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Enhancing Map Skills in Young Children Through Guided Play: Insights from a Kindergarten Classroom in Türkiye

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ABSTRACT

This study investigates the way a kindergarten teacher implemented a three-stage project to support children's map understanding. The project, the Map and Play, was designed to help children understand the relationship between reality and its abstract representation. The guided play was adopted as the pedagogical approach because it empowers children to make independent decisions, encourages critical thinking, and offers opportunities for exploration. At the same time, adults take part in purposeful activities alongside the children. The research employed an ethnographic methodology involving classroom observations, video recordings, and interviews. Content analysis was used to explore the data sources. The results illustrated the stages taken to introduce children to the idea of map considering scientific research about how to foster map understanding. The data displays occasional mistakes made by the teacher, offering valuable insights into the dynamics of classrooms where similar activities might be introduced. The MPP was a promising experience for kindergarten children in enhancing their map reasoning and use of spatial language. Still, there is a need for teacher training to guide this complex learning process effectively.

Keywords: map understanding; spatial thinking; early childhood; teacher education; guided play

Rehberli Oyun Yoluyla Küçük Çocuklarda Harita Becerilerinin Geliştirilmesi: Türkiye'deki Bir Anaokulu Sınıfından İzlenimler

ÖZ

Bu çalışma, bir anaokulu öğretmeninin çocukların harita anlama becerileri desteklemek için üç aşamalı bir projeyi nasıl uyguladığını incelemektedir. *Harita ve Oyun* adlı proje, çocukların gerçeklik ve onun soyut temsili arasındaki ilişkiyi anlamalarına yardımcı olmak üzere tasarlanmıştır. Pedagojik yaklaşım olarak rehberli oyun benimsenmiştir çünkü bu yaklaşım çocuklara bağımsız kararlar alma yetkisi vermekte, eleştirel düşünmeyi teşvik etmekte ve keşif için fırsatlar sunmaktadır. Aynı zamanda yetişkinler de çocuklarla birlikte amaca yönelik faaliyetlerde yer almaktadır. Araştırmada sınıf gözlemleri, video kayıtları ve mülakatları içeren etnografik bir yöntem kullanılmıştır. Veri kaynaklarını keşfetmek için içerik analizi kullanılmıştır. Sonuçlar, harita anlayışının nasıl geliştirilebileceğine dair bilimsel araştırmaları göz önünde bulundurarak çocukları harita fikriyle tanıştırmak için izlenen aşamaları göstermektedir. Veriler, öğretmen tarafından zaman zaman yapılan hataları göstermekte ve benzer etkinliklerin uygulanabileceği sınıfların dinamikleri hakkında değerli bilgiler sunmaktadır. *Harita ve Oyun*, anaokulu çocukları için harita muhakemelerini ve mekânsal dil kullanımlarını geliştirmede umut verici bir deneyim olmuştur. Yine de bu karmaşık öğrenme sürecini etkili bir şekilde yönlendirmek için öğretmen eğitimine ihtiyaç vardır.

Anahtar kelimeler: harita anlama; mekânsal düşünme; erken çocukluk; öğretmen eğitimi; rehberli oyun

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INTRODUCTION

Mapping, one of the most sophisticated forms of symbolic thought, helps individuals perceive connections among the Earth's physical features on a smaller scale, easing a comprehensive understanding of these relationships (MacEachren, 1995; Plester et al., 2002). Beyond its clear and primary benefits, such as navigation, global awareness, and data management, mapping also enhances and empowers human abilities in logical reasoning, problem-solving, and spatial representation (Liben, 2008; Liben & Yekel, 1996). According to research, engagement in creating and using physical space maps significantly improves spatial thinking skills, positively influencing all areas of STEM (Atit et al., 2022; Mix & Cheng, 2012; Uttal, Miller, et al., 2013). In fact, maps, graphs and computer molecular models, along with other spatial representations, are widely used in STEM education (Hegarty, 2010). Map skills may also be transmitted to the fields of architecture and engineering (Liben, Kastens & Stevenson, 2002). Therefore, the benefits of map skills are recognized and valued by professionals.

Maps are symbolic tools that offer survey-like spatial information otherwise inaccessible to individuals (Salsa et al., 2019). This information enables them to understand spatial concepts from diverse perspectives, thereby fostering the development of their spatial skills (Davies & Uttal, 2007). The human mind sets up a connection between the physical world and its map representation—an image composed of lines and shapes—and uses this cognitive tool to refine its sense of reality. Without such a tool, children's experiences allow them to perceive their immediate surroundings to a certain extent but within defined limitations. Our perception of the physical world at any given moment is restricted by our field of vision, which enables us to understand only the part of a room or street we face. As we distance ourselves from these spaces, our understanding of their overall characteristics and boundaries broadens, even though finer details may become less distinct. This expanded viewpoint eases the resolution of specific spatial problems (Davies & Uttal, 2007). Conversely, the act of interpreting space through a symbolic tool like a map also contributes to the enhancement of spatial skills.

Research shows that children have great potential to learn map reading skills. For instance, they can relate an aerial photograph of a landscape to its objective reality by age four (Blades et al., 1998; Plester et al., 2002). They can also use maps effectively to find hidden objects in a room (Liben & Yekel, 1996). However, their comprehension still needs to be improved at this stage, requiring further practical experience. They need to recognize that the information conveyed by maps is at least as reliable as their direct observations and that these symbolic tools help solve spatial problems. Young children also have difficulty understanding the symbols on maps (Liben & Down, 1994; Liben, Kastens & Stevenson, 2002). The practice of map-making and the significance of each symbol employed originate within a cultural context and are expected to be passed down to future generations through social processes (Gauvain, 2019). Therefore, children need education to develop their map reading skills.

The importance of developing spatial skills in the early years of education is emphasized by the NCTM's Curriculum Focal Points (Schielack et al., 2006) and the Principles and Standards for School Mathematics (National Council for Teachers of Mathematics, 2000). Children from kindergarten to second grade are expected to be proficient in finding locations, understanding relationships among various locations, exploring geometric transformations, and manipulating 2D and 3D shapes (National Council for Teachers of Mathematics, 2000; Schielack et al., 2006). However, there needs to be more studies on teaching spatial skills to young children, and many preschool teachers often neglect this critical area (Gilligan-Lee et al., 2022).

Research has demonstrated that spatial skills, including mapping skills, show significant improvement through education, and interestingly, this positive effect persists over the long term (Uttal, Meadow, et al., 2013). Providing children with opportunities to improve their spatial reasoning in early childhood, when the malleability of the human mind is at its greatest, is extremely valuable (Moss et al., 2016). Therefore, activities related to using maps must be implemented in preschool education (Plester et al., 2002; Zisi et al., 2021). However, not all activities offered to children to develop their spatial skills are as practical as desired (Blades & Cooke, 1994). For children to understand the logic of map construction and to use it effectively, they need to actively reflect on how well the symbols on the map correspond to elements in the real-world environment they stand for. Hence, teachers need to know how to guide and support children as they learn how to use maps.

Despite the importance of the topic, there are very few studies on what and how teachers teach about maps in the pre-school years (Plester et al., 2002; Zisi et al., 2021). We do not know much about teachers' practices of map teaching in preschool classrooms. It appears that how teachers support children's map understanding via using research-proven activities have not yet attracted enough attention of researchers. Examining a teacher's practice in a real classroom will shed light on the methods used by teachers and will be the basis for future research.

Aim of the Study

This article presents insights from an early childhood classroom where a map project, the Map and Play Project (MPP), was implemented. The aim of this research is to analyze how the implementation of instructional activities and the teacher's conversations with the children supported children's map understanding. Sharing insights about classroom experiences in teaching spatial skills would be a significant contribution to the field since many teachers require guidance in this area (Clements & Sarama, 2011; Lee, 2017; Markovits & Patkin, 2020).

The Map and Play Project (MPP)

The MPP was carried out as part of a larger-scale professional development (PD) program to support kindergarten teachers, about how to teach spatial orientation and early map skills to young children (Koç & Koç, 2023). The PD program had several components or small projects. The MPP was one of those small projects on which a kindergarten teacher, Sema (pseudonym), received training on the content of the activity and on how to implement it.

Before participating in the MPP, the children were involved in many play-based activities. In the first stage of the PD program, teachers assessed children's spatial skills. Subsequently, they engaged in various activities tailored to their developmental level. These activities targeted skills such as active use of spatial language, spatial orientation, object location awareness, and the recognition, identification, and evaluation of objects from multiple perspectives.

Additionally, the children had opportunities to explore maps during various events, including hands-on experiences with 1:1 scale map—such as a map of a doll's room—and large-scale maps of the school playground and neighborhood. The MPP was implemented in the third month of the program. In designing guided play activities related to spatial reasoning, the authors drew upon works of Ginsburg (Ginsburg, 1997) and Clements and Sarama (Clements & Sarama, 2021).

The MPP aimed to ease children's understanding of the relationship between the concrete world and its abstract representations and to create environments that enable effective map use in daily life. In designing the project, the goal was to construct learning environments informed by scientific evidence. The settings were intended to support the acquisition of essential skills for understanding and using maps, employing simple materials and instructions that any teacher can implement in their classroom.

In this project, guided play was adopted as the pedagogical approach because it empowers children to make independent decisions, encourages critical thinking, and offers opportunities for exploration (Verdine et al., 2019; Yu et al., 2018; Zosh et al., 2018). At the same time, adults take part in purposeful activities alongside the children (Weisberg et al., 2013). This approach delivers a balanced learning experience that merges child-directed exploration with adult-guided support, enhancing the educational process (Nesbitt et al., 2023).

Ethical Statement

This study was approved by Kocaeli University Science and Engineering Sciences

Ethics Committee (approval date: 15/02/2019). All the children's parents were informed about the content of the study both orally and via written consent forms before the study began., and they all approved their children's participation in the study by signing the forms.

ACTIVITY IMPLEMENTATION

The research was designed as an ethnographic study. As a part of the PD project where the MPP was introduced, Sema met weekly with both of the authors to receive training on how to teach young children spatial skills, implemented the activities she had learned, and video recorded her teaching. The authors visited her classroom at least once a week for about five months, including her teaching period before and after the implementation of the MPP and the first author was present during the period Sema implemented all the MPP activities. All the activities were video-taped and transcribed. The authors' field notes and her conversations with Sema were also resources of the data in this research. Both authors watched the videos several times and discussed them to make sure that the interpretations were valid and reliable. Yet, the authors did not discuss them with the teacher.

The analysis examined what the children were exposed to at each stage, how the teacher guided them, what kinds of questions they asked and how well they achieved the objectives in the process.

The School

The present project was carried out in a private kindergarten in Istanbul, Türkiye. The school serves 5-year-old children from middle class families. There were two kindergarten classrooms serving about 30 children in total. In addition to other instructional materials, each classroom was equipped with a rich set of mathematics manipulatives. The authors received permission from the school administration to conduct the project.

The Teacher

Sema, a kindergarten teacher with 27 years of experience, implemented the MPP. It was her second year in that school. She held a 4-year college degree in early childhood education. She had 15 children (8 boys and 7 girls) in her room. She voluntarily participated in the MPP. The teacher and children's parents gave informed written consent.

Sema was very enthusiastic about trying new methods and teaching children the new concepts she had learned. Yet, it was somewhat challenging for her to adapt her teaching style while teaching map-related concepts. The excerpts from her conversations with children illuminated what exactly the children in her classroom were exposed to and what they learned about maps.

Stages of Implementation

This project was completed in three distinct stages. In the initial stage, with the guidance of their teachers, the children drew and cut out pictures of myriad items for map-making. The second stage involved the creation of a map depicting their classroom. In the third stage, the children played a two-person game using an avatar on the map. The project was completed within about two weeks. The teacher implemented various components of the activity daily. Either authors observed and participated in the activity once a week. About 120 minutes of classroom implementations were also videotaped and analyzed.

The First Stage: Drawing Pictures of Classroom Furniture and Objects

At this stage, the children were asked to draw pictures of classroom furniture and objects to place them on the map later (Photograph 1).

There were four main objectives in terms of the development of spatial skills:

- To support children to examine the objects closely and understand the space each object occupies and its appearance from different angles.
- To support children's visual-spatial reasoning skills
- To enable children to actively use spatial language when talking about the drawings they produce.
- To connect the natural environment to its representation to better know the objects and their places.

Photograph 1. *Drawing pictures of classroom furniture and objects*

Research shows that drawing develops visual-spatial thinking (Goldsmith et al., 2016). The child who draws a picture by looking at an object analyses the object and determines the position of each of its parts in the whole thing. For example, they pay attention to what features are on the object's right, left, top, and bottom, and how they come together, and transfer them to paper.

In this section, the activity was initiated by Sema. Each child was given a sheet of paper and a pencil to draw an object in their classroom, such as a bookshelf, a closet, or a window. Children picked their things, sat on a chair against the object they wanted to draw, carefully investigated the details of the object, and drew a picture of it (Photograph 1). Each drawing was a representation of a different classroom object. Then, they traced around the picture and cut it out.

During and after the drawing activity, Sema went up to the children one by one and asked them questions:

Sema: Can you tell me a little bit about your drawing? What are you drawing?

Child: This is the cupboard. These are the shelves. Now, I am drawing the items on the shelves.

Sema: What are the things you drew on this top shelf?

Child: I am drawing toys.

Sema: Can you tell me about the blue toy I see on the cabinet on the far left in the picture? How did you draw it?

Child: First, I drew a body, then.

As seen in this example, Sema encourages the child to use spatial language while asking questions to the child. She also enables the child to describe what they are doing and use spatial vocabulary like under, above, to the right, to the left, and between. To understand and use maps effectively, children need to have a good command of the spatial language and be able to use it effectively (Giancola et al., 2023).

When the drawing task was over, the drawings were hung on the wall. We observed children showing their drawings to each other and watching the drawings, proud to be part of this project. "This is mine!", "This is the closet I drew." Recognizing children's contributions made them emotionally involved and more committed to the activity, contributing to longer-lasting learning (Pekrun & Linnenbrink-Garcia, 2022). Besides other benefits, this experience made the map-making activity more personal for the children as they drew, signed, and cut the drawing to be placed in their classroom map.

While drawing, no guidance was given to the children. They used the A4 paper as they wished. Some children drew a picture that covered the whole paper, while others drew a picture that fit on only a quarter of the paper. Some of the pictures were even much smaller. In addition, since the developmental levels of the children were different, some drew detailed and beautiful pictures, while others' drawings were hardly like the objects they pictured. In some drawings, various parts of the object were drawn out of proportion to each other; many of them did not have smooth lines, and it wasn't easy to recognize which object it was. Thus, scaling was an issue for many of them. This would challenge them in the next stage, as they would have fun investigating what the pictures showed while deepening their understanding of the subject.

Identifying the objects and their representative pictures

The next day, the teacher distributed the pictures to the children, and they first tried to figure out which item the picture belonged to.

Children were randomly given pictures of the objects, so each one was given someone else's drawing. They wondered who the pictures in their hands belonged to. The interaction began between them. They showed each other their pictures and talked for a while.

The fact that the drawings were not perfect led the children to examine the drawings very carefully and to talk a lot among themselves. They actively used spatial language to explain to each other why they thought as they did and tried to justify their claims. The result was a rich environment for discussion and children's deep thinking about the spatial properties of objects.

The teacher then asked the children if they understood the content of the drawings: "Has everyone understood what objects are in the drawings?" Then, the teacher told them to take turns, and they shared what they had individually. Children begin looking at the picture and saying the name of the object in the picture. Then, they pointed to the same object in the classroom and explained why they thought that the picture in their hands belonged to a particular object.

The objectives for this stage were:

- To link the actual objects and their representations
- To use spatial language while talking about the drawings
- To develop reasoning skills by making connections between the pictures in their hands and objects.

The initial exchanges allowed the children to identify the objects in the classroom and determine which drawings they had on hand. The teacher initiated by asking:

Sema: Alright! What pictures do you have? Which objects?

Child 1: I have this bookshelf.

Sema: Which one?

Child 1: The one in the science corner.

Sema: How do you know?

Child 1: Because there is this red scale on top.

Child 2: I cannot figure out what I have on my paper.

Sema: What might it be?

Child 3: It looks like a window.

Sema: How do you know?

Child 3: Because it has corners and handles.

All Children: It is a window.

The teacher proceeded with more questions:

Sema: How many shelves are there in this classroom?

All Children: Three.

Sema: Who has the pictures of the shelves?

(Children with shelf drawings hold up their papers).

Sema: One, two, and three (makes a counting gesture with her finger). Good. You have all the drawings.

The teacher's above conversation allows children to look at the representation (the picture), find the original object in the classroom, and discover its location. It is an opportunity for children to begin relating the original and its representation. They also realize that an object's location is essential and distinguishes it from other objects. For example, there are three bookshelves in the classroom. They are all the same, but their locations are different. One is between the table and the smart board, the second is next to the closet, and the last is under the window. So, correctly knowing and describing objects' locations is essential for better understanding the physical world around us.

The Second Stage: Building the Class Map

At this stage, Sema guided the children to place their pictures on craft paper to form a class map. The objectives for this stage were:

- To help them understand the connections between the real world and the map
- To help them recognize that the spatial relationships between objects are represented on the map with the same accuracy.

The students sat in a circle, holding pictures of the furniture. Sema laid out a large sheet of construction paper. Following, she started asking questions to enable the children to relate the shape of the classroom to the paper spread out on the floor:

Sema: Do you notice any similarities between the shape of our classroom and this big paper on the floor?

Child 1: It looks like our classroom.

Sema: In what way is it similar?

Child 1: Our classroom is a rectangle, and the paper is a rectangle.

Sema: Do the rest of you agree with your friend?

Child 2: Yes. The floor of the classroom has four sides, and the paper also has four sides.

Child 3: That's right. The opposite sides are similar.

Sema: Exactly. Consider the paper as a representation of our classroom. You each have pictures of the items in our classroom that you drew yesterday. Today we will map our classroom on this paper. We will glue these drawings on the paper.

The children had no difficulty seeing the similarities between the classroom and the paper, as they had earlier experience with maps (Photograph 2).

Photograph 2: *Relating the classroom and the map*

Sema found landmarks before placing the pictures on the map, and the children put them on the map.

Sema: Remember that we enter the classroom through the door. Where do you think our classroom door should be placed on the map?

Child 1: (pointing to the middle of one side of the rectangular paper) The door should be here.

Child 2: No, I disagree. (Points to one corner of the paper) It should be here.

Sema: (Asks the class) What do you think? Where do you think the door should go?

Child 3: I think it should be in the corner.

Sema: Why do you think it should be in the corner?

Child 3: Because our classroom door is also in the corner.

Sema: OK. Who has the (drawing of) the door?

Child 4: (waving the drawing in his hand) I have it...

The teacher encouraged the children to explain their mental processes in connecting their classroom and the map. The question "Why is it in the corner?" serves as an example of this.

The boy brought the door drawing and put it in the corner of the paper. Now, there was a landmark. In turn, they placed the other drawings where they belonged on the map, considering their position and the distance between them:

Sema: (Walking over the Smart Board in the classroom.) Look. Here is our door. So, where is the Smart Board in relation to the door?

Child 1: Behind it. (The child makes a mistake.)

Sema: (Pointing to the blackboard and the door) Look carefully, the door is beside the blackboard.

Child 1: On the right.

Sema: Yes. The Smart Board is to the right of the door.

The teacher walks to the board.

Sema: If the Smart Board is here (pointing with her hand), where should we place it on the map?

Child 1: (points with his hand) Here, next to the door.

Sema: Yes. Come and place the picture of the Smart Board on the map.

A review of the above exchanges between the teacher and the child shows that the child needs the teacher's guidance, yet the teacher's guiding questions were not enough for the child to describe the location of the smart board concerning the door, the landmark. Note that the teacher was highly aware of using the spatial language appropriately. She encouraged children to use spatial language without showing or pointing to the location of an object. However, she sometimes used gestures rather than spatial words as well.

On the other hand, Sema does not allow the children to recognize their mistakes or discover the correct position of the pictures on the map, and she corrects the error herself. It takes time for teachers to change their habits and develop new patterns of behavior (Darling-Hammond et al., 2017). In addition, the child uses spatial vocabulary correctly and knows the concept of on his right. Although he used spatial words correctly, he needed help in describing the relationships between the objects on the map.

After the child placed the smart board image on the map, they put the other drawings on the map in turn. Children were encouraged to show the specific location of the object on the map; for example, the smart board is between the closet and the table, and the windows are on the left. They were encouraged to use the proper spatial language to decide and explain where each object should go. Children interacted with each other about the correct location of the objects. Map-making conversations provided children with a rich learning opportunity to share their spatial reasoning and reflect on what they already knew. While some children could easily decide and say the correct location of the object, the task was challenging for others.

Children often made mistakes when placing objects on the map. They had difficulty in adjusting the distance between two objects. When the children made mistakes, the teacher drew the child's attention to the actual classroom and asked them to re-evaluate the positions of the objects and their spatial relationships to each other on the map. For example, the teacher directed the child who made a mistake in placing the chair drawings on the map to the classroom:

Sema: So, where are the chairs in the classroom? Can you look at them?

Child: By the door, my teacher.

Sema: If the door is in the corner, where are the chairs and the toy boxes? Where is the door in our classroom? Where are the chairs and the containers?

When the children pointed to the objects with their hands, the teacher often described the object's location using spatial language:

Sema: Isn't that right by the door, in front of the table?

In this way, Sema encouraged the children to use spatial language. While the children recognized the teacher's emphasis on it, they still preferred to point to the objects rather than verbally describe their positions. Most young children could correctly place the drawings in their proper locations; yet, the younger children had slightly more difficulty placing the drawings on the map than their older peers. When the children finished making the map, it was hung on the wall and stayed there for a few days. The children looked at it and talked about it.

The Third Stage: **Playing Games with a Doll Avatar**

At this stage, the children sat in a circle and played a game with the map in teams of two. The game involved one person walking around the classroom while the other used a doll in his hand as an avatar of his friend, taking it to where his friend went on the map. While two children played, the others watched and commented. After three moves, it was the next team's turn. In this way, all the children took turns.

The objectives for this stage were:

- To refine children's spatial language skills in a meaningful context
- To build a strong connection between reality and external representation

Sema initiated the activity by placing the map on the floor. There were twelve children in the class. Sema informed the children that they would play a game using the map they had prepared.

Sema: How do our class and the map look like? Are they similar?

All Children: The same.

Sema: On our map, our door is on the right. Which direction is the door to our actual classroom?

Child 1: Yes, it is on the right, the same.

Sema: Where is the door? Is it behind me?

Child 1: Yes.

Sema: And where is the table? Is it on the right side as shown on the map?

Child 2: Yes, the table is on the right.

Sema: As you can see, the positions and locations of the objects on the map and in the classroom match.

Before starting the activity, the teacher tries to help the children remember the relationship between the map and the classroom. She wants them to see the connections between some objects and their representations on the map. One by one, they discussed that each item on the map has the same place in the classroom. In this introductory stage, the teacher used spatial language intensively, explaining the relationships between objects. After this stage, Sema takes a doll from the toy basket and starts the activity using the map:

Sema: Can you help me?

Child: Yes.

Sema: Now, I will walk from one place to another in the classroom and you will make this doll follow my route on the map. So, this puppet will imitate me.

(Gives the doll to the child.)

Sema: Can it go where I go? Let us look. First, I stand in front of the teacher's desk.

The child places the doll on the map on the floor in front of the teacher's desk. The other children watch closely. The teacher moves around the classroom and stops at one point. The child moves the doll on the map and takes it to the point on the map where the teacher is moving around the classroom and puts it down. The teacher moves around the classroom and stops in front of the cupboard in the corner:

Sema: Look, where am I standing? Where am I standing in relation to the cupboard? (Asks children).

All Children: You are standing with your back to the cupboard.

Sema: Yes, the cupboard is behind me.

The child places the doll in front of the cupboard on the map.

Sema: What should I do now? Should I walk to the cupboard in the opposite corner? (The teacher walks to the cupboard in the opposite corner.)

After a few more such moves, Sema decided to let the children play independently and selected two volunteers (Photograph 3). In each pair, one child moved around the classroom at will, while their partner managed the avatar. The game was played in this manner by all the children in pairs. Although a few children made some errors, it was evident that all of them thoroughly enjoyed the activity. While the children had some difficulties in the first two stages, subsequent engagement with the avatar in the final stage significantly improved their understanding, as demonstrated by a noticeable decrease in errors.

Photograph 3: *Children are playing with an avatar on the map*

The findings show that on the one hand children could correctly place their drawings on the map, on the other hand they experienced challenges in using spatial language to describe the locations and relationships among the classroom objects. The activity encouraged children’s use of spatial language, such as "next to," "behind," and "in front of." However, some of the children found pointing to objects easier than describing them verbally. Even the teacher occasionally used gestures rather than spatial words to show the positions of furniture. Additionally, there were instances where the teacher adapted a more direct instruction rather than guided play, highlighting the challenges in changing teaching routines.

CONCLUSIONS AND SUGGESTIONS

The present study is an in-depth exploration of the Map and Play Project (MPP), a guided play activity for enhancing preschool children's spatial reasoning and language skills. It was part of a larger-scale PD program for early childhood teachers and conducted in three stages: Drawing classroom objects, building a class map, and playing games with a doll avatar on the map. The first two stages of the project were more challenging for children, but they excelled in the final stage where they played in pairs with an avatar. The relatively superior performance in the final stage can be attributed to what children acquired in the first two stages. It can be deduced that although children struggled in the earlier stages, this challenge might have prepared them for the final stage.

On the other hand, while the first two stages were predominantly guided by the teacher, the last stage was more playful, and the children had more fun. After the teacher introduced the game to the children, they took turns, made independent decisions, and played almost on their own. They focused all their attention on moving the avatar according to the position of their friends. Therefore, children's excelled map skills in the final stage can also be attributed to the more playful nature of the tasks. There is scientific evidence that play facilitates concentration and learning (Critten et al., 2022; Fisher et al., 2013; Hassinger-Das et al., 2017).

This study also reveals the multidimensional and challenging nature of teaching preschool mathematics (Cerezci, 2019; Cooke & Bruns, 2018; Ginsburg & Amit, 2008). In this activity, it is evident that Sema played a significant role in assisting children to connect the tangible world with its abstract counterpart, the map. However, occasional disruptions occurred. This was the case even though Sema had been receiving regular training for about three months, and the activity had been carefully designed and monitored by the authors. It takes time for teachers to adapt new teaching techniques. Research shows that it is difficult to change a habitual behavior and develop a new one (Heimlich & Ardoin, 2008). Consequently, it would be unrealistic to expect Sema to be able to change her behavior at once after a few months of in-service training. Sema adapted the skills she learned at the training, but since it was new for her, sometimes, she involuntarily displayed her old teaching routines.

Teaching spatial skills or other fields of mathematics to young children is as difficult as teaching elementary level mathematics (Ginsburg & Amit, 2008). In some ways, it is even more difficult. Indeed, while elementary level teachers follow a prescribed curriculum, a preschool teacher decides what to teach, how to teach it, and when to teach it (Björklund et al., 2020; Cooke & Bruns, 2018). Determining the level of the students and deciding when and how to implement the content of the MPP activity or similar activities requires deep domain knowledge and experience.

It also requires time and effort for teachers to master skills such as offering suitable prompts during the activities, facilitating opportunities for children to link abstract concepts with tangible experiences, posing questions that encourage self-discovery without directly providing answers, and patiently waiting for students to think through problems.

Educators willing to integrate map use and other spatial skills into their classrooms can start by preparing small-scale activities that incorporate each of these skills and develop children's spatial skills gradually. Among these skills, the use of spatial language is a priority because research shows that the active use of spatial language plays a crucial role in recognizing and using spatial relationships (National Research Council, 2006). We therefore recommend that teachers make spatial language part of their daily conversations and encourage children to use it at every opportunity.

For example, when children go out every day, they can talk about who is in front, at the end or in the second place. Spatial language can also easily be integrated into many games. Furthermore, maps can be brought into the classroom on school trips. At every opportunity the teacher and children can talk about the significance of maps in our lives. This approach will make the process of creating a class map much more meaningful for children.

Another point is that teachers should have a solid command of the subject matter and know how to effectively support children. For example, exhibiting patience while waiting for children's responses to questions, guiding them through additional inquiries when necessary, and preparing the environment for them to solve problems independently will help children to understand the content better. Besides, teachers should acknowledge that they may make mistakes when teaching spatial skills, or any other subject matter. In fact, making minor errors is a natural part of their profession and should not prevent them from embarking on new learning adventures.

The data shows that the MPP was a promising experience for kindergarten children in enhancing their map reasoning and use of spatial language. It was also seen that the teacher's guidance and questioning strategies were essential in helping children reflect on spatial relationships (Newcombe & Frick, 2010; Trawick-Smith et al., 2015). Still, there is a need for teacher training to guide this complex learning process effectively (Clements & Sarama, 2011; Lee, 2017; Markovits & Patkin, 2020).

This article highlights how the activities implemented in this project facilitated the development of map skills in children. However, we did not collect quantitative data to report the extent of children's improvement. Future studies can employ experimental designs when implementing similar map skills programs, demonstrating the effectiveness of the interventions with quantitative data. In addition, studies exploring diverse settings and cultures will provide valuable insights and inspire educators.

The current study not only provided the teacher with guidance on enhancing spatial and mapping skills but also underscored the effort required to excel in this area. Consequently, it is essential for preschool teacher training programs to focus on equipping educators with the necessary skills to navigate the multifaceted aspects of their profession during curriculum development.

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