subsequently, the distance between home and school is mapped and measured along the most direct route, considering pedestrian networks, boat routes, and unstructured paths. This distance is then compared with the actual route taken by the children.

The selection of GIS as the primary analytical tool is underpinned by several key reasons, significantly contributing to the study's overarching objectives. One crucial aspect is GIS's capacity to integrate diverse data sets, incorporating geographical features, transportation networks, and points of interest to provide a comprehensive spatial context for analysis. Another advantage lies in GIS's ability to precisely digitise and measure routes, accounting for various modes of transportation, including pedestrian pathways, boat routes, and unstructured paths. Furthermore, GIS's visual mapping capabilities enable the creation of comprehensive and intuitive visualisations that effectively communicate spatial patterns and variations to a broader audience. Lastly, GIS offers tools for rigorous quantitative analysis, facilitating the calculation of distances, densities, and concentrations of activities, aiding in identifying spatial trends and patterns.

The GIS software objectively assesses factors influencing children's spatial mobility patterns, analysing activity points and interactions within the hinterland areas. Heatmap analysis is utilised as a spatial mapping method to identify clusters of spatial phenomena, focusing on the distribution patterns of points indicating higher and lower concentrations of activity based on children's access to hinterland areas. The research also aims to observe variations in children's behavioural patterns related to the nature and features of spatial mobility patterns.

While the data collection and analysis were extensive, the chosen methodologies have inherent limitations. Participatory observation and go-along interviews may be susceptible to observer bias, potentially influencing the interpretation of children's experiences and behaviours. The researcher's presence during data collection could have impacted the children's natural behaviour, leading to observation bias. Additionally, GIS analysis depended on available and accurate geographical data, which might have affected the reliability of GIS-based findings. Recognising these limitations and biases is crucial for comprehensively evaluating the research outcomes and suggests areas for further exploration in future studies.

4. FINDING AND DISCUSSION

4.1 Level of affordances

Children's activities during their home-school journey in hinterland areas provide essential insight into how they interact with their environment. These interactions shape the perception, use, and form of the environment. To effectively present information on affordability levels, a map was created using GIS, which displays the affordability amounts assigned to each group in circles with different colours.

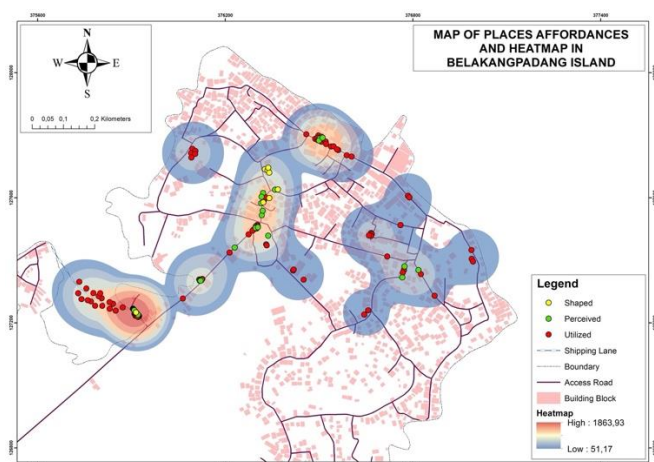


Figure 1. Map of the level of affordances in the hinterland area

Figure 1 illustrates the distribution of affordance levels, showing that most of the children's activities are centred on affordances utilised ($n=70$) with a score of 1864, perception ($n=68$), and formed ($n=10$) with a low score of 51. Children are generally involved in the facilities they use, for instance, swimming and diving in the sea, paddling with their hands, and practising body balance on a boat. Nevertheless, the extent of children's play opportunities during home-school journeys is contingent upon factors such as their constrained time and the mode of transportation employed. This finding diverges from Yatiman et al. [2], which highlighted children's engagement based on perceived abilities rather than actual utilisation. This disparity is attributed to the rural context of the current study, where affordances are passively enacted in contrast to the active realisation of affordances. The subsequent sections delve into utilised, perceived, and shaped affordances.

The concept of affordances has gained traction in children's journeys between home and school, particularly concerning using boats in urban planning. However, it is imperative to acknowledge that boat transportation is less prevalent than land-based modes of transportation. Consequently, the applicability of this concept varies across urban areas, especially in hinterland regions connected to water bodies, such as coastal areas. In these locales, boat transportation emerges as a feasible and practical alternative. Evaluating the efficacy of utilising boat transportation for children's school commutes in urban planning necessitates an examination of the correlation between the urban environment's capabilities and the advantages offered by this mode of transportation. The assessment involves a thorough analysis of the potential opportunities that boat transportation offers and an evaluation of how well these opportunities were being utilised in the context of children's school journeys.

4.1.1 Utilised affordances

The study reveals that children predominantly engaged with utilised affordances, followed by water 14%, flat, relatively smooth/rigid surfaces 8%, graspable/detached object 5%, attached object 1%, non-rigid, attached object 1%, non-rigid, attached object 3%, shelter 1%, mouldable material 2%, aperture 5%, affordance for sensory 1%, and muddy ground 5% (see Figure 2). The finding attributed to the diverse properties and attributes of the hinterland area, comprising water and houses on the island along the home-school journey. The children encounter these elements during their home-school journey, whether walking or boating to school. The study further reveals that children with different mobility types experience distinct affordances. The results indicate that the children primarily engaged in energetic play activities that involved motoric action through direct physical interaction with the hinterland area along the home-school journey. For instance, children with boats can access water-based activities like swimming, diving, boating, fishing, floating, splashing, jumping, pouring, and paddling. The study establishes a strong correlation between children's activity on utilised affordances and their ability to use something, primarily for play activities.

Consequently, water emerged as children's most frequently utilised affordance, given its easy availability and mobility during the journey back from school to home. Evidence suggests the hinterland area offered the opportunity to the children for exploration and movement, encouraging them to be physically active. Physical activity and active travelling can benefit children's physical health [42], cognitive development [43], and opportunity for socialising and exploration of neighbourhood localities, which help create a child's identity as part of the community [44].

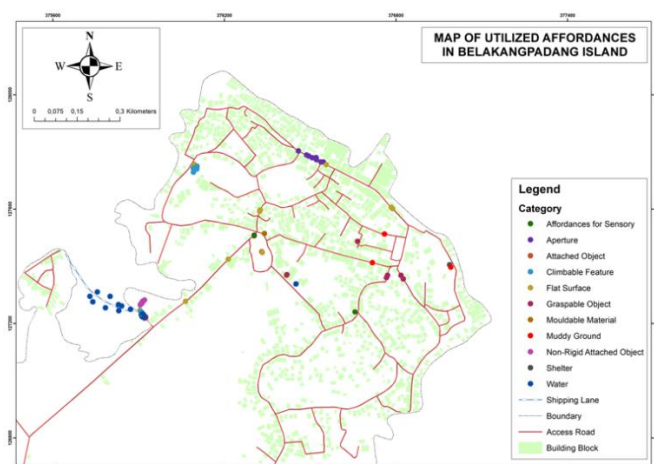


Figure 2. Utilised affordances of the home-school journey in the hinterland area

In summary, this subsection highlights that children predominantly engage with utilised affordances, particularly water-based activities, and experience perceived affordances with social interactions and sensory engagement, emphasising the significant role of the hinterland environment in shaping their daily experiences during the home-school journey.

4.1.2 Perceived affordances

For perceived affordances, children were commonly engaged with 12% of affordances for sociality, 11% of water, 3% of flat, relatively smooth/rigid surfaces, 3% of graspable/detached objects, 3% attached objects, 2% of non-rigid,

attached object, 1% of shelter, 5% affordances for sensory, and muddy ground 5% (see Figure 3). The children mainly experienced perceived affordances with various shops, houses, friend's houses, jetties, boats, and people who were mostly adults. Engagement with natural features, such as playing with kittens, chickens, and fish, touching the timber platform after jumping on the sea, and recognising the type of dried fish. The affordances include singing a song, planning a schedule, determining the boat's direction, and knowing when it will rain on the boat. Boat in the hinterland area serves as the safe transportation mode for children and locals to commute their activities. However, the boat and jetty infrastructure was not well designed; it was made of a timber platform whose structure was sometimes hollow, and there was no written boat schedule or safety instructions, which had a detrimental influence on the children during the home-school journey. Hence, it does not deter the children from exploring and engaging with the environment.

The children greeted the vegetable seller and fish traders and talked with a pedicab driver. The situation makes children meet locals who are friendly to them. They borrowed their phone from the children to call boat guardians for the unpredictable schedule. They tell stories about their activities in school to locals. For instance, after getting back from school, one of the children went to a pedicab driver, asking permission to borrow their phone to call the board guard and give the information to pick them up. The incident showed that children engaged in social play in which the community was a part of their journey. It means that children were close to and treated locals as part of their friends.

Moreover, the children were fishing fish at their friend's house. The situation is called a restorative activity, allowing them to be happy during their home-school journey. Children also develop values towards nature Through engaging with animals as play tools [45]. Indeed, a growing body of evidence supports the view that the natural environment provides restorative benefits. The children's activity was daily life but meaningful to them because it gave them a feeling of happiness that developed their cognitive responses [5].

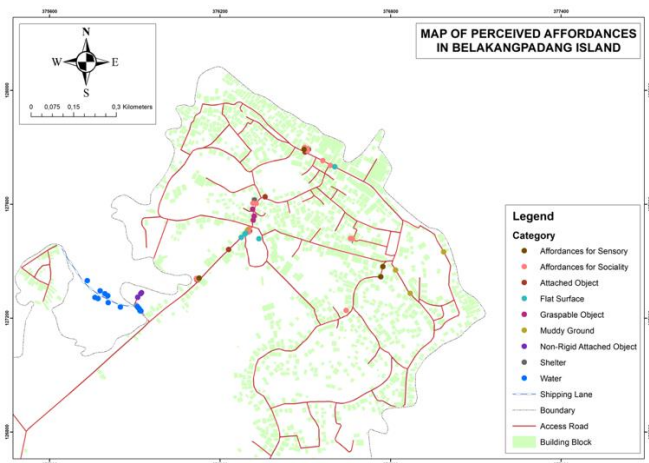


Figure 3. Perceived affordances of home-school journey in the hinterland area

Therefore, children's activity on perceived affordances was associated with emotion and senses, including sight, audio, touch, smell and taste [15]. The finding suggests that the perceived affordances were influenced by the properties and attributes of the journey, which offers a diversity of elements

that allow the children to see, touch, smell and taste. For instance, observing fish on the sea, recognising fish, smelling the fish, and explaining the passing ships. The perceived affordances were also influenced by the opportunity to engage with the elements along the home-school journey. Independent mobility without parental supervision was the best type that allowed children to engage in all types of senses.

The subsection illustrates that children's engagement with perceived affordances, particularly social interactions and sensory experiences, highlights the significant role of the hinterland environment in fostering their emotional and cognitive development during the home-school journey, emphasising the importance of independent mobility in facilitating comprehensive sensory engagement.

4.1.3 Shaped affordances

Children are engaged with graspable elements 3%, attached objects 1%, non-rigid, shelter 1%, and mouldable material 2% for shaped affordances (see Figure 4). The children changed the elements as they desired, including their function or form [30]. However, the children in the hinterland area only mentioned a small number of shaped affordances. For instance, the children wear self-made jewellery from flowers, manipulate stones as play *congkak* tools and balls, collect twigs for play, manipulate muddy ground as a building, shape cake from muddy ground, smear muddy ground as a painting, fish using timber, and scooping fish with clothes. The result suggests that children create and play games during their home-school journey and explore interesting sites [46].

The children manipulated the features found in the street of the hinterland area as their play tools. The finding signifies that children are creative and imaginative while outdoors and can solve their problems [4, 47]. Children in the hinterland area understood the materials that can be shaped. For instance, as previously mentioned, they applied the concept of the functionality of fishing equipment to use timber, turning coconut leaves into a takraw ball net. Through children's responses in the home-school journey, the study has recognised that it benefits them. As such, the affordances of the home-school journey have encouraged children's physical, social and cognitive performance.

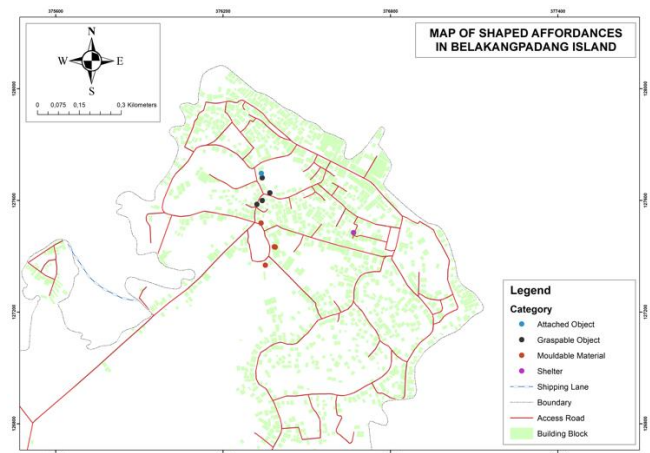


Figure 4. Shaped affordances of the home-school journey in the hinterland area

From the findings, children are practical, where they utilise and sometimes shape the elements for their activities; where they show satisfaction with having contact with the

environment; where the children are attracted to nature; and also scientific, which most of the children could understand the relation of the elements in the environment. The connection between affordances and the home-school journey in urban planning refers to the relationship between the built environment and the physical environment characteristics in hinterland areas and the opportunities and constraints this environment provides for children along their home-school journey. The affordances refer to possible actions perceived or offered by a space to children. Urban planning plays a significant role in shaping the circumstances of children's home-school journey. These conditions influence their lives, including safety, physical activity, social interaction, and overall well-being.

The subsection emphasises that children engage in shaped affordances, showcasing their creativity and problem-solving skills during the home-school journey in the hinterland area, contributing to their physical, social, and cognitive development, thus highlighting the significant role of the environment in fostering children's experiences.

4.2 Taxonomy of affordances

Using Nvivo 12 Plus, a comprehensive and systematic analysis was conducted to identify and classify 11 distinct categories within a functional taxonomy of children's experiences during their home-school journey. These categories were drawn from comparable categories. These categories were as follows: 1) flat, relatively smooth/rigid surfaces, 2) graspable and detached objects, 3) attached objects, 4) non-rigid, 5) climbable, 6) shelter, 7) mouldable materials, 8) water, 9) apertures, 10) affordances for sociality, and 11) affordances for Sensory. A new category has recently been incorporated into the existing muddy ground categories. This research discovered that each category presents opportunities for children's school journey activities in the hinterland area. Therefore, the results of children's activities are shown in Table 2.

Table 2 presents a taxonomy of affordances for a hinterland area, indicating that water was the most prominent category, observed in 28% (n=38) of activities. This finding contradicts the results of other studies which studied rural settings and found that vegetation was the most notable classification of children's school journey actions. Similarly, studies in urban settings and identified graspable/detached objects as the most prominent affordance in children's actions during their school journey. The children mostly engaged in water-related activities, such as swimming, diving, paddling, balancing, and floating, which comprised the largest percentage in the water category. They even swam in school uniforms in the sea, using their arms and legs to move. Diving was also popular, with children learning and practising four different techniques. Paddling was a highlight during a home-school journey in the hinterland area, allowing children to navigate the sea using a *boat pancung* and develop their spatial skills. This hands-on experience on the water enhanced their understanding of spatial relationships, directions, and navigation skills. This finding suggests that travel mode, specifically being accompanied by a parent, does not significantly influence children's environmental knowledge during a school journey in urban settings. However, in the hinterland area, where water activities like paddling are prevalent, the unique spatial challenges and skills required to navigate the sea significantly impact children's spatial skills and environmental knowledge

(see Figure 5).

"Diving brings us so much joy! We love showing off our skills with forward dives, back dives, twists, and even somersaults."

Table 2. Previous study of functional taxonomy of affordances

No	Category	Affordances
1	Flat, relatively smooth/rigid surfaces	running, walking, jumping, spinning, practising, crossing, avoiding, assuming, feeling, sitting, sweeping, playing, relaxing
2	Graspable/detached object	playing, releasing, plucking, kicking, weighting, jumping, giving, feeding, using, making, wearing, manipulating, collecting, watching, searching, relaxing
3	Attached object	observing, recognising, manipulating, sitting
4	Non-rigid, attached object	signalling, floating, carrying, spinning, sitting in, lying on, jumping, playing, holding
5	Climbable feature	climbing, jumping, passaging
6	Shelter	recognising, manipulating, shading, taking
7	Mouldable material	manipulating, shaping, smearing, digging in, scooping
		observing, recognising, watching, relaxing, scooping, swimming, jumping, diving, playing, speaking, paddling, practising, crossing, standing, touching, eating, floating, fishing, jumping, stoping, explaining, releasing, mastering, catching, asking, joking, telling, singing, planning, sitting, splashing, pouring, determining, knowing, boating, playing, standing to gain balancing
8	Water	
9	Aperture	braking, paddling, turning, pushing, seeing, grasping, pushing, turning, chatting, watching, talking, queueing, waiting, talking, policing, asking, greeting, estimating, recognising
10	Affordances for sociality	
11	Affordances for Sensory	smelling, passing, feeding, choosing, recognising
12	Muddy ground	Recognising, planting, catching, carrying, running, leading, playing, releasing, holding

The second highest category was muddy ground, 14% (n=20), which suggested that children experience muddy ground during the low tide. During low tide on a children's school journey in the hinterland, when the water recedes, the muddy grounds offer various opportunities for activities. Children explore muddy areas and can catch seashells with their hands. They learn about different types of shells, collect them, and observe their unique shapes, patterns, and colours. It was an exciting and educational experience, sparking their curiosity about marine life. While exploring the muddy grounds, children carry bags to collect items such as shells, rocks, or other interesting natural objects. This activity helps them develop physical strength and coordination while instilling a sense of responsibility in caring for their belongings. Specific paths or channels become visible on the muddy terrain as the tide recedes. Children learn to identify

these safe paths that can be crossed without sinking into the mud. It enhances their spatial awareness, problem-solving skills, and ability to navigate natural environments. Children engage in traditional activities such as spear “Ketam” in some cultural contexts. Holding a spear involves learning about proper grip, stance, and technique. It also promotes an understanding of sustainable fishing practices and respect for the environment. Overall, these activities on the muddy grounds during low tide provide children with hands-on experiences, opportunities to connect with nature, and a chance to develop skills such as observation, problem-solving, and physical coordination.

"when the water level recedes, we engage in the activity of catching Ketam using our bare hands and spears."



Figure 5. Boys show off the skills with forward dives, back dives, twists, and even somersaults

The third highest category was graspable and detached objects, with 13% (n=20). During the children's school journey on the island, the explorers encountered many graspable and detached objects that piqued their curiosity. Along the sandy shores, they eagerly collected seashells of various shapes, sizes, and colours, their hands delightfully grasping the treasures bestowed by the sea. Once detached from the ocean floor, these shells became tangible mementoes of their island adventure. Venturing further, they discovered smooth fragments of beach glass scattered along the tideline. With careful fingers, they plucked these weathered pieces of glass, marvelled at their soft, polished surfaces and the hues refracted in the sunlight. Each shard carried a story of its own, whispering secrets of a distant journey across the vast expanse of the ocean. They detached these slimy strands with playful hands, discovering the diversity of textures and shades concealed within this marine vegetation. Their graspable finds offered glimpses into the rich biodiversity that thrived beneath the ocean's surface. Finally, their attention turned to the pebbles and rocks across the beach. These smooth stones, detached from their geological origins, were like tiny fragments of the island's ancient history. The children relished selecting their favourites, feeling the weight and texture of each rock as they clutched them in their hands, cherishing the tangible connection to the island's rugged landscape. As the children's home-school journeys in the hinterland area, these graspable and detached objects become more than simple artefacts. They became signs of exploration, vivid reminders of the adventures of curiosity of children.

5. CONCLUSIONS

The study's findings effectively address the research question by illustrating the significant role of the home-school journey in the hinterland area in shaping children's spatial mobility patterns. The activities identified during the journey, such as swimming, diving, boating, and fishing, highlight the diverse range of skills and experiences that contribute to the children's development within their spatial environment. The results suggest that the home-school journey serves as a crucial element for children to express their physical, social, and cognitive skills, forming distinct patterns of mobility through their behaviours. The findings from this study hold several practical implications for urban planners and policymakers. The study emphasises the significance of creating safe and accessible infrastructures, mainly water-based transportation in hinterland areas. By acknowledging the role of the environment in shaping children's experiences, urban planners can prioritise the development of well-designed jetties, boats, and transportation schedules, ensuring the safety and convenience of children during their daily commutes.

Furthermore, policymakers can utilise these findings to advocate for integrating nature-based activities and outdoor learning into the educational system. Policies promoting the inclusion of nature-based learning experiences can contribute to children's overall well-being and cognitive development. Moreover, incorporating children's perspectives in the planning and designing infrastructures can lead to more Child-Friendly City/District (CFC/D) and inclusive urban development policies.

Additionally, identifying the need for comparison with mainland children's home-school journeys emphasises the importance of understanding potential variations in spatial mobility patterns for future research, ultimately providing comprehensive insights into the dynamics of children's experiences during their journeys in different geographical contexts. Parents' preference for boat transportation in mainland Batam City, even when land transportation options such as roads and bridges are available, underscores the significance of community behaviour and cultural practices in coastal areas. This preference highlights the perceived safety and reliability associated with boat transportation for children's daily commutes to school. Understanding and acknowledging these community behaviours are crucial for urban planners and policymakers when developing transportation infrastructure and designing policies that cater to coastal communities' specific needs and preferences. By incorporating local knowledge and cultural practices, urban planners can create more effective and sustainable transportation solutions that align with the values and priorities of the community, thereby fostering a safer and more inclusive environment for children and their families.

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