A CASE STUDY ON MAP ACTIVITIES WITH CHILDREN OF KINDERGARTEN AGE

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Abstract
For the purpose of measuring the ability of students at the kindergarten level in Turkey in terms of using maps, three activities were carried out with a total of 67 students. In the first activity, a total of 6 questions asked for the children with the aim of measuring their abilities in 1) matching the entities in the real world and their representations on the map, 2) determining topological relationships, and 3) matching a 3D (relief) representations and 2D (planimetric) representations. In the second activity, they were asked a total of 3 questions with the aim of measuring their abilities in 1) matching the objects in the classroom and the representations on the classroom plan, and 2) determining topological relationships. Finally, a treasure map activity was performed. As a result, it has been determined that there are differences between 60% and 80% in terms of abilities in these activities.

Keywords: Cartography, Map Activities, Matching, Topological Relationships, Children of Kindergarten Age

INTRODUCTION
The importance of map education and its impact on the psychological and mental structures and development of children has been an ongoing discussion. According to Piaget et al. (1956, 1960), the development of map learning increases throughout childhood and the progress achieved is parallel to the intellectual development of children. From an early age, children can distinguish objects they see around them on a map. They focused on the Three Mountain Problem in their work and revealed different behaviors among children of different age groups. It is seen that 4–5-year-old children perceive only those objects in their own sight, children in the 6-year-old age group show an increase in their level of perception, and in the 7–8-year-old age group other people’s perception can be perceived by the children.

In Jahoda’s study (1963), children were divided into four groups according to their age (5–7, 9, 9–11, 11). The questions “Where is Glasgow? Where is Scotland? What is Scotland? What is Britain? Did you hear about Britain? What do you think?” were asked in this study and the children’s answers were divided into the following four stages. In the first stage a common understanding of Glasgow's definition could not be established; in the second stage, children recognized Glasgow but not as part of Scotland; in the third stage, Glasgow was recognized as part of Scotland, but Scotland was not recognized as part of Britain; and in the fourth stage, the Scottish–British relationship was determined correctly. As a result of the study, only 14% of the children in the 6–7-year-old age group reached the third stage and only 6% reached the fourth stage. The results show that this age group has weak spatial perception.

Piche (1977, 1981) analyzed the methods used by Piaget and Jahoda in their work. He worked with 48 children between the ages of 5 and 8 and used drawings, map exercises, and geographical puzzles in an analysis of London. Only 10% of the children understand that London and England are connected and Piche also identified 6-year-old children that knew their address but did not know the meaning of it.

Somerville and Bryant (1985) defend the idea that spatial coordinates play a crucial role in map education at school and they conducted a study to evaluate the knowledge children have about the concept of space. In the study, children were asked to draw two lines by connecting a certain two coordinates and showing at which point these two lines met. As a result of the study, it was determined that young children (4–6 years) could find a position in the space by using two spatial coordinates and they could solve complex problems when they grew older (6 or older).
In Daggs’s study (1986), children in the 6–7, 7–8, and 8–9-year-old age groups were divided into three groups and an oral test, a graphical test, and a large-scale physical model was used for this study. The results show that there were differences in verbal test results in the first and second groups and that there were differences in each group in the graphical test. However, when a large-scale model was used, it was observed that the performances of all groups were improved.

Uttal and Wellman (1989) used 130 children between the ages of 4 and 7 to investigate the development of the concept of space in children. In the first experiment, the children were shown a map of a playground, which they could later see, and were expected to create a route around the objects in the playground. In the second experiment, the objects in the rooms in the playground plan designed as six different rooms were taken in a single room and the aim of creating the same route was repeated. The ability of young children to read maps was revealed in this study.

In studies conducted by Harwood and McShane (1996), 5–6, 7–8, and 9–10-year-old children were investigated using three different methods (map shadowing, oral interviews, and puzzles) to study if they could understand how Nuneaton–England–the British Isles–Europe are spatially related to each other. Children with travel experience showed an increase in understanding.

Sowden et al.’s study (1996) includes pre-school children's reports on the interpretation of a black-and-white and upright aerial photographs and their ability to solve a simulated navigational problem on a photograph. This study has shown that children aged 4 have insufficient map skills. It is also believed that more teaching methods can be used to improve the current abilities of young children.

In a study by Huttenlocher et al. (1999) a point in a rectangle was shown to preschool children and, based on this display, they were asked to find an object in a larger sandbox. Most children succeeded in this task, although a model has been proposed to simplify scaling.

Sandberg and Huttenlocher (2001) examined 6-year-old children for the ability to redirect a complex road formation. 36 kindergarten students used a large-scale map to navigate the route. Navigation success, route length, and error types were all considered, and the results show that kindergarten children can use maps to plan and conduct routes and they demonstrate planning skills by reliably selecting efficient routes.

In this study, various activities were carried out with the kindergarten students for the purpose of measuring the following abilities: 1) matching the entities in the real world and the representations on the map, 2) identifying topological relationships, 3) matching 2D (planimetric) representations and 3D (relief) representations, 4) matching the graphical representations on the map and the objects in the class, and 5) navigation.

METHOD, EXPERIMENT AND RESULTS

For this study, we conducted activities with Flying Balon Kindergarten students operating in the Karamürsel, Kocaeli, Turkey. A total of 67 students in the 5–6-year-old age group participated in activities from four different classes. We were careful to select children from normal classes in which there were no children identified as gifted. As well, we detected that one of the students was foreign and did not understand the process. For this reason, the results of this student's activity were not evaluated. We created groups of four students and the activities were performed in order within each group. While we were studying one group, the other students participated in map recognition and game-time activities with their teachers.

Preparatory Activity

We asked students for understand do the know maps and whether they have encountered the map before. In general, children could not make accurate comments about what the map was. However, there were also some children who knew what the map was and could give specific examples (i.e., treasure maps or road maps). Information about the map knowledge was provided.

We asked children what they know about the concept of an island because we used a Cyprus 3D (relief) map in the first activity. In response to the question of what an island is, the name of a television show that broadcasts in most of our country was recorded. This answer indicated to us that television can have positive effects on children, whereas it is generally considered to have negative effects. Another answer children gave when asked the island question was regarding the islands where pirate treasure was found. We explained the concept of the island to the children and the structure of the island was shown on a 3D (relief) map of Cyprus.
It has been said that children should play as they did with the Cyprus relief map to ensure that they can get closer to the map through physical contact and at the same time be shown that it can be a fun game tool.

**First Activity**

For the first activity through the Cyprus 3D (relief) map (Figure 1), a Cyprus map drawn manually to represent the certain entities appearing on the Cyprus 3D (relief) map (Figure 2) and Turkey map (Figure 3) we asked some questions of the children to measure their ability to do the following: 1) match the real world entities and the representations on a map, 2) identify topological relationships, and 3) match 3-D (relief map) representations and 2D (planimetric) representations.

*Question 1:* In order to measure the children’s ability to match the representations on the map and the entities in the real world, we showed the children mountain representations on the relief map and asked them what these representations correspond to in the real world.

*Question 2:* In order to measure the children’s ability to match the representations on the map and the entities in the real world, we showed the children the lines representing the roads on the relief map and asked them what these lines correspond to in the real world.

*Question 3:* In order to measure the children’s ability to identify topological relationships, we asked the children if a road that appears on the relief map was located at (near, inside, on) the relevant mountain.

*Question 4:* In order to measure the children’s ability to match 3D (relief) map representations and 2D (planimetric) representations, we asked the children whether a mountain appearing on 3D (relief) map also appeared on the map drawn manually.

*Question 5:* In order to measure the children’s ability to match 3D (relief) map representations and 2D (planimetric) representations, we asked the children whether a road appearing on 3D (relief) map also appeared on the map drawn manually.

*Question 6:* In order to measure the children’s ability to match 3D (relief) map representations and 2D (planimetric) representations, shown a relief map of Cyprus and was asked where is appears on the map of Turkey.

The children’s responses to the questions in this activity on 3D (relief) and printed maps are given in Table 1 as correct (+) or wrong (-). The responses were evaluated using a SPSS (Statistical Package for the Social Sciences) software. According to this evaluation, 60.45% of the children participating in the activity had the ability to match the map representations and the entities in the real world, 65.7% had the ability to determine topological relations, and 70.65% had the ability to match 3D (relief) representations and 2D (planimetric) representations.

![Figure 1. 3D (relief) map of Cyprus](image)
Figure 2. Cyprus map drawn manually to represent the certain entities appearing on the Cyprus 3D (relief) map

Table 1. The answers given by the students in the first activity

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Figure 3. Turkey map
the ability to determine topological relations.

the second activity had the ability to match the objects in the class and the representations on the plan and 64.93% had

were next to other objects, such as the door, tables, and toy lockers, and what signs represented these in the plan.

responses were evaluated using a SPSS software. According to this evaluation, 86.6% of the children participating in

Question 3: In order to measure the children’s ability to identify topological relationships, we asked them what objects

Question 1: In order to measure the children’s ability to match the objects in the classroom and the representations in

plan.

Finally, we gave the children a treasure map activity. For the treasure map activity, we hid an object in a certain area in

Second Activity

In the second activity, we gave each student one classroom plan (Figure 4). We allowed the children to paint the plans
to keep their interest alive. These plans were used to measure the children’s ability to 1) match the objects in the class
and the presentations on the plan and 2) identify topological relationships.

Question 1: In order to measure the children’s ability to match the objects in the classroom and the representations in
the plan, we asked them where the door, tables, and toy lockers were in the classroom and where the same objects were
represented in the plan.

Question 2: In order to measure the children’s ability to identify topological relationships, we asked them which objects
were next to other objects, such as the door, tables, and toy lockers, and what signs represented these in the plan.

Question 3: In order to measure the children’s ability to identify topological relationships, we asked them what objects
were near the objects such as the door, tables, and toy lockers in the classroom, and what signs represented them on the
plan.

The children’s responses to these questions in this activity are given in Table 2 as correct (+) or wrong (-). The
responses were evaluated using a SPSS software. According to this evaluation, 86.6% of the children participating in
the second activity had the ability to match the objects in the class and the representations on the plan and 64.93% had
the ability to determine topological relations.

Third Activity

Finally, we gave the children a treasure map activity. For the treasure map activity, we hid an object in a certain area in
the class and the children were required to find the object using the plan from the second activity. Although the majority
of the children were in the right position, only one person could find the hidden object. The activity that encourages
children to entertain and learn the most is the treasure map activity.
CONCLUSIONS

We determined that the students who participated in the activities were the most successful in matching the objects in the class and the representations in the class plan. The reasons for this may be that the plans were abstract in a similar way to the pictures that children draw, that they have encountered a representation that they are prone to them, and that these representations are of small area that they are living in and know well. As a result, we can conclude that children can read large scale models (maps) of small areas that they are living in and know well.

We also determined that the children were less successful in matching the entities in the real world and the representations on the maps of Cyprus. In other words, as the area covered by maps grows and the scale become smaller, the children cannot read the model (i.e. the map) well. This result supports our previous conclusion.

We also found that children can determine topological relationships at almost the same level in both the places where they live and 2D/3D models (maps). This result showed us that size, dimension, and scale did not have a significant influence on the children as factors to determine topological relationships.

The results we recorded of the children matching 3D (relief) representations and 2D (planimetric) representations showed us that the children were aware that 3D objects can be displayed in 2D on a plane, which indicates that children have an understanding of the concept of projection.

We found that children were most successful at the treasure map activity and were able to reach their targets easily thanks to a map (plan). This showed us that the map was the most effective way to improve the children’s navigation skills.

Figure 4. An example of class plan used in the second activity
## Table 2. The answers given by the students in the second activity

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## REFERENCES


**BIOGRAPHY**

Halil İbrahim Şenol, BA (Yildiz Technical University, 2016), MA (Yildiz Technical University, Ongoing), is a Research Assistant in the Cartography Division, Geomatic Engineering Department, Harran University. He is currently studying about map education for children, UAV photogrammetry, geodesign and city planning. Since 2017, he has been working on the Harran University as a Research Assistant.

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