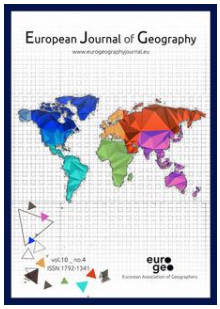

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A study of children's environmental awareness and discovery of hidden geographies based on the award-winning maps from the Asahikawa environmental map contest

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hidden geographies, children, environmental awareness, senses, Asahikawa Environmental Map Contest

Abstract

In this paper, we explored children's environmental awareness and their discovering of hidden geographies. We employed a secondary data analysis using the 2018 and 2019 award-winning maps from the Asahikawa Environmental Map Contest, and an earlier study on the 2009 award-winning maps. Recently, most of the maps submitted to the contest have explored the cultural environment, whereas the number of maps related to the natural environment and environmental problems have decreased in comparison with the contest 10 years ago. This indicates that the natural environment is not so familiar to children because many of them live in urban areas. The maps showed children's considerable scientific skills. Some children demonstrated an outstanding ability to map hidden geographies discovered through vivid sensory experience.

The publication of the European Journal of Geography (EJG) is based on the European Association of Geographers' goal to make European Geography a worldwide reference and standard. Thus, the scope of the EJG is to publish original and innovative papers that will substantially improve, in a theoretical, conceptual or empirical way the quality of research, learning, teaching and applying geography, as well as in promoting the significance of geography as a discipline. Submissions are encouraged to have a European dimension. The European Journal of Geography is a peer-reviewed open access journal and is published quarterly.

1. INTRODUCTION

The EUROGEO 2019 Annual Conference, held in Ljubljana, Slovenia, was dedicated to the topic of Hidden Geographies. According to the conference website, hidden geographies are "ways of spatial arrangements of natural or cultural, real or imagined features, relations or processes in a landscape that are hidden in any possible meaning, such as (so far) not visible, unseen, kept out of sight, concealed, disguised, masked, unrevealed, also unperceived or unknown" (The EUROGEO 2019 Annual Conference, 2019). Elements of the children's surrounding environment can be hidden due to lack of information or indifference. When children begin to observe and reflect on their environments, they can discover a lot of previously hidden elements. Matthews (1986) points out that we underestimate children's environmental skills. Commonly, adult researchers consider children as the subject of research. Recently, a new style of research has become known as "research with children". For example, Malone (2018) describes children as co-researchers in the place-based research on how children experience their environment, using interviews, drawings, photography, mapping and so on. Participation in research using these tools is intended to enable children to increase the awareness of their environments and discover hidden geographies.

Geographical education in Japan was traditionally indoor-oriented, and fieldwork was not common practice at schools. The Asahikawa Environmental Map Contest was launched in 1991 with the aim of complementing indoor-oriented geographical education. The map contest emphasizes the importance of first-hand outdoor observation and the mapping process. It is a great opportunity for children to survey and observe their environment, and to present their findings through a map. Himiyama (2010) showed through the analysis of some award-winning environmental maps that environmental mapping activity is a very effective means of improving children's scientific skills. Kim (2017) noted that some schools continued to participate in the map contest to enhance children's environmental awareness.

In this paper, we consider the award-winning environmental maps as children's research. The map contest organizers created a database of award-winning maps for each year, which is freely available on the SEME (The Society for Environmental Map Education) website. We used the database to examine children's environmental awareness and their discovery of hidden geographies. We analysed the award-winning environmental maps to discuss the role of environmental mapping activity in children's discovery of hidden geographies.

2. LITERATURE REVIEW

One of the basic requirements of geography education is careful observation of the environment. Geography education starts very early—when children begin to discover the world around them (GA, 2009). Fieldwork can encourage children to find their own interest in their environment. Even when conducted in a familiar place, fieldwork can provide an opportunity to take children beyond their everyday knowledge of that place (Lambert & Reiss, 2016). One of the purposes of fieldwork is to facilitate the learning process. Observation, categorization, and data collection are common tasks that are assigned to the participants (Schmidinger et al., 2014). Fieldwork can provide children with opportunities for real world learning and help them understand the role of theory in interpreting and representing the real world (Hammond, 2018).

For a long time, the geography teachers' main objective for undertaking fieldwork was to improve children's map skills (Boardman, 1974). Although the significance of map skills in fieldwork has declined in the last few decades (Smith, 1999), they are still closely related to fieldwork. Kastens and Liben (2010), for example, investigated children's strategies while using a map to record their locations during fieldwork. However, little research has been conducted to show a map-related pedagogy in fieldwork.

The traditional strand of research on children's spatial cognition and mapping abilities sits at the boundaries of developmental psychology and children's geographies; it is shaped by a core group of researchers who have refined Piagetian models of children development (Holloway, 2014). This line of research has challenged scientific understandings of the limits to children's developmental potential by showing their competence at a very young age. Piagetian approaches have been immensely influential in children's interactions with maps in geography education (Wiegand, 2006). The central idea in Piaget's theory is that cognition is a form of environmental adaptation, and that learning depends on the individual's cognition structures. In this context, studies on children's mapping abilities use sketch map as a technique for collecting data on children's cognitive maps. Thommen et al. (2010), analysed maps of children aged 5 to 13 years in Brazil and Switzerland. To understand the relationship between cognitive development and map-drawing abilities, they asked the children to draw the journey they undertake every day from home to school. The results of the analysis revealed that younger children could draw simple topological maps, and then move on to egocentric landmarks, whereas older children could identify and draw more streets and buildings, and then move on to decentred maps.

On the other hand, the social approach to children's geographies focuses on understanding children's experiences as subjects in the world, rather than their abilities to perceive space (Holloway, 2014). In geography education, Vygotskyan perspective considers human learning and cognitive development primarily as a social process. Although this perspective is well established in relation to children's learning, relatively few studies have so far adopted this theoretical position as an explanatory framework for children's cartographic thinking (Wiegand, 2006). Margaret Roberts (2003) adopts Vygotsky's concept of the zone of proximal development as her rationale for inquiry learning. Among the different types of inquiry learning she has developed, affective mapping is an activity that explores personal geographies. According to Roberts, affective mapping means plotting on maps the feelings that a particular place evokes. For example, children can map their feelings about their school or local area using symbols they devised themselves and giving reasons for their feelings.

Children's mapping is a data collection and communication tool that some have applied to their research. Research evidence is stronger for kindergarten and elementary school than for junior and senior high school. Children aged 3 to 5 years can make a map that represents relations between objects and places (Geist, 2016). Since kindergarteners focus on their own movements from place to place, their maps are not based on landmarks, as is the case with most maps made by adults. In Thommen et al.'s study (2010), 5-year-old children understood the task and drew their way from home to school as a line more or less directly connecting the two places, whereas more than half of the 8-year-old children gave precise features for navigation using some crossroads and buildings. To help develop children's ability to use landmarks in their

map-making, Geist (2016) proposes that teachers take young children out for neighbourhood walks, point out landmarks and discuss how to get back to the school from a certain location.

Although there is little research evidence, junior and senior high school students' mapping activity can continue to develop with an enhanced appreciation of the use of visual variables and symbol design (Wiegand, 2006). In junior high school, students begin to be able to express their preferences in an informed way as a result of their own mapping. Senior high school students should begin to understand the nature of subjectivity and bias in cartographic representation through their own mapping.

3. BACKGROUND

3.1 Asahikawa Environmental Map Contest

The Asahikawa Environmental Map Contest has been held annually since 1991 to enhance children's environmental awareness and improve their on-site observation, mapping, and presentation skills (Himiyama, 2010). The experience gained in 30 years of running the contest has shown that it can make a significant contribution to the improvement and promotion of environmental education. SEME was established in 1998 to further promote the map contest.

Several similar map contests have been held in Japan, although in those cases, the application was limited to the local area. There is no other such contest that receives submissions from abroad (Izumi & Iwamoto, 2015). In the Asahikawa Environmental Map Contest, the application is open to all schoolchildren (6–18 years old) from all over the world. Every year, approximately 1200 maps are submitted by children from eighteen countries, such as China, Macedonia, Zimbabwe, Ecuador, India (Onodera & Hisahara, 2015), and since 2017 also by junior high school students from Slovenia.

Maps must be based on applicants' observations of their environment. Applicants can choose either a free theme or a specified theme. The following themes have been chosen in recent years: History (2019), Smell (2018), ECO (2017), Electricity (2016), Change (2015), Food (2014), and Disaster Prevention (2013/2012).

Experts in geography education, environmental education and map education, as well as experienced teachers evaluate the maps. Best works are awarded and an average of 100 maps are displayed in an exhibition every year.

During the exhibition, SEME organizes a related event, "Everyone's Workshop", which is attended by many children, mostly by that year's award-winners. Through the workshops, children have an opportunity to meet each other and make friends. In the end, children present their own maps and listen to the other presentations.

In addition, contestants have a chance to present their own maps at their respective schools. Created maps are a useful communication tool through which children can share their stories.

3.2 Environmental Mapping Activity

Himiyama (2010), a former President of SEME, explains that when children make an environmental map, they follow a process that includes project planning, field survey

preparation, field survey and observation, mapping/recording, map-making, reading and explaining the map, and presentation (Figure 1).

First, children choose the theme and area of study. They decide what information can be collected in the field and what methods can be used for this data collection. Depending on what they want to do, they may also plan to use some tools such as paper holders, blank maps for recording observations, instruments and recording devices. Sometimes, children are organized in groups for these tasks and for the fieldwork itself.

The next step is to collect data in the field through observation, measurement, interviews, etc. Only learning in the classroom does not enhance children's awareness of environmental elements. Field experience is essential for environmental mapping, as children should not rely on their memory but write on papers or blank maps, use camera or other means to record what they see, think and feel. Furthermore, a sensory walk is a well-established method for developing environmental awareness (Hall, 1989). Hall mentions that sensory walks work better when attention is partly directed, such as trying to distinguish between natural and synthetic smells. It encourages children to concentrate on each of the senses separately and break the habit of routine observation in the field. Following the concept of symbolic icons (landmarks), children can visually represent the sensory perceptions by drawing a "sound map," or a "smell map."

The information recorded in the field is then taken back home or to school and made into a map. This step requires various skills, such as cartographic, artistic, and scientific skills. Children have to think carefully about what to include in the map and how to present it. They can use all forms of expression (words, numbers, images, etc.) to display information. They can get acquainted with the key components of a map by looking at some examples. The environmental map should include

- a title, which may specify thematic content as well as the location of the place mapped;
- the author's name;
- a scale, shown in a way that is meaningful to the others;
- a legend, with the elements appropriately grouped;
- the orientation (a North pointer);
- the data sources and short notes (Wiegand, 2006).

The final step is the presentation. The produced map can provide a rich and complex description of children's view of the environment, and capture emotional and other abstract connections experienced by children (Amsden & Van Wynsberghe, 2005). As such, maps enable children to share their stories; it is therefore very important to read, describe, and explain the produced map. The presentation of their maps and listening to other presenters are very effective means of learning how to make good maps, how to read and explain maps, and how to communicate with other people using maps.

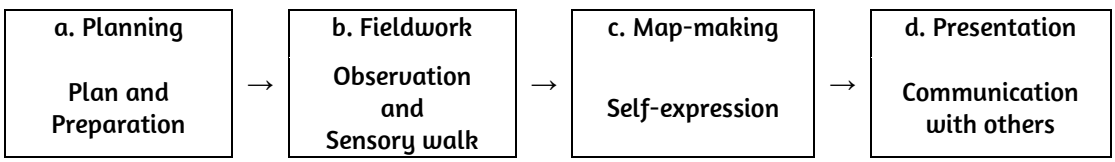


Figure 1. Process of environmental mapping

4. METHODOLOGY

4.1 Data Collection and Research Questions

We used the 2018 and 2019 award-winning maps of the Asahikawa Environmental Map Contest, which means that we used pre-existing qualitative data. The database of the map contest is freely available on the SEME website. We also used secondary quantitative data collected by Himiyama (2010) as part of a study on the Asahikawa Environmental Map Contest. The secondary data analysis offers many advantages (Dufour & Richard, 2019). It also makes it possible to determine the validity or credibility of previous studies and to access rich descriptive data on another historical era or on the context in which the primary data were collected (Corti, 2007).

On the other hand, using secondary qualitative data raises many ethical issues in terms of consent, opportunity and risks, data sharing, transparency, clarity and anonymity, permission and responsibility (Yardley, Watts, Pearson, & Richardson, 2014). We obtained children's consent for using their maps through their school, and we removed their names on the map to keep them anonymous (Figure 3–6).

To explore children's environmental awareness and their discovery of hidden geographies through environmental mapping, we intended to seek answers to the following questions:

1) What kind of environment can be found on children's maps? And how does the representation of environmental elements on children's maps vary according to educational stages?

2) What are the themes of children's map? And how have the themes of the maps changed in comparison with the contest 10 years ago?

3) How do children represent their discovery of hidden geographies on their maps?

4.2 Analysis of the selected examples of children's maps

Apart from five maps from Slovenia (junior high school student's maps), all other award-winning maps from the 2018 and 2019 contests were submitted from Japan. As shown in Table 1, 53 were made by elementary school students, 119 by junior high school students, and 30 by senior high school students. Although the number of participants from elementary school has been increasing in recent years, more than half of the maps were still submitted from junior high school students.

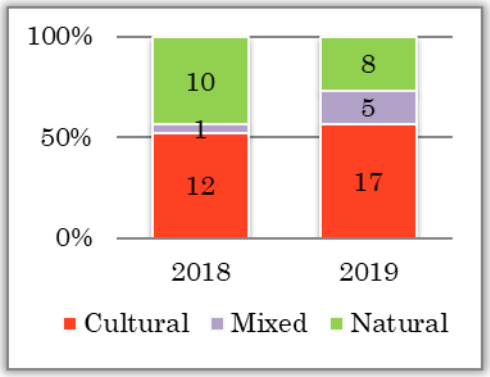
Table 1. The number of award-winning environmental maps

	2018	2019	Total
Elementary School	23	30	53
Junior High School	63	56	119
Senior High School	15	15	30
Total	101	101	202

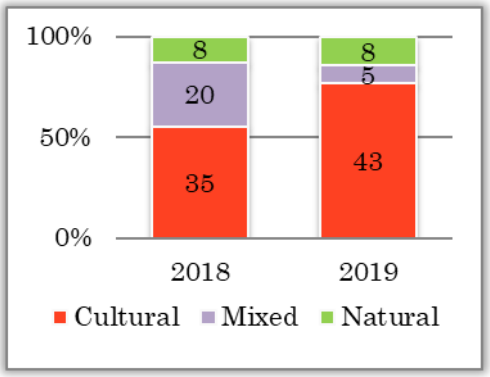
Source: Based on the SEME website

4.2.1 Environment on children's maps

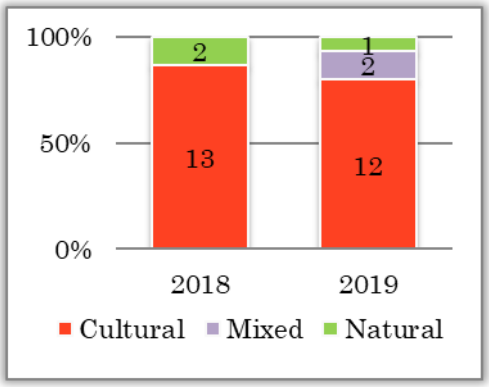
Children have direct, primary contact with geographical environments in the field as well as environmental knowledge from secondary sources such as literature. Figure 2 shows the environments chosen on children's maps according to the main theme.



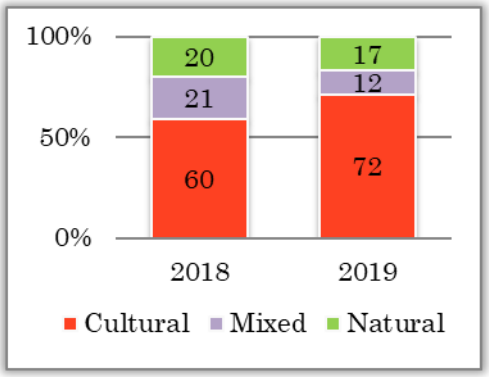
a. Elementary School



b. Junior High School



c. Senior High School



d. Total

Figure 2. Environment choices according to educational stages

Of the 202 maps, 132 maps related to the cultural environment and only 37 maps to the natural environment. Children's choices of environmental themes indicate that the natural environment is not so familiar to them. Nowadays many children live in urban areas and spend most of their time doing activities that keep them essentially isolated from the natural environment. When the data obtained from the children's maps were compared according to their educational stages, the results revealed that elementary school students included more natural environmental elements compared to the others. Although both mapping ability and map accuracy improve as children grow older, younger children may be more interested in the natural environment. What is more important than strict distinction of geographical environments (Himiyama, 2010) is that children observe their environments by themselves, find something interesting, and express their findings, thoughts and feelings to others by using their maps.

As mentioned earlier, the first thing that children do during the environmental mapping activity is choose the theme of the map. We analysed the themes of the 2018 and 2019 award-winning environmental maps according to Himiyama's classification (2010). As strict differentiation of the themes is not easy since many maps do not deal with only one theme but combine two or more themes, we counted the number of maps according to the main theme. Table 2 lists the themes of the award-winning environmental maps from the 2009, 2018 and 2019 contests.

The themes "Built environment, facilities" and "Road, traffic, parking", which reflect the fact that many children live in urban areas, rank high. The maps related to these

themes included urbanized environments such as stations, high-rise buildings, shopping centres, streetlights, surveillance cameras, traffic lights, and road signs. On the other hand, the themes focusing on the natural environment, "Animals, insects", "Tree, flower, plant, green," and "Water, river," have decreased significantly in comparison with the contest 10 years ago. Moreover, many current maps of the natural environment are mapped as green spaces in cities, such as parks and rivers.

The themes "Animals, insects" (2009), "Smell" (2018), and "Local history" (2019) rank high in the respective years also because they were that year's "specified theme". It is interesting to note that the theme "Hazard, risk" ranked high in 2018, when successive heavy rains in Japan resulted in widespread flooding. Environmental problems are most explicitly addressed in "Garbage and pollution." The maps closely related to environmental problems have decreased significantly in comparison with the contest 10 years ago. However, many other maps address environmental problems in a very broad sense, such as the problem of traffic noise or the current situation regarding clean energy vehicles. The themes "Temperature, humidity, brightness, sound" and "Smell", which ranked low, have a huge influence on how children perceive places. Although they are not visible, children can visualize them through environmental mapping.

Table 2. Themes of the award-winning environmental maps

	2009*	2018**	2019**	Total
Built environment, facilities	8	16	11	35
General	8	9	17	34
Road, traffic, parking	14	9	11	34
Animals, insects	21	5	6	32
Tree, flower, plant, green	14	9	7	30
Local history	2	4	20	26
Land use	6	8	8	22
Hazard, risk	No data	14	7	21
Scenery	3	9	4	16
Water, river	13	1	2	16
Garbage, pollution	9	2	3	14
Temperature, humidity, brightness, sound	4	4	5	13
Smell	No data	11	0	11
Total	**102**	**101**	**101**	**304**

*Source: *Himiyama (2010); **based on the SEME website*

4.2.2 Children's discovery of hidden geographies: sound maps and smell maps

Environmental awareness starts with children's observation of their own surroundings, which involves the collection of data using all senses. However, fieldwork mostly involves the use of sight, with little attention given to sound, smell, taste, and touch (Laws, 1989). A sensory walk, on the other hand, is an effective means of heightening this type of children's environmental awareness.

Figure 3 shows a map with the title Searching for the Singing of Cicadas by a 6-year-old Japanese girl. This sound map shows not only the location of cicadas that she heard but also the preferred host trees of cicadas that she observed in the field. The red crosses mark places without cicadas. The locations of three species of cicadas with their own sounds are marked by three coloured dots. The song of the Minmin-zemi (dark blue dots), called "robust cicada" in English, sounds like "miin, minminmin" and is the best known of all. The abura-zemi (sky blue dots), called "large brown cicada" in English,

sings "jii, jii, jiri, jiri". The tsukutsuku-boshi (red dots), called "walker's cicada" in English, has the most complex sound. In addition, the author explains that the preferred host trees of these cicadas vary depending on the tree species because of their specific taste.

Figure 3. Searching for the Singing of Cicadas

Figure 4. The Smell of Brezovica

Figure 4 shows a map with the title The Smell of Brezovica, made by two 13-year-old Slovenian girls. They used their eyes and noses to map smells in Brezovica, a small town near Ljubljana. During a sensory walk, smell-related places were recorded and classified on the map. In the legend, the bar combining red, orange, yellow and green colours shows the intensity of the smell from pleasant to unpleasant. Places that smelt unpleasant, such as gas stations and fields with manure, were painted red. The farm and the school were painted orange, the station and the car dealerships were painted yellow, and the pleasant-smelling places amid plants and flowers were coloured green.

Another example of a smell map is a work titled Smell Maps in Hikarigaoka by a 13-year-old Japanese boy (Figure 5). The work shows maps that are his interpretations of smells in a particular place. He tried to categorize smells with subjective connotations such as "good" or "unpleasant". Smells of nature (green), originating from flowers, trees and soil, and smells of food around stores and restaurants (red) are categorized "good". On the other hand, "unpleasant" smells belong to waste, smoking, and a strong presence of cleaning chemicals (blue and purple). The largest map shows that the smells of food in his hometown are located around a shopping centre, while the other maps show the smells on each floor of the shopping centre. Multi-scale maps are very useful when children intend to link their observations and thoughts with different scales.

To gather sound and smell data in the field, children do not use only their noses and ears but also instruments. In the map titled Noise Map with 60 Observation Points Within a 400-meter Radius of the Kokubunnji Station by a 12-year-old Japanese boy (Figure 6), the noise was measured with a sound level meter application on a smartphone. Although there are various ways of presenting the measured sound data, such as coloured dots (red, pink, yellow, and blue), pie charts, bar charts, and tables, the student decided on a unique and impressive hand-shaped design. One of his findings was also that there is less noise from a rail transit vehicle than from car traffic due to the presence of a noise barrier.

Figure 5. Smell Maps in Hikarigaoka

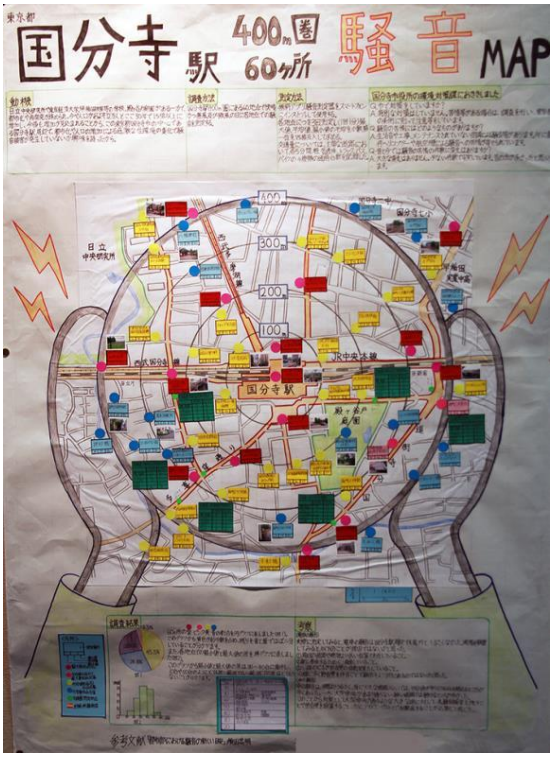


Figure 6. Noise Map with 60 Observation Points Within a 400-meter Radius of the Kokubunnji Station

5. DISCUSSION

This paper draws attention to the role of the environmental mapping activity in children's discovery of hidden geographies and in the development of their ability to draw a map.

Adams et al. (2017) explored children's representations and perceptions of natural spaces using community mapping, which is very similar to environmental mapping. Their research was conducted with children aged 12 to 14 years in socio-economically diverse communities in South Africa. The children's community maps showed their favourite places in nature and spaces where they felt safe or unsafe. According to Amsden and Van Wynsberghe (2005), community mapping is a visual and relational data-gathering technique that can be used to document not only geographical but also other forms of abstract data. The strength of community mapping lies in the openness and inclusiveness of the map-making process. On the other hand, environmental mapping as map-related pedagogy should provide children with the opportunity to learn a universal "how to map" formula. Through the environmental mapping activity, children engage in the process of observing, organizing, representing, analysing, and interpreting geographical information. Environmental mapping also encourages children to develop social skills, such as communication and collaboration.

Making an environmental map may be a challenging task for children. A "good" environmental map should contain one's own findings recorded in the field. Fieldwork does not involve only the use of eyes but also the use of nose, ears, fingers, etc. The environmental mapping activity has the power to transform aimless sight and numbness into purposeful observation and strong emotion, and boring environment into meaningful environment. The children's capacity for vivid sensory experience is an

aspect of the world that adults no longer possess because of a measurable decline in the sensitivity to taste, smell, colour and sound (James, 1990). Chris Philo (2016), in his keynote essay, takes a cue from the poetry of John Betjeman, "Childhood is measured out by sounds and sights and smells, before the dark of reason grows." As shown in Figures 3, 4, 5 and 6, children demonstrated an outstanding ability to represent their discovery of hidden geographies through vivid sensory experience. It is important to focus on the sounds or smells around them in order to identify the directions from which these sounds or smells emanate. It is interesting to see how children visualized unseen sounds or smells using colours.

6. CONCLUSION AND RECOMMENDATION

In this paper, we presented children's environmental awareness and their discovery of hidden geographies through environmental mapping, using the secondary data analysis of the award-winning maps from the Asahikawa Environmental Map Contest. Recently, most maps submitted to the contest explored the cultural environment, whereas the maps of the natural environment have decreased in comparison with the contest 10 years ago. Accordingly, many children chose the themes reflecting the fact that they live in urban areas.

The environmental mapping activity can offer children a good opportunity to observe and study their environments, find hidden geographies in those environments, and represent their observations and perceptions on the map. Environmental awareness starts with children's observation of their own surroundings, which involves the collection of data using all senses. A sensory walk in particular is an effective means of heightening children's environmental awareness. We hope that the results presented in this paper can contribute to the understanding of children's view of hidden geographies.

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