Trends in Research on Teaching and Learning Spatial Cognition in Elementary Social Studies in Japan: A Systematic Review from 1989 to 2019

WATANABE Takumi*, SAKAUE Hiroaki**, OSAKA Yu*** and OKADA Ryosuke****

* Graduate School of Humanities and Social Sciences, Hiroshima University; 1–1–1 Kagamiyama, Higashihiroshima, Hiroshima 739–8524, Japan.
** Faculty of Education, Chiba University; 1–33 Yayoi, Inage, Chiba, Chiba, 263–8522, Japan.
*** Faculty of Economics, Tokuyama University; 843–4–2 Gakuen-dai, Shunan, Yamaguchi 745–8566, Japan.
**** Center for Institutional Research, Educational Development, and Learning Support, Ochanomizu University; 2–1–1 Otsuka, Bunkyo, Tokyo 112–8610, Japan.
E-mail: takumiw@hiroshima-u.ac.jp*

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Abstract This paper is a systematic review of scholarly articles published in Japan from 1989 to 2019 that discuss instruction regarding the formation of spatial cognition in the context of elementary school social studies. This study aims to examine the trends, transitions, and challenges of this field of research and clarify the backgrounds of these studies. Based on the results of the review, four research themes were determined: “objectives, principles, and curriculum,” “lesson design,” “maps and globes,” and “learning assessment.” For the continued development of this field, we assert the need for further research into (1) the construction of a lesson model that encourages participation in community development and its actual practices based on children’s formation of their worldview; (2) collaboration between researchers and teachers to investigate actual situations and obstacles to teaching and propose strategies for teacher competence development based on evidence; and (3) assessment of the relationships between geography, geography education, and social studies, and consideration of curricula and learning instruction with respect to the formation of children’s spatial cognition, via collaboration among researchers involved in these fields.

Key words spatial cognition, geography education, social studies education, elementary school, literature review

Introduction

This study is a systematic review of scholarly articles published in Japan that discuss instruction regarding the formation of spatial cognition in the context of Japanese elementary school social studies. This study aims to examine the trends, transitions, and challenges in this field of research and clarify the backgrounds of these studies. Multiple studies on the theme of spatial cognition have been undertaken by various researchers in Japan. Some have further investigated the actual status of spatial cognition in children (Iwamoto 1990; Yamaguchi 1990; Wakabayashi 1996; Ohnishi 1999; Teramoto 2003; Yoshida 2018). In addition, as indicated by Nishiwaki (2014: 6), maps and globes have been found to be important means for forming spatial cognition, and research on map-related abilities (Suzuki 2000) has been attempted. In recent years, with the spread of information and communications technologies (ICT), research on the utilization of geographic information systems (GIS) in the classroom has also increased (Ito 2015; Kunihara 2015).

In Japan, the formation of spatial cognition has been included in the public curriculum, known as the “Courses of Study.” Asakura and Ishii (1999: 54) pointed out that intentional education, such as subject and extra-subject activities, affects the formation of children’s spatial cognition. The formation of this cognition is an important goal of social studies and geography education, and the related curriculum and learning instruction have been studied together to determine the actual situation of children’s spatial cognition. With regard to research in geography and geography education, from the 1970s, research primarily focused on actual surveys of children’s spatial cognition, whereas the necessity for research related to course formation based on the findings of the said surveys was emphasized from the latter half of the 1980s (Iwamoto et al. 1985; Saito 1988). Regarding the educational system perspectives, in particular, the 1989 Course of Study, “Deconstruction of Social Studies (Shakai ka kaitai),” significantly influenced Japan’s social studies
Based on the foregoing points, this study reviews trends since 1989 in research on instructions for spatial cognition formation in Japanese elementary school social studies education (3rd to 6th years). We believe this review can contribute to proposals for new learning instruction and support measures for teachers in the future. The following research questions are addressed:

(1) In the context of Japanese elementary school social studies education since 1989, what are the themes among the research studies that have examined the instruction of children's spatial cognition formation, and what did these themes help clarify?

(2) What was the background behind the implementation of such research, and what challenges remain to be explored?

(3) Based on these results, what kinds of research are needed in the future?

Method

Systematic review

A systematic review was adopted, which is a research methodology for literature reviews that is mainly used in medical science and nursing (Yamakawa 2013; Lane and Bourke 2019). In this method, documents are systematically collected using clear procedures and criteria, and their contents are analyzed and examined (Wakamura and Nishimura 2020: 57). The method is used to collate findings clarified in previous studies before conducting new studies and practices and obtain new findings for research topics by comparing and integrating them (Shimmitsu 2013: 77–91). Systematic reviews are more objective and less sensitive to investigator bias than “traditional” or “narrative” reviews (Petticrew and Roberts 2006: 9–10); further, in 2009, Western research groups published procedures and standards for systematic reviews (“Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA”) to achieve a common understanding internationally ( Liberati et al. 2009; Moher et al. 2009). The systematic review is also used in humanities and social sciences research, and was adopted by Lane and Bourke (2019) and Bowers and Creamer (2021) as a research method in the field of geography education.

Search process and paper selection

In the present study, a literature review was conducted with reference to the PRISMA 2009 Flow Diagram (Moher et al. 2009) (Figure 1). Japanese-language articles published between January 1989 and December 2019...
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were searched for in the National Institute of Informatics’ Database of CiNii Articles, using the search term “kukan” AND “kyoiku (kyoiku OR gakushu OR shidou OR jugyo OR shakai ka)” in Japanese (in English, “space” AND “education (education OR learning OR instruction OR lesson OR social studies)”). Although there are multiple words that mean kukan in English, the translation of “space” was chosen based on the entry for “kukan” in The Dictionary of Human Geography (Mizuoka 2013: 90). In formulating the search terms, discussions were held between the authors based on related literature and thesaurus entries.

The database search was conducted on March 25, 2020, and 3,075 papers were initially gathered. Many papers in the field of social studies and geography education research in Japan do not contain keywords or abstracts; therefore, only article titles were searched to prevent bias in results due to journal format. Manual searches were also performed. In addition to the database search, major academic journals related to social studies and geography education and reference lists of articles were used as clues for these manual searches. Consequently, 60 papers that were determined to be related to guiding children’s spatial cognition formation were added. Duplicate documents were deleted from the 3,135 papers obtained from the database and manual searches, leaving 2,566 papers.

First, the papers’ bibliographic information, titles, and abstracts were screened to remove any that had the following four features: 1) no author information was included, 2) their format was anything other than an academic paper (conference/meeting proceedings, reports, educational journals), 3) papers addressing themes not directly related to social studies or geography education, and 4) papers unrelated to the formation of children’s spatial cognition, or those that only described the current situation. Subsequently, 2,518 papers were excluded, resulting in 48 papers. Next, these 48 papers were carefully reviewed, and their eligibility for consideration in the present study was examined by applying the following three criteria: 1) elementary school was not the research subject (n=3), 2) the development of spatial cognition was limited to superficial treatment or the introduction of lesson practice (n=14), and 3) review papers (n=3). Finally, 28 papers were selected. Systematic reviews in the fields of medicine and nursing often include intervention studies. However, if systematic reviews in education seek “to establish what is known about a topic, then studies without interventions may also be helpful to include” (Tai et al. 2020: 96). Examples of reviews which also studied theoretical research are Honda et al. (2020), who attempted to classify research trends in certain journals for English-language education, and Dyment and Downing (2020), who aimed to determine the research trends in their entirety for specific themes in teacher education. In the context of Japanese social studies and geography education, one can also find suggestions about

Figure 1. Target paper selection process.

Source: Created by the authors in reference to the PRISMA 2009 flow diagram (Moher et al. 2009).
teaching and learning in theoretical research and in studies offering proposals on course development. Inclusion of such studies within a review would thus enable better understanding of the actual research trends.

The present study's analysis was conducted according to the following procedures. To examine the research questions, study sheets consisting of 8 items—1) research background, 2) research aim, 3) research question, 4) research method, 5) main results, 6) conclusion, 7) supplement, and 8) awareness—were completed, and the results were then qualitatively analyzed based on these items. Next, from the contents of each of the study sheets, keywords related to research questions were extracted. Finally, papers containing similar keywords were grouped, and themes were derived. Excel sheets were then created for the references found in the target papers, and relationships among target papers were confirmed. The selection and analysis of the target papers proceeded while the authors discussed the findings using Zoom web conferencing software and e-mail.

**Dataset description: General characteristics of 28 papers**

These procedures resulted in 28 papers targeted for analysis. With regard to the systematic review, prior to explaining the results of the examination of paper contents, we present a description of the formal characteristics of the dataset. Table 1 shows the names of the journals which included the 28 papers. Most of the research was published in geography education and social studies education journals (n=21), such as *The New Geography* by the Geographic Education Society of Japan (n=11) and *Journal of Research on Education in Social Studies Department* by Education in the Social Studies Department Research Association (n=3). Some research was also published in geography journals (n=5). Additionally, two applicable articles were published in university bulletins (n=2).

These studies were conducted by university instructors (n=17), elementary school teachers (n=13), a graduate student (n=1), and a university instructor who was also a graduate student (n=1). Most of the studies were prepared by individual authors (n=26) or two or three co-authors (Hisano and Unuma 2018; Miyazaki et al. 2018). The studies’ target grades/years were the third year (n=4), fourth year (n=3), and fifth year (n=8) of elementary school; 10 studies were conducted in all years of elementary school, while three focused on the whole span of primary and secondary education (Shinohara 1990; Sakurai 1991; Takeuchi 2012).

| Journal | Institute | Type of journal | Number of papers |
|---------|-----------|-----------------|------------------|
| E-journal GEO | The Association of Japanese Geographers | geography | 2 |
| Geographical Sciences | The Japanese Society for Geographical Sciences | geography | 2 |
| The Geographical Reports | Association of Geographers of Aichi University of Education | geography | 1 |
| The New Geography | The Geographic Education Society of Japan | geography and social studies education | 11 |
| Journal of Research on Education in Social Studies Department | Education in the Social Studies Department Research Association | social studies education | 3 |
| Bulletin of Japanese Educational Research Association for the Social Studies | Japanese Educational Research Association for the Social Studies | social studies education | 2 |
| Journal of Educational Research on Social Studies | Japanese Educational Research Association for the Social Studies | social studies education | 1 |
| Journal of Geographical Education | The Japan Association for Geographical Education | social studies education | 1 |
| The Journal of Social Studies | Japanese Association for the Social Studies | social studies education | 1 |
| The Journal of Social Studies Education | Naruto Association for Social Studies Education | social studies education | 1 |
| The Research for Social Studies Education | The Association for Social Studies Education the Aichi University of Education | social studies education | 1 |
| Bulletin of Center for Research and Development of Education | Center for Research and Development of Education, Fukushima University | university bulletin | 1 |
| Research in Educational Practice and Development | Center for Cooperative Research and Development on School Education Faculty of Education, Gunma University | university bulletin | 1 |

*Source: Created by the authors based on the review.*
In Table 2, the target papers were classified into the categories of theoretical approach (n=8), historical approach (n=3), and developmental and practical approach (n=17). In addition, while most of the papers used a qualitative method to grasp children’s status toward designing lessons and/or assessment of their learning outcomes, three papers had combined qualitative and quantitative methods (Yoshida 1990; Kino 1996; Kosugi 2006).

Findings

Focusing on the written contents of each of the 28 papers (especially on the research aim(s) and main results), organization and classification of common items was performed inductively. Four research themes related to teaching for the formation of spatial cognition in children were clarified: “objectives, principles, and curriculum,” “lesson design,” “maps and globes,” and “learning assessment” (see Table 3). There was further division into sub-themes. Analysis results on the basis of these themes are described below.

Objectives, principles, and curriculum

There has been some debate about the educational significance of focusing on geospatial and spatial cognition in relation to the goals and content selection of social studies and geography education (Sakurai 1999; Saito 2003; Yamaguchi 2006; Iwata 2019). Eight related papers have been published over the past 30 years on the subject of objectives, principles, and curriculum. Five of these were principle studies that organized and analyzed existing research results and educational policies and proposed viewpoints and ideas for improving the curriculum and learning instruction of social studies and geography (Shinohara 1990; Sakurai 1991; Teramoto 1995; Yoshida 2003; Takeuchi 2012). These were divided into three sub-themes.

The first type included studies that used geographical concepts in explaining educational goals and curricula formation principles. Through an examination of the description of the Course of Study, Shinohara (1990) clarified the perspectives and principles underlying the structure of the content of geography education corresponding to internationalization. The author insisted that to deepen children’s international understanding in geography education, it was necessary to place focus on the world’s “integration” (international relations) and “diversity” (characteristics of different countries and regions and the issues they face). He also stated that a multifaceted approach is necessary to fully capture each region and proposed introducing the concept of spatial scale into geography education and capturing phenomena within this framework. Sakurai (1991) also reevaluated the concept of the “region” in social studies and geography education, based on the results of research on agricultural and rural geography. According to Sakurai, a region is a collection of spaces of various levels, organized by a group of people, and each region is characterized as having a spatial unit. He proposed that in geography education, teachers should identify the land user and focus on human behavior on a specified scale and argued that through such learning activity, children can cultivate a global perspective.
While the above two papers focused on geographical concepts, some studies explained educational goals from the perspective of developing spatial cognition in children; these constituted the second type. Teramoto (1995), however, focused on children's perceptual environments. He argued that in elementary school geography education, children need to pursue their “connections” with their environments (nature, human society, time). Here, he tried to foster children’s awareness of the community by grasping environments from the three perspectives of “place,” “movement,” and “relationship” and suggested facilitating exploration, travel, and learning using all five senses to help children cultivate spatial cognition. Further, Yoshida (2003) took the position that spatial cognition should be formed in all subjects, not only social studies. The author emphasized that in elementary school geography education, children form their own image of community spaces according to their developmental stage and argued that regions of different scales should be gradually positioned in the curriculum from the first and second grades to teach the regional geography (place names, positions, orientations, distances) of familiar regions, Japan, and the world.

The third type included studies which explained educational goals and curricula from the perspective of the social participation of children. Takeuchi (2012) proposed incorporating social participation learning into geography education from elementary school to high school and specifically proposed the concept of a geography curriculum. In response to the claim by environmental psychologist Hart (1997), Takeuchi insisted that geographical phenomena and social problems that occur in “different spatial scales” should be handled within the curriculum, according to child learners’ developmental stage, in order to nurture children as main actors in community formation. He also pointed out that although elementary school social studies deal with social issues on various spatial scales based on local issues, they must be practiced in a restricted fashion due to the limitation of class hours.

The remaining three studies were historical reviews of curriculum and lesson practice in geography education (Shim 2003; Nagata 2009, 2010). Historical studies have found suggestions in past educational practices via

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| Theme of the papers | Number of papers | Papers |
|---------------------|------------------|--------|
| **Objectives, principles, and curriculum** | | |
| Geographical concepts | 2 | Shinohara (1990), Sakurai (1991) |
| Development of spatial cognition in children | 2 | Teramoto (1995), Yoshida (2003) |
| Participation of children in general society | 1 | Takeuchi (2012) |
| Historical research as a foundation | 3 | Shim (2003), Nagata (2009, 2010) |
| Subtotal | 8 | |

| Lesson design | 2 | Yoshida (1990), Kosugi (2006) |
|----------------|-------------------|--------------------------|
| Based on children gaining a practical understanding of spatial cognition | 2 | |
| From the perspectives of geographical concepts and ways of seeing and thinking about geography | |
| A. Emphasis on understanding via awareness of the actual status of a region or local area | 2 | Kano (2014), Hisano and Unuma (2018) |
| B. Emphasis on the active usage of geographical concepts and methods | 4 | Hanioka (2011), Sato (2015), Iwashita (2017), Miyazaki et al. (2018) |
| Subtotal | 8 | |

| Maps and globes | 3 | Watanabe (2000, 2002), Teramoto (2012) |
|-----------------|-------------------|--------------------------|
| Significane of maps and globes as teaching materials | 3 | |
| Strategies for teaching and instilling map and globe skills | |
| A. Practical research | 3 | Kino (1996), Masuoka (2010), Oya (2015) |
| B. Foreign research | 5 | Tabe (1992, 2004), Iizuka (2002), Ito (2011), Kotani (2017) |
| Subtotal | 11 | |

| Learning assessment | 1 | Onishi (2016) |

Source: Created by the authors based on the review.
the examination of the “concepts” and “explanations of the essence” of education courses. In this process, such studies aim to “offer historical theoretical foundations for the novel creation of curricula and educational practices” in education courses (Ikeno 2001a: 365). Nagata (2009, 2010) discussed the background of the continued emphasis on regional geography learning in Japanese education from the perspective of Lefebvre’s (1974) theory of “the production of space.” Examining prewar elementary school geography classwork (local education) in Japan and reevaluating teaching practices, he asserted that while practice centered on the “representation of space” was carried out in the prewar period, there was also educational instruction in which children created their own life spaces (i.e., “spaces of representation”). Nagata (2009) is also cited in practical research (Sato 2015, to be described further below) and thus has had an influence on contemporary educational practices as well. Meanwhile, Shim (2003: 13–14) compared and analyzed the geography education system and content of elementary schools in mainland Japan and colonial Korea during the Pacific War, positing that having children “correctly understand their hometown” leads to “the basic idea of geography learning” and the development of national identity.

These eight studies clarified the principles of desirable curricula and the composition of content by which children form their spatial cognition capacity; they reevaluated the base and purpose of dealing with space (recognition) in social studies and geography education, and, based on this, proposed guidelines for curriculum and lesson design.

**Lesson design**

In the study of social studies and geography education in Japan, developing lesson models, and practicing and verifying lesson plans based on hypotheses, have been recognized as important areas of academic research (for example, see Sakurai 1999; Yamaguchi 2002; Kusahara et al. 2015). There were eight papers on the theme of lesson design. These were divided into two major sub-themes.

The first sub-theme was research on course and classroom practices based on the results of the actual surveys of the spatial cognition of children (Yoshida 1990; Kosugi 2006). According to Yoshida (1990), forming a worldview in a child’s mind is one of the goals of geography education, and children should study world regional geography from elementary school onwards. After conducting a fact-finding survey on the names and locations of children in foreign countries, he taught “living in a village in the Himalayas” in community learning in the third grade and verified the effects. Kosugi (2006) also focused on the accurate recognition of place names and their positions and practiced teaching children in the fourth grade to recognize the cities, towns, and villages in their prefecture using maps.

The second sub-theme focused on the development and/or practice of course and classroom models from the perspectives of geography concepts and geography-related ways of thinking and seeing. These were studies emphasizing an accurate understanding of the actual awareness children have of their own areas (Kano 2014; Hisano and Unuma 2018) and those emphasizing the active use of geography concepts and methods by children (Hanioka 2011; Sato 2015; Iwashita 2017; Miyazaki et al. 2018). First, Kano (2014) aimed to guide children to form a worldview by making them aware of spatial facts. To this end, the author assessed fifth-grade students’ performance in learning exercises aimed at helping them understand the location of geographical phenomena and the characteristics of the area and then verified the effect of this activity. Kano referred to the findings regarding spatial cognition published by Hart and Berzok (1982) and geographer Golledge (1978), with particular focus on the “anchor-point hypothesis.” Second, Hisano and Unuma (2018), similar to Kano (2014), emphasized fact recognition but relied on Takeuchi’s (2014) educational theory to argue that children should be nurtured as the subject of community development. The authors highlighted the need to raise children’s awareness and interest in the local community, conducted lessons with children in the fifth grade, and verified the effects.

Meanwhile, four studies emphasized children’s ability to explain the mechanism of regions and contemporary society by using geographical concepts and methods, rather than limiting their research to fact recognition. Hanioka (2011) referred to the Course of Study in the field of geography in junior high school social studies and argued that for children to grasp the idea of a region, it is necessary to incorporate the perspective of “spatial scale” into the educational content of elementary school social studies. Hanioka also developed a lesson model for industrial studies in the fifth grade. Iwashita (2017) took the same approach as Hanioka (2011) but developed a lesson model for industrial studies focusing on the viewpoint of “spatial interaction” rather than “spatial scale.” Finally, Sato (2015) defined studying the community in social studies education as a means to understand contemporary society, relying on Iwata’s (1991) social studies lesson theory and Lefebvre’s (1974) “production of space” theory. The author developed a third-grade social
studies class and insisted on the importance of making children aware of the spatial scale. In addition, Miyazaki et al. (2018) conducted a regional survey and, based on the results, proposed the study of national territory in the fifth grade. In the learning unit the authors developed, “the viewpoint of position and spatial expanse” was emphasized as a geographical perspective (Miyazaki et al. 2018: 14).

While each of these eight studies was intended to lead to children's formation of spatial cognition, their lesson structures were different. In the background of the lesson structure detailed in each paper, we were able to confirm the positions as being either centered on the child's spatial cognition or on the concepts and methods of geography.

Maps and globes

Map reading, drawing, and creation and globes have long been studied in the context of the formation of spatial cognition (Tanaka 1996; Akimoto 2003). Despite the fact that maps and globes have been shown to make children’s spatial cognition more reliable (Teramoto 2015), learning from maps and globes continues to be claimed to be insufficient in school settings such as the elementary school Course of Study. Among the selected papers, 11 focused on maps and globes: On the premise that maps and globes are involved in the formation of children's spatial cognition, these papers focused on teaching materials, specific skills and instructional methods. Since this research purpose diverged from the themes of learning objectives and principles, and curriculum and lesson design, “maps and globes” was defined as a different theme. Further, the maps and globes were divided into two major sub-themes.

The first was the significance of maps and globes as teaching materials in the formation of spatial cognition. Watanabe (2000, 2002) argued that children’s spatial cognition could be nurtured through their experience of the creation of maps and globes and learning the principles undergirding them. The author proposed specific learning activities that were then applied to children in the fifth grade. Teramoto (2012) described the role of maps and globes in children's formation of spatial cognition from domestic research trends and argued that their use can contribute to character building and the social usefulness of maps.

The second sub-theme involved studies which proposed strategies for teaching and instilling map and globe skills. Eight papers proposed the value of map skills and map learning methods for cultivating spatial cognition in children. These were further divided into a research group on educational practices, as in the case of the author’s own practical research (Kino 1996; Masuoka 2010; Oya 2015), and another using cases from foreign (i.e., non-Japan) educational practices and curricula (Tabe 1992, 2004; Iizuka 2002; Ito 2011; Kotani 2017). The former group is discussed here first. Based on a fact-finding survey of children's “sketch maps,” Kino (1996) emphasized the need in third-grade map-learning to pay attention to those roads and landmarks that are closely related to the children's own lives. The author suggested that children develop map-reading skills such as orientation, distance, and contour-line reading through active experiences and activities and used roadmaps, rather than topographical maps, as teaching material. Similarly, Oya (2015) examined community learning among children in the third grade and found that various places were actually observed from the viewpoints of “landscape/land use/main facilities,” “terrain,” “land use and terrain,” and “land use and history”; he proposed that map reading and drawing skills can be developed in children through such observations. Meanwhile, Masuoka (2010) focused on “community safety map-making” and verified that its activities lead to the development of children's spatial cognition and “geographical observation abilities,” pointing out that their spatial cognition is enhanced by ascertaining dangerous or safe “places,” rather than “people,” through “community safety mapping.” The studies of Kino (1996) and Oya (2015) emphasized map and globe skills for spatial cognition, while Masuoka (2010) considered such skills as important for community (local area) invigoration and development.

Next, we focus on the second group of studies of foreign countries. Overall, five analyses of map learning in the United States (Tabe 1992, 2004) and the United Kingdom (Iizuka 2002; Ito 2011; Kotani 2017) were reviewed, all of which aimed to improve map learning instruction in Japan. Tabe (1992) examined the composition and positioning of geographical skills in the US social studies curriculum to analyze the systematic nature of map instruction and revealed that map and globe instruction was emphasized within the said curriculum. In a later analysis of the California curriculum and US national geography standards, Tabe (2004) revealed that students develop the ability to read maps and globes step-by-step from kindergarten to year 12. Further, Iizuka (2002) analyzed teaching examples in the educational magazines Mapping News and Primary Geographer, as well as events related to map utilization hosted by the Geographical Association, and clarified the actual conditions of OS map utilization and map skills in primary
education. This study cited Tabe (1992), who highlighted a mutual influence between the US and the UK in terms of geography education. Ito (2011: 3) described the “condition of learning” proposed by educational psychologist Gagné (1965) that allows children to “shift from their own private life world to an abstract map world” in the introductory period of map learning. Based on this, he insisted on the need to gradually develop children’s map knowledge and skills. Kotani (2017), however, focused on children’s formation of cartographic scale recognition and compared and analyzed Japanese textbooks and Map Start 2 learning instruction. Based on the findings, she developed a lesson model for map learning in the fourth grade. The three publications that examined the UK context discussed Map Start, a teaching material for map learning.

In the abovementioned 11 papers, maps and globes were positioned as the basis for children to accurately grasp the characteristics of a region. In the study background reported in each paper, there was a common awareness that the utilization of maps and globes and the development of related skills should be improved in Japan; however, different papers expressed different views on the appropriate direction of this improvement.

Learning assessment

There has been much debate over competence in geography education (Ida 2003; Akimoto 2009), and it has been noted against this backdrop that research on learning evaluation is required (Nishiwaki 1993; Sakurai 2003; Shimura 2013). Nevertheless, only a single paper was found that concerned the learning assessment of spatial cognition. Since this paper had a different research purpose compared to the others, it was categorized under its own theme in our analysis. In exploring the social sciences, Onishi (2016) developed an evaluation method for thinking and proposed that child learners’ thought processes could be improved by having them illustrate the relationships between geographical phenomena from the perspective of “spatial axes” (topography, climate, transportation, etc.) and the “temporal axis” (time, etc.), while teaching them the hierarchy of spatial scale. Educational contents of industrial studies in the fifth grade was used as an example.

Discussion

To answer Research Question 1, 28 papers were identified and 4 themes (“objectives, principles, and curriculum”; “lesson design”; “maps and globes”; and “learning assessment”) were derived on the instruction of spatial cognition formation. Following is an overview of the findings for each theme: (1) For “objectives, principles, and curriculum,” the teaching and learning orientation of spatial cognition were within geography and social studies education, as well as geographical concepts, the spatial cognition of children, and the social participation of children. (2) For “lesson design,” the topics of discussion were geography and the spatial cognition of children. Further, methods of course creation based on these topics and presentation of actual case examples were proposed. (3) “Maps and globes” were clarified as a means of promoting the formation of spatial cognition in children, elucidated through facts related to map and globe skills. (4) For “learning assessment,” assessment strategies to determine the actual status of children’s spatial cognition, especially related to inquiry based learning, were proposed.

With regard to themes (2), (3), and (4), there are many papers written by school teachers, which may be called “practitioner research” (Sakurai 2003; Cochran-Smith and Lytle 2015; Kusahara et al. 2015). However, no empirical research clarifies the teachers’ views on lesson design and learning instruction or those influencing factors and situations. Further, no studies proposed strategies for developing teacher competence. The present study thus showed that there are very few studies on learning assessment.

Three key trends

This section will focus on answering Research Question 2. In elementary-school social studies, three background trends were confirmed on guiding children’s formation of spatial cognition (see Table 4).

The first trend highlighted the formation of an error-free worldview in children, a position that emphasizes the accurate understanding of the events that make up the community, thus fostering children’s spatial perception (Teramoto 1995; Yoshida 2003). Other researchers placed emphasis on attributing an identity to such places accordingly (Shim 2003). Specifically, some of the reviewed studies focused on topics such as the recognition of place names and their locations (Yoshida 1990; Kosugi 2006; Kano 2014), map and globe skills training aimed at cultivating the understanding of regional characteristics (Tabe 1992, 2004; Kino 1996; Iizuka 2002; Ito 2011; Teramoto 2012; Oya 2015), and the mechanisms of maps and globes (Watanabe 2000, 2002). As these studies also considered children’s psychological development, the present review referred to the results of a fact-finding survey on chil-
children’s spatial perception (Iwamoto 1981; Teramoto 1984; Yamaguchi 2002; Teramoto and Ohnishi 2004). The background work for this survey was conducted by Saito (Saito 1988, 1995), a professor emeritus at Tokyo Gakugei University. Saito argued that school geography education should form and support the worldview of children, and previous studies have noted the impact of Saito’s theory of geography education on lesson practices.8

The second trend focused on explaining how children explore areas, as well as the structure of those areas and society. This position emphasized equipping children with geographical concepts and methods of inquiry to understand communities and societies. Here, the necessity of “cultivating geographical perspectives” was discussed as a goal of geography education (Shinohara 1990; Sakurai 1991). Specifically, a lesson model that incorporated “spatial scale” (Hanioka 2011; Sato 2015; Kotani 2017), “spatial interaction” (Iwashita 2017), and the “viewpoint of position and spatial expanse” (Miyazaki et al. 2018) into the educational content was developed. This review also highlighted an evaluation study that aimed to visualize the cognitive processes contributing to children’s concept acquisition (Onishi 2016). These studies incorporated some of the concepts and methods of junior high school humanities and social sciences instruction into the educational content of elementary school social studies, keeping in mind their connection to the field of geography. There were few references in the actual condition and development of children compared to the first and second trends. Hanioka (2011), Sato (2015), Onishi (2016), and Iwashita (2017) cited the educational theory of Iwata (1991, 2001), a professor emeritus of the Hyogo University of Teacher Education. Iwata’s idea of inquiry-based learning can be said to have influenced the development of these lesson models.9

The third trend aimed to encourage participation in community building (development), based on the formation of children’s worldview. This position focused on enabling children to understand the characteristics and problems of their local area and experience the procedures used to solve these problems (Takeuchi 2012). Elementary school social studies mostly dealt with local issues related to disaster prevention, safety, agriculture, etc. (Masuoka 2010; Hisano and Unuma 2018). The idea of community building was found in prewar Japanese elementary school practices (as reported by Nagata 2009, 2010). Elucidating such an educational history can form the foundation for geography education in the future.

These studies appear to have been derived from the first trend; however, the relationship between space and children differed in each. In the first trend, space was an object that children perceived through learning, that is, a place that children should understand in order to form their own worldview. In the third trend, space was an object that children were involved in and changed through learning, that is, a place in which they acted to solve problems. The circumstances leading to this shift were a change in the perception of children in their geography and environmental psychology (Ohnishi 2000; Teramoto 2003), as well as the influence of citizenship education research on social studies education (Karaki 1994; Ikeno 2001b). Here, the objective shifted to the development of children’s ability to participate in building society through the content of social studies coursework. When there is grounding in such learning goals, no conclusive learning assessments are made within the classroom (i.e., during the course itself). Takeuchi (2019), for example, reported on what children and ex-students learned from community learning and, through questionnaire surveys and interviews, how community learning affected their subsequent lives. There have also been similar long-term attempts to evaluate children’s learning.

Further, in the first, second, and third trends, the focus on area (space) in teaching and learning differs. In the
first trend, the focus is on understanding specific areas. In the second trend, learning is by using areas as examples. In the third trend, based on an understanding of areas, through actual participation by children in their areas (communities), students learn perspectives regarding community building and the methods used. While the necessity of teaching and learning as in the third trend has been emphasized previously, its actual usage is low (Takeuchi 2019: 2). Nevertheless, amid the current changing societal circumstances, children themselves should participate in "space (re)design" practices, including for "community building" and "disaster prevention and response." The demand is for children to develop their competence through actual activities. Against this backdrop, there was a renewed questioning of the significance and goals of geographical education by around the turn of the 21st century. This requires reconfirmation of the necessity of fostering a sense of citizenship and social participation among students in geography education (Nishiwaki 2003; Izumi 2009). Thus, the third trend is developing in tandem with such discussions. In addition, due to today's social circumstances, children have to be better able to understand situations in different areas worldwide; their geography and social studies coursework should help them cultivate spatial cognition, a capacity they will need in order to examine and address the social problems occurring in different spaces. In this sense, as well, the importance of the third trend is expected to increase in the future.

Conclusion

Based on the above considerations, to address Research Question 3, this study proposed an outlook for the type of research needed in the future. The first theme is the construction of lesson models that encourage participation in community development based on child learners' formation of their worldview and the accumulation of data gathered from the implementation of such lessons. The present study found five related papers in trend 3. However, as Takeuchi (2012: 66) observed, in Japan, where geography is positioned within social studies, both the formation of spatial cognition and the development of citizenship must be taken into consideration. Since the 2010s, spatial citizenship education, which aims to foster citizenship through the understanding of space in worldwide geography education, has been advocated by Gryl and Jekel (2012) and Shin and Bednarz (2019). The success or failure of the implementation of such a lesson model will depend not only on the efforts of individual teachers but also on the involvement of researchers. For example, researchers working in the field of geography and social studies education should develop strategies to support elementary school teachers' competence development, as was highlighted by Tabe (2004: 137–138). To solve this issue, in addition to promoting practical research by teachers themselves, researchers will need to collaborate with teachers to investigate the actual state of teaching and associated obstacles. Additionally, based on the available evidence, researchers will need to conduct research to inform proposals for strategies to promote competency formation.

As has been previously argued, it is necessary to consider the curriculum and learning instruction for the formation of children's spatial cognition by examining the relationship among geography, geography education, and social studies education (Kikuchi et al. 1983) and through collaboration among researchers involved in these fields (Tanahashi 2017: 37). The utilization of geographical concepts, methods, and achievements is indispensable for understanding complex regions and societies. In fact, some of the studies examined in the present review utilized geographical concepts and were influenced by Lefebvre's (1974) theory of "production of space." It will henceforth be necessary for researchers who are engaged in various fields of science related to space, such as geography, to participate in education research and clarify the educational significance of their studies' results.

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Notes

1. The importance of spatial cognition formation has been discussed widely outside of Japan, and many studies have been conducted. For example, a study on spatial thinking (National Research Council Committee on Spatial Thinking 2006) was conducted in the United States in which the five major themes of geography were advocated. In Germany, where space is at the center of
geography education, geography lessons “provide insights into the connections between natural conditions and social activities in different parts of the world, and... teach an associated spatially-oriented competence that can be applied” (German Geographical Society 2014: 6). In the mid-2010s, the International Geographical Union Commission on Geographical Education systematized research on the relationship between, and the practice of, geographical technology such as GIS and geography education (Muñiz Solari et al. 2015).

2. Toida et al. (2012) provided an explanation of the transition of the Course of Study in English.

3. At the time of the initial discussions, the subject was called “Basic Geography (Chiri kiso)” instead of “Geography.”

4. Currently, social studies are taught in the 3rd–6th grades of elementary school in Japan (8–12 years old) and the 1st–3rd grades of junior high school (12–15 years old).

5. In this issue, papers set in the contexts of China, South America, Japan, Chile, Ireland, and Australia were published. In Japan, Shimura (2015) reported on the status and issues of the country’s primary geography education system from the perspective of geographical content and teacher expertise in the elementary school Course of Study.

6. The following journals were searched manually: E-journal GEO and Geographical Review of Japan Series A/B (The Association of Japanese Geographers), Japanese Journal of Human Geography (The Human Geographical Society of Japan), Journal of Educational Research on Social Studies (Japanese Educational Research Association for the Social Studies), Journal of Geographical Education (The Japan Association for Geographic Education), Journal of Research on Education in Social Studies Department (Education in the Social Studies Department Research Association), The Journal of Social Studies (Japanese Association for the Social Studies), and The New Geography (The Geographic Education Society of Japan).

7. To date, there have been few relevant studies conducted anywhere in the world, particularly those involving the evaluation of primary geography education. This was highlighted by Lane and Bourke (2019: 32), who reviewed international journals concerning geography education.

8. Saito (2003: 30–32) mentioned Teramoto (1984) and Teramoto and Oi (1987) as “empirical studies on genetic geographic education theory.” Teramoto (2002: 134–138) stated that “genetic geographic education theory” “will succeed in motivating children to learn more about geography,” and the relationship between the two was also mentioned by Ito (1997: 67).

9. Moriwake (1978) also presented a typical theory of inquiry learning in social studies; however, the viewpoint of “space” was weaker than that featured in Iwata (2001). The reason for this is that the formation of the “spatial axis,” that is, the perception of regional geography, differs between the two. According to Kusahara (2008: 243–244), Moriwake should have avoided the compulsory identity formation requirement for children in social studies education; Kusahara negatively viewed the regional geography curriculum, which is its main factor. However, Iwata argued for the need for a regional geography curriculum from the standpoint that such a curriculum should support the formation of independent identities in children.

10. Sakaue et al. (2020) reported in Japanese on trends in spatial citizenship education in Western countries.

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(J) written in Japanese
(JE) written in Japanese with English abstract