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REPORTS, INFORMATION, AND DISCUSSION

Development of Children's Environmental Perception and Primary Geography Education in Japan

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1. Introduction

The purpose of this paper is to explain the development process of children's environmental perception and how the Japanese primary geography education curriculum contributes to this development. Children build mental representations of their environment from their perceptions. Free recall sketch maps are a way to represent these environmental perceptions. Previous empirical studies analyzing sketch maps and using other methods already explored the relationships between children and their environment, as well as various aspects of their environmental perception (Hart, 1979; Matthews, 1992; Shin, 2006; Freeman, 2010; Catling, 2017; Egli et al., 2020).

Primary geography is taught as an individual subject in England. However, it is part of an integrated subject in other European countries and in Japan (Tani, 2004, 2014; Ida & Shimura, 2015). In Japan, Geography is taught mainly within Life Environmental Studies in the first two grades and within Social Studies between third and sixth grade. The Ministry of Education, Culture, Sports, Science and Technology (MEXT) approved the latest version of the National Curriculum Standards in 2017 that appeared in print in 2018 (MEXT, 2018a, 2018b). The National Curriculum Standards, revised approximately every ten years, are In effect in all Japanese prefectures.

The Japanese curriculum integrates geography into Social Studies during grades 3–6 (Fig. 1). This curriculum emphasizes not only the acquisition of knowledge and skills, but also stresses thinking, judgement, expressiveness, and the development of attitudes. The Social Studies curriculum is based on the principles of the concentric horizontal expansion study theory (Ida & Shimura, 2015). Lower grades focus on areas in the proximity of the school, while higher grades turn to more distant areas (Shimura, 2015; Yoshida, 2015, 2017).

In the third grade (students aged 8-9 years), Social Studies focuses on observing social phenomena in the immediate vicinity of the school and in the local area (city, town, village). In their fieldwork, children observe land use and local features, after which they create a map of their neighborhood. These activities in the local area provide them with

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experiences of places. Children first observe the location and functions of local fire and police stations. Through observation, they learn about the nature of the jobs carried out in the community.

In the fourth grade, the geographical study area expands to the prefecture in which the children's town is located. Children usually study the key geographical features of the prefecture their school is located in. In Tokyo schools, children usually study landforms, distribution of railroads and highways, expansion of satellite towns, and change of land use in the Tokyo metropolitan area. They also explore typical ways of life in towns and villages, such as those in the mountains or on the islands that depend on their unique physical environment. Additionally, Social Studies also looks into ways of life in areas that have retained traditional aspects of Japanese society and culture. Children utilize landform and land use maps of their own prefectures.

Lessons in fifth grade focus on the effects of Japan's primary physical and human geography on industry. Children are introduced to economic geography while learning about agriculture, including rice cultivation, fishery, and the distribution of factories (machinery and metal industries). During these lessons, students use many types of maps of Japan and atlases.

In the sixth grade, children first learn about the political system of Japan. History forms a major component of the Social Studies curriculum. In the study of geography, children investigate ways of life in countries that have economic or historical relations with Japan.

The curriculum for higher grades only offers children few opportunities to study their local area or to use map at suitable scales for the local areas. Lessons on local areas provide children with opportunities to develop their environmental perception. It is necessary to study local areas both in lower and higher grades.

Grade	Geographical Strand			Historical Strand	Civics Strand
	Place	Topics	Skill		
3	local area	landform, land use, and traffic	observation, investigation, map, blank map collecting information about feature differences by places atlas		public utilities
	(city, town, village)	commercial activities of people in the local community and their relationship with other areas in Japan and foreign countries		lifestyle changes in the local community	activities to keep safe from disasters and accidents
4			map atlas		electricity, gas and water supply, and waste management
				traditional lifestyle and the achievements of ancestors	activities to keep safe from natural disasters in the community
	prefecture	position of the prefecture characteristics of the prefecture characteristic areas in the prefecture	land use map collecting information about the characteristics of the prefecture		
5	country (Japan)	land of Japan characteristics of the landform and climate in Japan	map, atlas, globe, various kinds of materials, visits investigating the characteristics of Japan		
		agriculture and fishery in Japan, their role in food supply and relationship with the physical environment			agriculture and fishery in Japan, their role in food supply and relationship with the physical environment
		manufacturing industries in Japan and their role in our lives			manufacturing industries in Japan and their role in our lives
		communication industries in Japan and their influence on our lives			communication industries in Japan and their influence on our lives
		the relationship between the physical environment and people's lifestyle in Japan			the relationship between the physical environment and people's lifestyle in Japan
6					constitution and function of Japanese politics
				main historical matters seen though the achievements of ancestors and cultural heritage	
	world	place of Japan in the world	map, atlas investigating foreign countries and the role of Japan		place of Japan in the world

Fig. 1. Social Studies curriculum (2017 edition) in Japanese elementary schools (Source: Ida & Shimura, 2015, modified)

2. Literature Review

In recent decades, children's sketch maps, interviews, behavior observation, and other methods served to examine the relationship between the environment and children. Matthews (1984a, 1984b) asked children to draw maps of their home area and found that 78 percent of those who drew a pictorial map rather than a plan map were aged eight or under. Moreover, he found that girls were more likely than boys to draw pictorial maps than plan maps (Matthews, 1987). Although girls have the same inherent potential as boys, girls' environmental behavior tends to be severely constrained by their parents. Girls have little opportunity for rich environmental experiences.

Harwood and Usher (1999) surveyed eight- and nine-year-old children's abilities to draw a map going from their school to a church. They argued that children's map skills can be improved through long-term geography teaching based on the geography curriculum containing map activities. It improves children's skills of perspective and symbolization. Freeman (2010) explored the way children interact with their neighborhoods. A total of 92 children aged nine and eleven participated in the study. She found that children's social connections influenced their behavior in their neighborhoods. Lehman-Frish et al. (2012) argued, through sketch map surveys and interviews with nine- and ten-year-old children, that children's social backgrounds impacted their neighborhood representations and experiences. The socio-cultural diversity of the neighborhood influenced children's activities. Egli et al. (2020) researched the places where children aged seven to thirteen in Auckland, New Zealand, went in their neighborhoods. The most common destinations were parks to play with their friends and shops.

As children grow, the quality and quantity of their environmental perceptions gradually changes. Age, and other social, cultural, and areal factors affect the relationship between children and their environment (Gillespie, 2010). The studies mentioned above targeted children of a limited age range; however, it is important to investigate both younger and older children's perceptions to design a geography curriculum. Therefore, the present study explored the environmental perception of a much broader age range, sampling sketch maps by 636 nursery, elementary, and junior high school students. Therefore, it is necessary to make use of children's geographies, experiences, and perspectives to plan the geography curriculum (Catling, 2005; Catling & Willy, 2018).

It is important to position fieldwork and map-work in the geography curriculum to develop environmental perception. Dolan (2016) argued that outdoor learning provides children with an opportunity to experience the nature of the real world in a place-based curriculum. Children perceive their neighborhood environment through outdoor activities. Scoffham (2013) proposed that outdoor learning leads children to exemplary geography learning through first-hand experience of real environments. The present study examines the development process of children's environmental perception, always mindful of primary geography's contribution.

3. Research Design

Young children perceive their environments in unique ways. Their environmental perception changes with age. Analyzing sketch maps is an effective method to investigate the development of children's environmental perception. This paper explores Japanese children's environmental perception also using results of previous studies (Yoshida, 2008; 2018).

Although sketch maps are complicated representations of children's internal images, they can be an effective tool to interpret internal representation (Freeman, 2010). For the purposes of this study, children's free-recall sketch maps served to analyze their environmental perception. Participating children were instructed to draw a map of their living environment on a plain sheet of B4 paper. A time limit of approximately 40 minutes was set, and extra sheets of paper were available upon request. The Nagamine area of Inagi City in the Tama New Town Tokyo suburbs was selected as the study area. 636 children from nursery school, elementary school, and junior high school (aged 5-13 years) participated (Fig. 2).

There are several suburbs in the western Tokyo metropolitan area, all exhibiting a hilly topography. There are natural hills formed from soft rocks. Tama New Town was created by the large-scale leveling of a hill (Kanasaka et al., 2011) and is a developed residential area in the western part of Tokyo. Inagi City has two kinds of housing types that can be found in either the new town area or the semi-rural

area located outside of it, featuring paddy fields and orchards. The new town area is suitable for surveys as many children live within a limited area.

Children received the following instruction: *Draw the area surrounding where you live on a map*. As there were no further instructions, if a child asked where to begin drawing the map, the teacher simply replied *Anywhere you like*. Children drew their neighborhood maps as a part of a class exercise. They only used pencils and erasers without rulers to draw their maps. Most children drew maps depicting their home or school.

Almost all children in the Tama area went to a state school. The elementary school had a total of 17 groups spanning first to sixth grade. The average number of children per group was 32. All children travelled alone to their elementary school. Their parents did not pick them up after school.

Grade (age in years)	Boys	Girls	Total
Nursery school (5-6)	13	8	21
First (6-7)	31	37	68
Second (7-8)	39	38	77
Third (8-9)	54	55	109
Fourth (9-10)	54	46	100
Fifth (10-11)	42	52	94
Sixth (11-12)	45	46	91
Junior high school (12-13)	46	30	76
Total	**324**	**312**	**636**

Fig. 2. Sketch map survey participants (Source: Yoshida, 2008, p. 686)

4. Findings

The development of environmental perception is examined from these three perspectives: (1) map types; (2) drawing method, and (3) number of elements. There were clear differences between younger and older children. The type of maps varied between route maps and survey maps. Younger children drew route type maps from the side view with various kinds of elements, such as trees, buildings, or shops. Older children drew survey type maps from plan view. These trends indicate developmental stages.

The types of maps drawn are significant in measuring the development of children's perception. The sketch maps are further divided into several groups. Moreover, children's methods of drawing change as they develop.

4.1 Map Types

In this study, children's sketch maps were divided into two main categories: route and survey type maps. To further clarify children's development process, the maps were grouped, using Yoshida's (2008) systematics, into five sub-types: non-route, route type 1, route type 2, survey type 1, and survey type 2. Overall, young primary school children drew route maps, while the share of survey maps increased with age (Fig. 3).

The above categorization is based on whether a route can be identified on the map. Sketch maps without an identifiable route are classified as *non-route* type–a simple map in which buildings and features are drawn individually and there are no roads connecting them. As they develop in complexity, sketch maps allow a further differentiation into the *route* and *survey* types. *Route* types consist of sequential elements focusing on roads, paths, or routes. *Survey* type maps consist of spatial elements focusing on a wider area of the neighborhood entailing blocks and sections.

Route type 1 is the simplest map, in which a road connects the student's home and school. There is usually a wandering line with a building at both ends. *Route type 2* is more developed: multi-

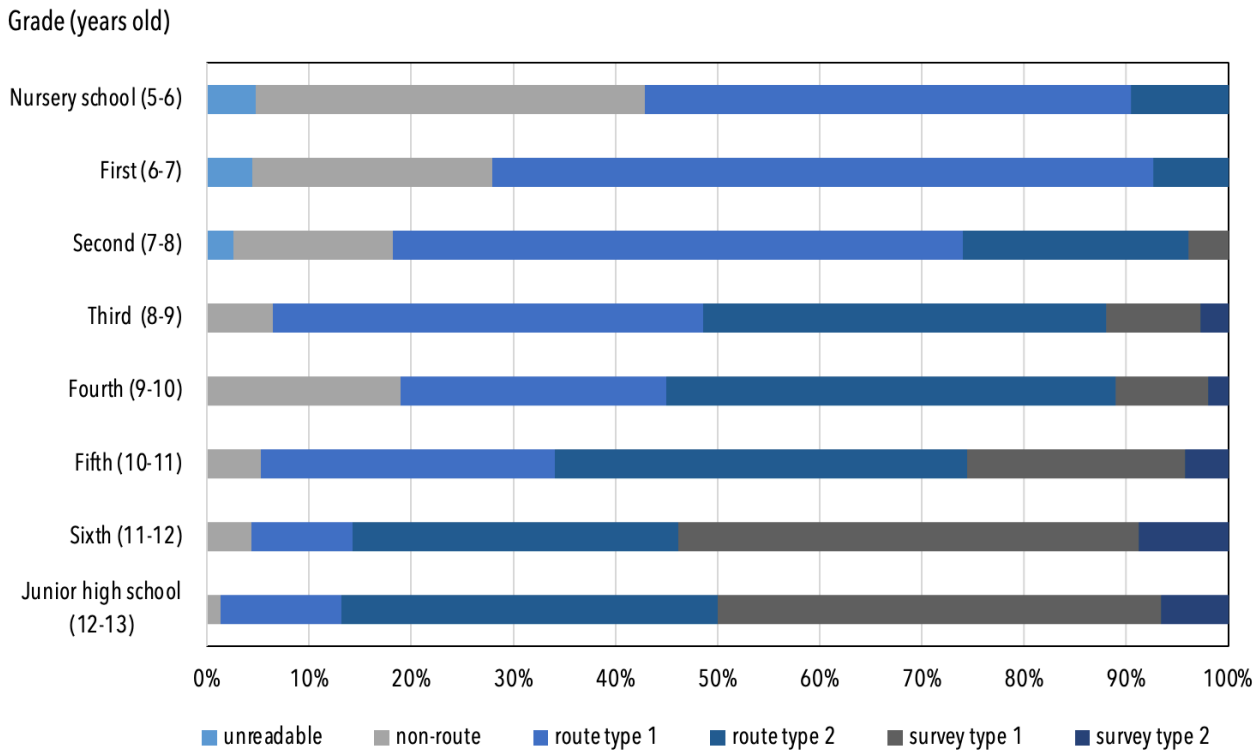

Fig. 3. Types of sketch maps (Source: Yoshida, 2008, p. 676)

ple routes, loops, and branches are featured, including routes connecting the school, children's homes, shops, and parks. *Survey type 1* is a map that shows a wide area and features blocks surrounded by roads. *Survey type 2* is a wider, complete, and more accurate map in which many blocks and other parts are drawn. Using this classification, in a first step, the frequency of route and survey maps drawn by the participating students was calculated. Additionally, the developmental trends of each classification were clarified.

The following trends were found regarding the development of sketch maps drawn by children. Younger children drew pictorial houses and buildings individually on maps with ambiguous locations. These maps were classified as non-route type. Some nursery school children could already draw route maps that connected their home and school with a road. These were classified as route type 1. About 60 percent of the first-graders drew route type 1 maps. Even in the second grade (7-8 years olds), both the share of children drawing route type 1 maps was high and the proportion of children drawing route type 2 maps displayed higher values. However, the number of survey maps remained low. In the third grade (students aged 8-9 years), the share of route type 2 maps rose, and approximately 80 percent of all maps were either route type 1 or route type 2 (Fig. 4). About 70 percent of the fourth-graders (age 9-10 years) drew a route map, while only around 10 percent produced survey maps. In fifth grade (students aged 10-11 years), most maps belonged to the route type 2 category, with the majority of children remaining in the the route type representation stage. The share of type 1 and type 2 survey maps increased to about one third of all representations. In grade six, the share of survey maps rose further; however, even in sixth-grade and the first grade of junior high school, the share of survey maps only accounted for around half of all representations, which is a rather modest value.

The results of this study show that the ability to draw route maps develops from early childhood on, before children enter elementary school. Subsequently, the share of children drawing route maps gradually rises. Up to the fifth grade of elementary school, the majority of children draw route maps and even in the first grade of junior high school, the share of children drawing survey maps only reaches half of the sample groups.

Looking beyond map typology, however, it is important to understand children's environmental perception and their styles of drawing sketch maps to build a suitable geography curriculum enabling adequate lesson planning.

4.2 Drawing Method

The method of drawing architecture in children's sketch maps can be divided into two types: side view and plan view (Fig. 5). As children develop, their architectural drawing types changes from side view to plan view. The former contains picto-

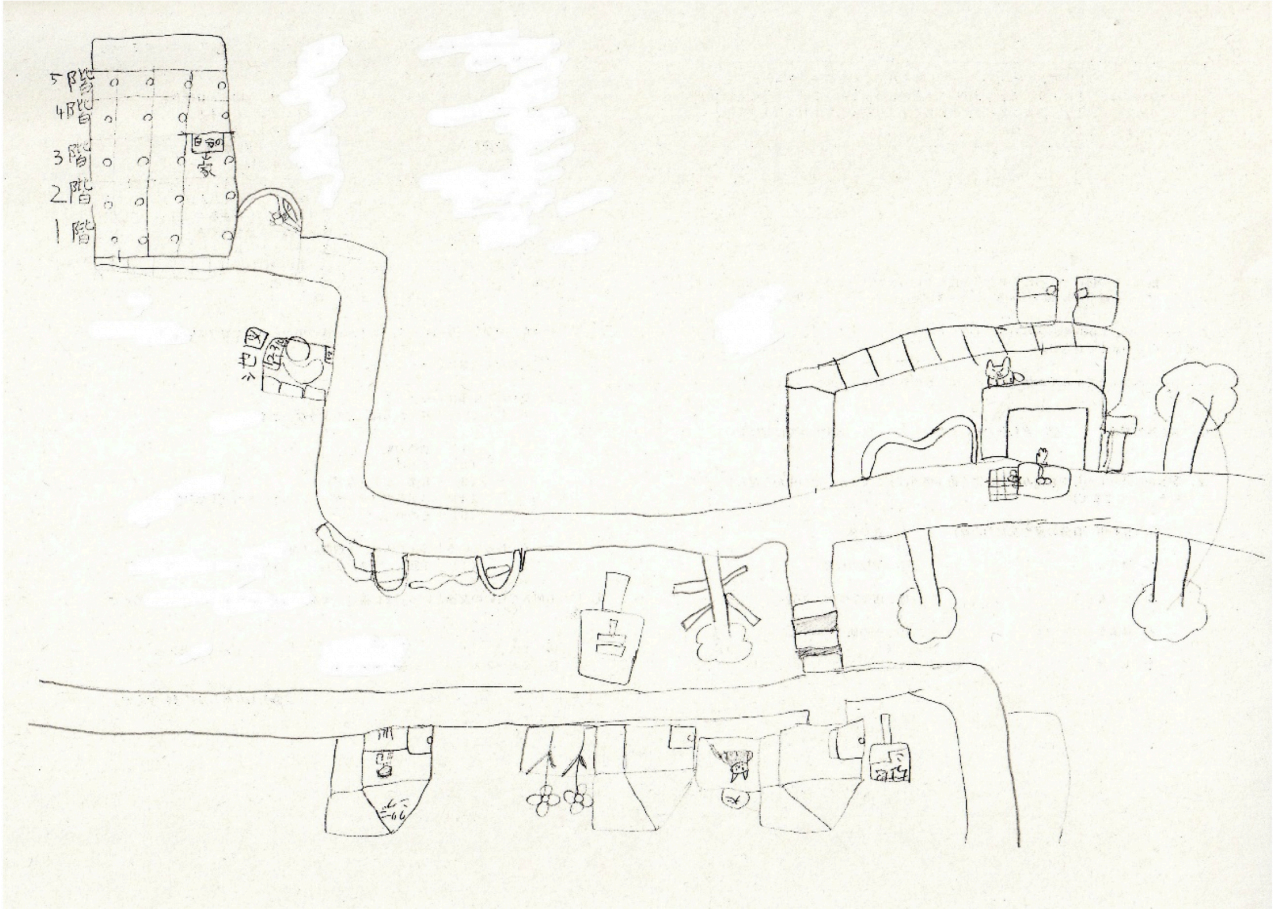

Fig. 4. Route type 2 sketch map of a third-grader (girl) (Source: Yoshida, 2008, p. 677)

rial expressions drawn from a horizontal viewpoint, the latter plan maps that are drawn vertically from an aerial view. Children who draw side view type images are unable to transform spatial information into an aerial view. Almost all young children in nursery school drew side view sketch maps.

In the first grade, the side view type is still dominant, although, as children grow older, the share of plan view type drawings increases. However, in the third grade, the plan view type still made up almost 20 percent of the total drawings. By the fourth grade, about half of the students were able to draw the plan view type of map. In the first grade of junior high school, their share reached about 90 percent.

There are significant differences between drawing architecture before and after third grade of elementary school. Students enrolled in nursery school and in the first two grades of elementary education primarily use the side view type of representation. Using this horizontal perspective, younger children represent the features they experience in their everyday experience. They often draw win-

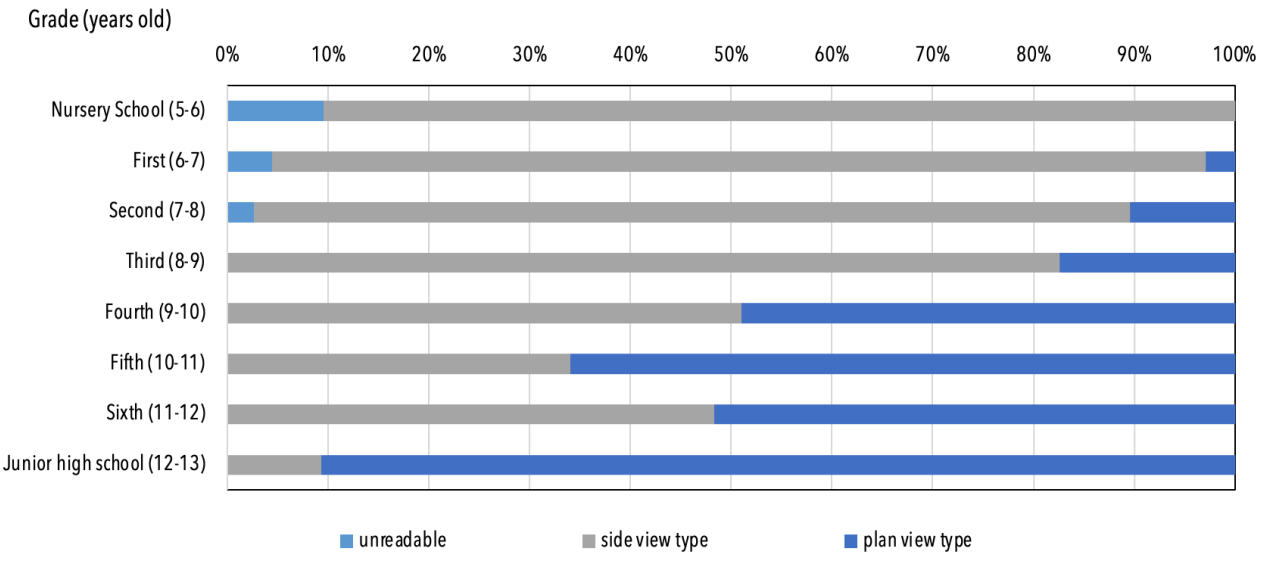

Fig. 5. Method of drawing architecture (Source: Yoshida, 2008, p. 680)

dows and doors on their houses and trees on both sides of the road. After the fourth grade, the viewpoint gradually changes from the horizontal to the vertical, and by the first grade of junior high school almost all children acquire the vertical viewpoint. Children's psychological development allows them, with growing age, to perceive the environment from the viewpoint of others at the concrete operational stage (Piaget & Inhelder, 1956). They are no longer egocentric and can shift their viewpoint. Moreover, using maps in geographical learning in Social Studies develops children's map skills.

4.3 Number and Categories of Elements

Children drew various elements on their maps, including houses, buildings, roads, railroads, parks, shops, symbols, and landmarks (Fig. 6). Children only selected and drew the features that they were interested in.

First- and second-grade children tended to draw cars, people, and flowers, which are less usually drawn map content. Starting with the third grade, geography seems to have supported students in identifying which features were suitable map content.

Younger children drew fewer elements. From nursery school to third grade, the number of elements increased, with the highest total number of elements peaking in third grade. After the fourth grade, there was no obvious increase in the number of elements. This indicates how children's perception changes during this period. Younger children up to the third grade tended to pay attention to the individual features of an area. They built a sense of place based on minute features and detail. Their challenge was to draw all the elements they noticed. Older children integrated several elements into one symbol on their maps. So-called physiognomic perception is more prominent among younger children (Werner, 1948). This tendency influenced children's environmental perception and their method of drawing a sketch map. Thus, in the period from third to fourth grade, children's environmental perception develops remarkably well.

Concerning the elements featured on the maps, this study distinguishes between seven categories, namely physical environment & land use, shops & clinics, traffic & roads, schools & public facilities, houses & buildings, parks & open spaces, and other. The share of schools & public facilities is high. Young children began by drawing maps that included their schools or houses. With growing age, the share of shops & clinics increased. For older children, particular shops became meaningful sites to spend money.

4.4 Development of Children's Environmental Perception

Changes in sketch map types indicate two periods of children's development: a period of route map formation and a period of transition from route to survey map types (Fig. 7). There is a turning point from the route to survey map type. The majority of children attending nursery school and the first two grades of elementary school corresponded with the route map formation period.

At first, children drew non-route type maps that contain buildings without roads. Then, children started to draw route maps by tracing familiar roads. The period from the fourth grade of elementary to the first grade of junior high school corresponded with the period of the transition from route to survey type maps. At this stage, children drew a wide area with accurate and complex map arrangements.

4.4.1 Period of Route Map Formation

In this period, children drew route maps. After entering elementary school, they walked to school by

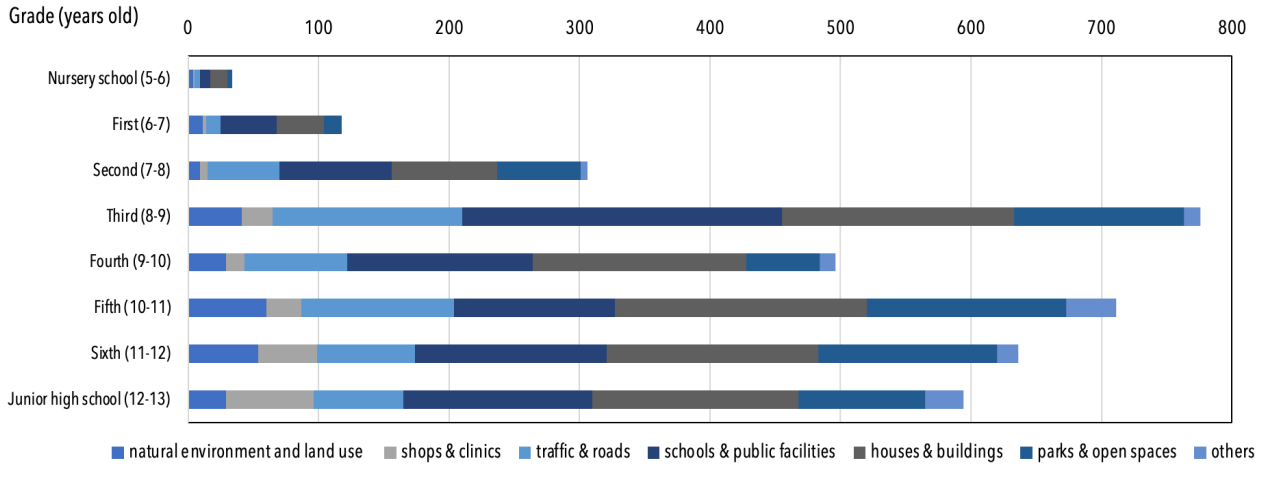

Fig. 6. Number of elements on sketch maps (n = 3,671) (Source: Yoshida, 2008, p. 678)

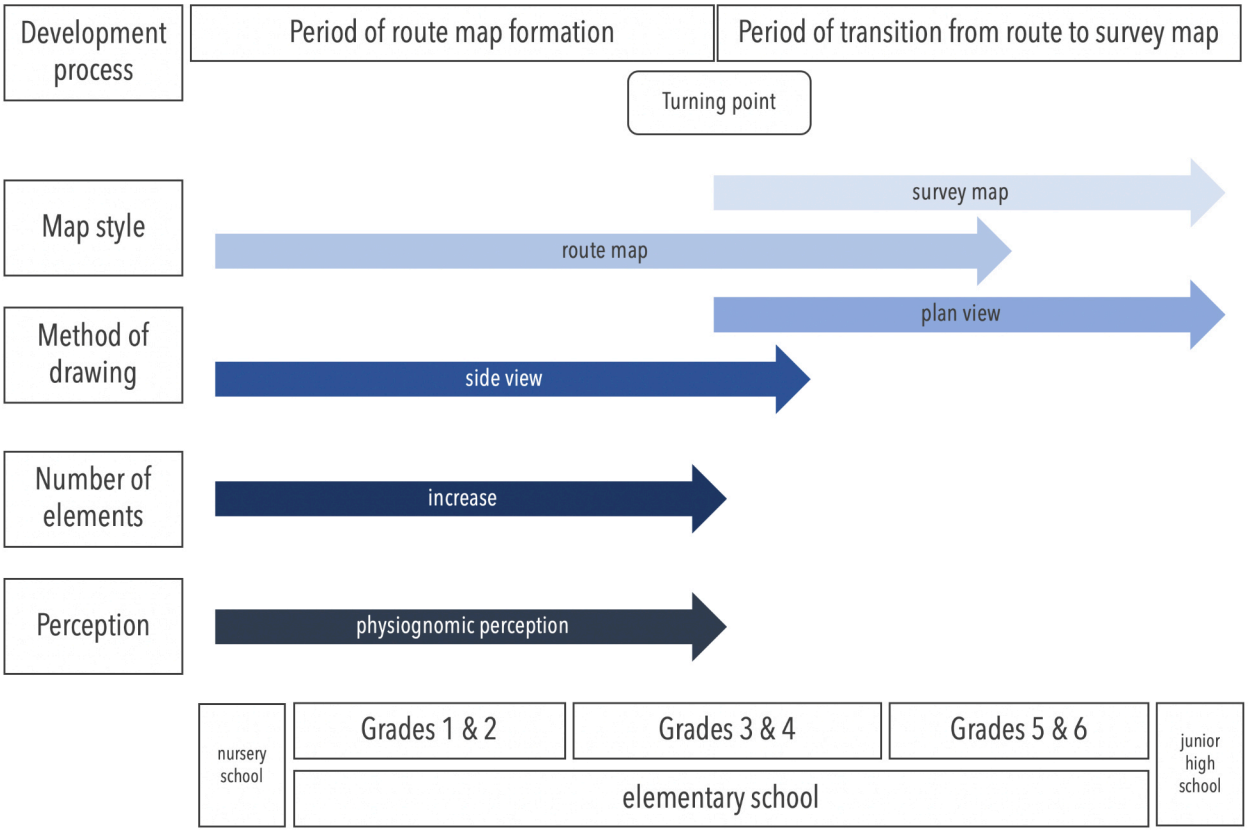

Fig. 7. Development process of children's environmental perception (Source: Yoshida, 2018, p. 184, modified)

themselves. Almost all children traveled for ten to twenty minutes to school on foot in urban areas. In rural school areas, children sometimes took school buses. On their maps, they connected their home to their school with the road they traveled along every day. The map type gradually changed from a simple route type 1 map that connects children's homes and schools by a single route to route type 2 that has multiple routes with loops and branches. During this period, side views of architecture dominate the maps drawn from a horizontal viewpoint. The change of view from horizontal to positional expression has not yet occurred.

4.4.2 Period of Transition from Route to Survey Map

Most children's maps gradually changed from route to survey type maps after the fourth grade. Their maps encompassed a wider area, as they acquired information about their local environment through spatial behavior and experience of place. Additionally to houses and buildings, students also drew main roads, railroads, and different blocks in the school area. Furthermore, they seemed to comprehend the correct layout of spatial features. The number of children who drew plan view type architecture increased after the fourth grade and the viewpoint from which children drew a sketch map shifted from horizontal to vertical. Children's environmental perception changed from concrete focusing on individual elements to abstract focusing on general elements. The qualities of children's perception changed noticeably during the turning point from third to fourth grade.

5. Using Maps and Fieldwork in Life Environmental Studies

The aim of Life Environmental Studies is to raise students' awareness of their own merits as well as those of the people surrounding them, society and nature, and their relationships, through activities and experiences (MEXT, 2018b). Learning in Life Environmental Studies focuses on children's activities and observations. Out-of-classroom learning provides children with valuable opportunities to experience places. Children learn about their neighborhood environment through activities. They observe the physical environment in different seasons and describe changes in the atmospheric temperature.

Children partake in town exploration lessons in the neighborhood. The units of town exploration take place in the spring and autumn terms of the second grade. The unit in the spring term focuses

on class explorations in areas near the school, and the unit in the autumn term focuses on interviewing professionals. Some children visit shops and interview shop-keepers. The teaching activities of the unit include outdoor lessons (Fig. 8).

The elementary school located in Inagi City, in the suburbs of Tokyo, grouped its students into 18 classes from first to sixth grade. There were 89 children (46 boys, 43 girls) in the three classes of second grade. There was a female homeroom teacher in two classes and a male homeroom teacher in the third class. Children learned about the parks near the school through fieldwork without neighborhood maps in the first grade. In the second grade, children went out for fieldwork in a large school area using maps for the first time.

In class, children selected a few of their favorite places in the neighborhood and discussed their locations and the reasons for their selection. For example, before the exploration, one child selected a small park near the school because she enjoyed playing tag with her father there. When children performed fieldwork in the neighborhood area, they kept a map on their clipboard to know where they were. They recorded the observed information on the map. After the exploration in the classroom, children communicated and shared their fieldwork findings.

Through these experiences, children are able to understand the positional relationship of roads, places, and their school in the area. Fieldwork in the neighborhood leads children to notice the location and distribution of natural and social surroundings. Outdoor activities create opportunities for children to experience places. Moreover, using maps in fieldwork develops their skills. These lessons contribute to the development of children's environmental perception. In the period of route map formation, children draw maps of wider areas, extending the routes in them. These lessons have a positive effect on children's map drawing abilities. However, the National Curriculum Standard for Life Environmental Studies in Japan does not clearly indicate the importance map use in these lessons, reason why their use strongly depends on the school. Thus every school is different concerning effective map usage. Few teachers who studied geography during initial teacher education use maps frequently.

Unit title	Exploring and discovering in town	
	Spring term	**Autumn term**
Teaching activities	Find the children's favorite places in the neighborhood	Find professionals in the neighborhood
	Explain why children like these places	Plan to visit shops and interview professionals
	Discuss where children should go	Undertake small group fieldwork
	Undertake class fieldwork	Explain and describe what children find
	Describe the location of the places visited	

Fig. 8. Teaching activities in town exploration in second grade (Source: author, adapted from Yoshida, 2018, p. 78)

6. Using Maps and Fieldwork in Social Studies

In third grade, children start to learn Social Studies–a subject that emphasizes the direct observation of their local area. Students undertake fieldwork in the area where they live to observe geographical characteristics, such as rivers, roads, buildings, traffic, old architecture, and paddy fields. These activities build awareness of location-specific features and differences.

During fieldwork, children observe the local landscape and land use. After that, they create a map of their neighborhood (Fig. 9). Colored cards are typically used to indicate land use. For example, on the map, orange cards symbolize apartment buildings, while red cards indicate shops. Eleven unit-hours were set for lessons on the local area. One unit-hour lasts for 45 minutes in elementary school. The teaching activities of the unit include observation and fieldwork in the neighborhood area (Fig. 10).

At the beginning of the unit, children drew sketch maps of the neighborhood area. Most of them only drew a small part of the school area. When they noticed that they only partially knew the area around the school, they were motivated to more widely explore the places near where they lived. The children observed the landscape from the rooftop of the school building. They saw the

Tama River flowing to the north of the school and found a railroad and hills to the south, but they could not observe the whole area around their school. Subsequently, they planned a route of exploration around their school in their class using neighborhood maps. They decided where to go and what they would observe. On the neighborhood map, the children followed the fieldwork route using their fingers.

Children conducted the fieldwork as a class and observed land use along the main road and surveyed the car traffic there. They recorded the number of cars that passed along the road in one minute. They found that there was heavy traffic and many shops were located along the main road. They noticed that land use near the main road was different from that of other places. The students discussed the characteristics of the area around them, understanding the relationship between transportation and the location of shops.

In third grade Social Studies, children were provided with the opportunity to record geographical characteristics by observing land use and the landscape. After the fieldwork, children were asked to present the characteristics of the area on a map. They created maps with the features they found during the fieldwork and then explained the characteristics of the area. These activities help them to develop their environmental perceptions. Moreover, they help them deepen their understanding of the community.

Comparing sketch maps before and after lessons in the neighborhood area reveals the effect of learning geography. In the first geography lesson, the children were asked to draw a sketch map of their neighborhood. Eight weeks after drawing the first map, children drew sketch maps again. Nine months later, they drew another sketch map. One particular child had drawn a non-route type sketch map before the lessons (Fig. 11). Afterwards, she drew a survey type 1 sketch map (Fig. 12) with correct arrangements in a plan view. After the lessons, almost one third of the children were able to draw survey type maps.The children drew maps representing the features they found during the fieldwork. Through these activities, students were able to recognize the location of physical and human features in vicinity of their school. Additionally, they developed their environmental perception. The local neighborhood studies produced positive outcomes for the children. However, in the revision to the primary school Social Studies curriculum in 2017 (MEXT, 2018a) neighborhood learning contents were reduced, which seemed to contradict the value of these study units for children's geographical learning.

Fig. 9. Neighborhood map drawn by a third-grader (The yellow cards represent houses and the green cards represent rice fields) (Source: author)

Unit title	Places around our school
Teaching activities	Draw sketch maps of the neighborhood area
	Observe the landscape from the rooftop of the school building
	Plan the fieldwork and exploration route
	Confirm the key inquiry questions
	Undertake fieldwork
	Create maps of the neighborhood area
	Discuss the characteristics of neighborhood area
	Express their views on the characteristics of neighborhood area

Fig. 10. Teaching activities in third-grade fieldwork (Source: author, adapted from Yoshida, 2018, p. 159)

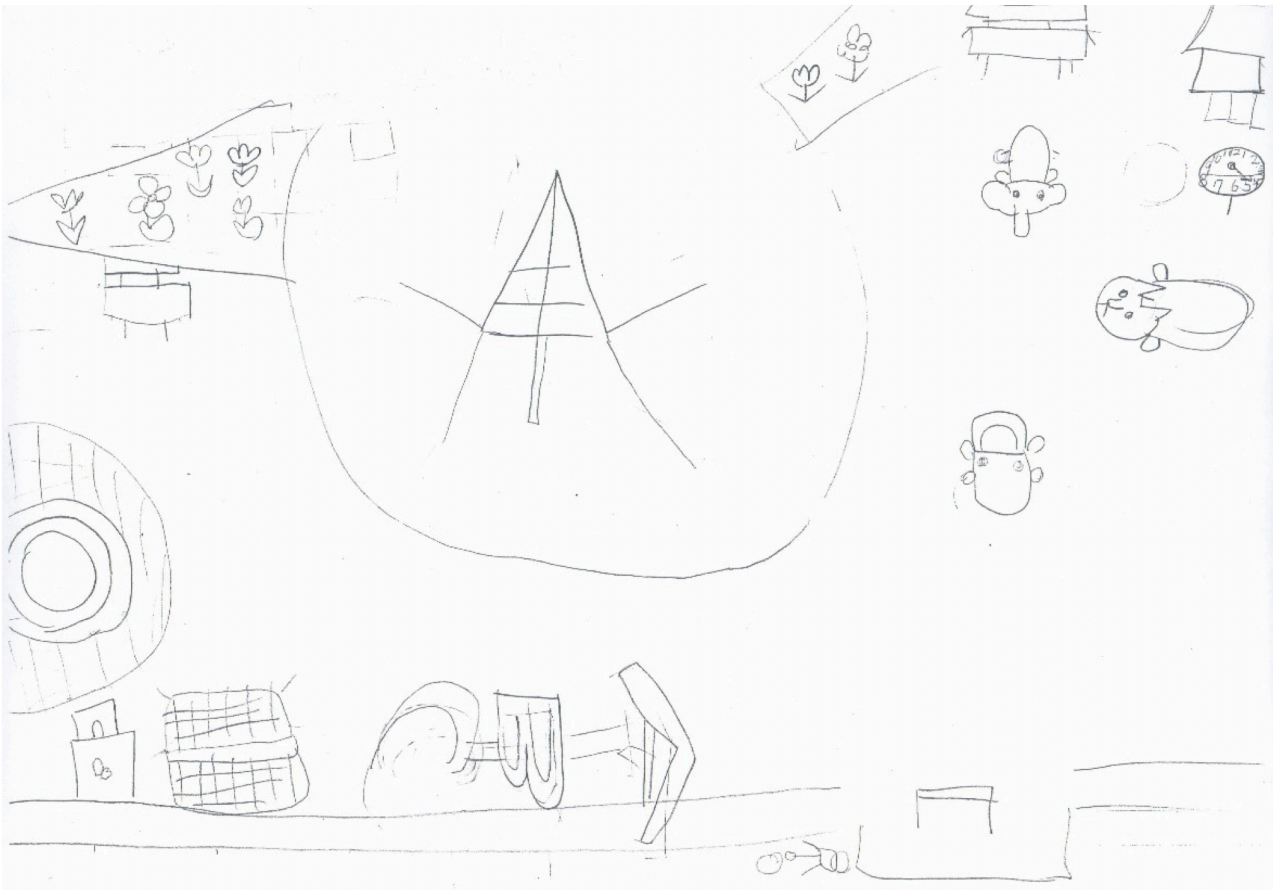

Fig. 11. Non-route type sketch map of a third-grader girl before the geography lessons (Source: Yoshida, 2018, p. 175)

7. Using Maps and Fieldwork to Develop Children's Environmental Perception

The school subjects Life Environmental Studies and Social Studies use neighborhood maps during fieldwork in local areas. Using maps and fieldwork provide opportunities to develop children's environmental perception. They are basic and valuable activities in geography learning (Ike, 2015; Pike, 2016; Scoffham & Owens, 2017; Witt, 2017).

During the early years of primary school, children are in the period of route map formation. The acquisition of spatial information in their local areas through outdoor activities allows them to draw more extensive maps. The experience of using maps helps them to accurately locate geographical elements in their drawings.

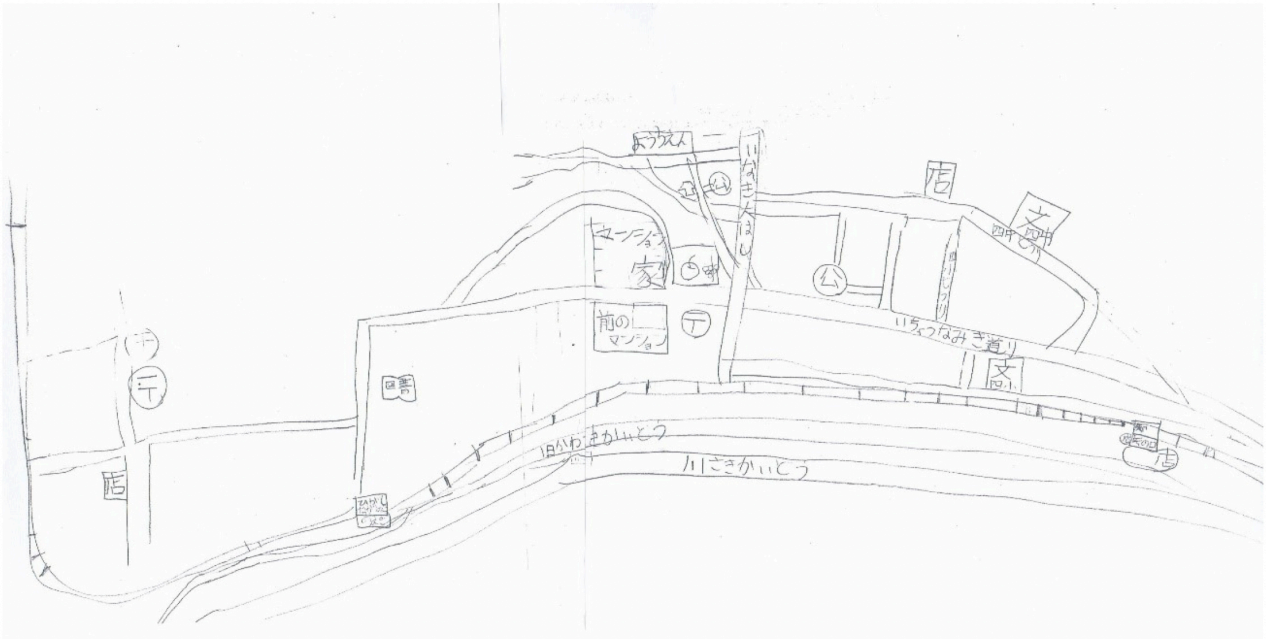

Fig. 12. Survey type 1 sketch map of a third-grader girl after the geography lessons (Source: Yoshida, 2018, p. 176)

During the late years of primary education, children enter the transition period from route to survey type maps. Viewpoint rotation along with the inclusion of information from a wider area enables them to draw survey maps. Children's spatial behavior and experiences offer them spatial information from a wider area, allowing the draw more complex maps. Children's experiences of places enhances and extends their geographical knowledge and skills.

Everyone has diverse environmental experiences, including experiences of place and space in childhood. Children have their own personal geography, which is a part of their ethno-geographies (Catling, 2006, 2014). However, children's geography changes with age. Younger children's concept of geography is not the same as that of older children and is much less developed than that of adults. It is important to design a geography curriculum that is appropriate for the different developmental stages of children.

Geography lessons about children's local neighborhoods develop their knowledge of their home area (Catling & Willy, 2018). While acquiring this knowledge, children develop their personal geography, moving it from a simple and subjective forms to more complex and objective ones.

Children should develop map skills according to their cognitive developmental stages. It is important that curricular elements representing geography in both Life Environmental Studies and Social Studies provide children with opportunities to learn locality through outdoor fieldwork using neighborhood maps.

The Japanese National Curriculum Standards define the aims of Life Environmental Studies and Social Studies separately. However, there is a gap between the aims of Life Environmental Studies and Social Studies. Greater emphasis should be placed on the active use of maps in neighborhood learning in the curriculum of Life Environmental Studies. Also, a smooth connection between both subjects is required as children develop their environmental perception through geography education continually.

8. Conclusions

This paper aimed to analyze the development process of children's environmental perception based on their sketch maps. The results showed a shift in the method of drawing architecture from a side to a plan view with age. The number of elements on sketch maps increased from nursery school to grade 3 of elementary school. However, an increase in the number of elements on maps was not obvious from the fourth grade onwards. The sketch maps also changed with age, very gradually from route type to survey type maps. Young children up to the third grade of elementary school represented the period of route map formation, while older children (starting with grade 4) reflected the period of transition from route to survey type maps.

Children's development is continuous from preschool to middle childhood; however, it exhibits stages. Their type of reference system shifts from route type to survey type representations (Hart & Moore, 1973; Downs & Liben, 1991; Matthews &

Limb, 1999; Harwood & Usher, 1999). However, based on this study's findings, the change from route to survey type maps was delayed. There were various restrictions on both space and time in the children's play behavior. These restrictions of outdoor play behavior in the neighboring environment influence and restrain the development of children's environmental perception.

Children do not shift to the survey map stage immediately after they enter elementary school. It is difficult for children to perceive their neighborhood environment over a wide area and obtain a lot of spatial information. Free exploration outside without adult control leads them to develop their perception and learn about the environment. Children's outdoor activities tend to be spatially and temporally restricted (Yoshida, 2018). Geography education plays an important role in developing children's perception and awareness of the environment (Scoffham, 2010, 2013; Catling & Martin, 2011; Pike, 2011). Therefore, it seems necessary to plan fieldwork and exploration with a map in the neighborhood area in the primary geography curriculum.

Every opportunity to gather experience in outdoor spaces and participate in a broader mobility in their neighborhood supports children's knowledge and skill development. Therefore, it is alarming that children's opportunities to play outside have decreased in recent years (Yoshida, 2018, p. 44).

Further research is needed regarding children's environmental perception and spatial behavior to better understand their needs and prerequisites, preferences and choices. A geography curriculum based on such research should emphasize experience in children's local areas to produce more powerful learning.

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