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Analysis of the Effect of Mind Mapping Studies on the Acquisition of the Concept of Time Among 60-72 Month-Old Children

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Abstract

This study aims to analyze the effect of mind mapping studies on the acquisition of the concept of time among 60-72 month-old children. The research was conducted with 30 children who attend a preschool in Istanbul. The Mind Mapping: Concept of Time Program was applied to 15 children in the experimental group of the study, for 12 weeks. Pre-test and post-test data for the study were gathered through the Time Concept Achievement Assessment Scale. It was found that the total post-test scores of the children in the experimental group obtained using the scale and their total post-test scores obtained from the Sub-Scales of Before-Now-After, Morning-Noon-Evening-Night, Month, Year, and Time Indicator Tools were significantly higher than those of the children in the control group. As a result of the study, it was set forth that mind mapping studies are an effective strategy for children's acquisition of the concept of time.

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INTRODUCTION

The acquisition of concepts, which are the basis of thinking and learning, begins in the first years of life and continues intensively in the preschool period (Gelman, Coley & Gottfried, 1994). Time is one of the concepts that young children cannot comprehend easily due to its abstract structure and is learned through experiences which progress from simple to complex phases. Although understanding time is an innate social skill (Kol, 2010), the maturity of the concept of time is not fully realized until adulthood (Naylor & Diem, 1987).

Studies indicate that children under 3 years old have a primitive sense of time. Babies can learn the time intervals of two events, distinguish different periods related to events and form habits (Droit-Volet, Delgado & Rattat, 2006; Droit-Volet, 2011; Droit-Volet, 2013; Provasi, Rattat & Droit-Velet, 2011). As children grow up, their responsiveness towards time increases. Freidman (1990) demonstrated that three-year-old children are successful in comparing the period of daily activities by marking a scale which extends from a very short time to a very long time. In addition, children under the age of four know that the terms of the concept of time have a common category in the dictionary. Even though children gave wrong answers to the question “How long did an event last?”, they responded by using appropriate terms of time (Shatz, Tare, Nguyen & Young, 2010). Children begin to adjust their behaviors according to time between the ages of four and six years old (Pouthas, Droit & Jacquet, 1993). Children at these ages become increasingly familiar with patterns relating to time. They can list seasons or basic daily activities in the proper way. Children at the age of seven and eight learn to list the days of the week or months of the year and start to get to know the weekly or yearly school routines as well as the daily ones (Freidman, 1990).

For children, the concept of time is shaped by personal experiences, social events and cultural terms. Personal experiences cover past, present and future. Children reveal their perception of time in their personal experiences with phrases such as “last night", “when I was younger” and “when I grow up” (Charlesworth & Lind, 2010). Being able to correlate the events in the past, in the present and in the future allows for the development of a consistent sense of self among children as well as helping them to interpret the concept of time (Michon & Jackson, 1985). With respect to social events, the concept of time is shaped within the daily order and routine. For example, children who come to school first take off their coats and hang them up, greet their teacher and then go to the activity center. They are inclined to behave in line with this layout and routine. However, the learning and interpreting of time with regard to social events require experience for children. On the other hand, cultural terms are represented by standard units of time. Although children use terms such as hour, minute, day and month in their daily speech, they can comprehend such constant terms as late as their concrete operational stage (Charlesworth & Lind, 2010). A real understanding in terms of date, time and the calendar can form only with maturity (Beneke, Ostrosky & Katz, 2008).

The development of the concept of time contain the skills such as identifying time during speech, measuring time, organizing time-dependent events and adjusting the planning period. Using terms of time may give rise to various difficulties for children whose language skills did not develop sufficiently (Tillman & Barner, 2015). Children generally use patterns of the present tense in their daily conversations. During pre-school period, mathematical skills of children, such as classification, sorting, the part–whole relationship and comparison should be supported and children should be involved in the activity processes of concepts such as before-after and past-present-future (Tillman, Marghetis, Barner & Srinivasan, 2017). In addition to this, a class diary containing field trips, play times, project work and documentations, along with a timetable showing the timing of daily activities, supports children in learning the concept of time (Dogan-Temur & Inan, 2011). It can be said that it is vital for children to receive stimuli related to time concepts from preschool period, thus they can understand the concept of time and correlate the events.

We believe that one of the important tools to be used for generating, discussing and interpreting ideas about the concept of time is mind mapping. Mind mapping is an effective technique that actively uses numerous skill regions of the brain (e.g. attention, words, numbers, logic, imagination, rhythm, pictures, lists, details, colors and spatial awareness, analyzing, establishing cause and effect relationship, planning, memory and emotions) (Buzan & Buzan, 1996; Wen-Cheng, Chung-Chieh & Ying-Chien, 2010). Mind mapping is a form of visualization in which lines, colors, numbers, pictures, symbols or key words are used to associate and integrate a concept with the former ones, and detail it (Buzan & Buzan, 1996). The visualization techniques applied in mind mapping such as colors, codes and symbols make the learning process more efficient and permanent (Buzan, 1989; Margulies, 1991). Mind maps eliminate specifically the gaps and deficiencies in the teaching of abstract concepts and by providing the opportunity to visualize the ideas it facilitates cognitive activity and recall (Hardy & Stadelhofer, 2006; Nesbit & Adesope, 2006). Furthermore, the visual structure of mind maps helps in detailing knowledge and concepts and in doing so revealing deeper facts regarding the relevant subject (Hardy & Stadelhofer, 2006).

The subject or concept to be highlighted is visualized centrally in mind maps. The main themes about the subject, which are in the form of a picture or a key word spreading as branches from the central image. Subordinate subjects are represented by being linked to upper branches. In this way, all branches generate a structure of interconnected nodes (Buzan & Buzan, 1996). Complex relationships of the concepts or themes in such a diagram are represented visually. It becomes easier to understand and recall these relationships and analyze components. Thus, while it becomes easier to represent the information, learning which was previously superficially becomes much deeper (Mayer & Gallini, 1990).

Mind mapping is a substantial technique that promotes learning skills of preschoolers (Bilasa, 2015). There are several studies which indicate that mind mapping activities support the development of children's mathematical and science skills (Polat, Aksin Yavuz & Ozkarabak Tunc, 2017), critical thinking skills (Polat & Aydın, 2020), the development of their skills of understanding what has been read, and language skills (Koster, van der Wilt, van Kuriustum & van der Veen, 2017; van der Veen, van der Wilt & Boerma, 2018), value acquisition (Polat & Aydın, 2021) and of their attention skills (Daghistan, 2016). Even though there have been various studies revealing the positive effects of mind mapping on different skills of preschoolers, studies analyzing the effectiveness of mind mapping on children's acquisition of the concept of time have not been conducted. Mind maps present a deeper and more permanent understanding by assisting children in the embodiment of abstract concepts, so we believe that they will affect children's acquisition of the concept of time in a positive way. In the literature, the limited number of the mind mapping studies performed with preschoolers, stands out. Based on these reasons, this research aims to analyze the effect of mind mapping studies on the acquisition of the concept of time among 60-72 month-old children. In line with this, the hypotheses to be tested as follows:

H0 (null hypothesis): There is no improvement in time concept [sub-scale/total] scores for children in the treatment group following participation in a mind mapping intervention, when compared to the scores of children in the control group.

H1 (alternative hypothesis): Children in the treatment group show increased time concept [sub-scale/total] scores following participation in a mind mapping intervention, when compared to the scores of children in the control group.

METHOD

RESEARCH DESIGN

In the study, an experimental design with pre-test post-test control group was used to examine the effect of mind mapping on children's acquisition of concept of time (Büyüköztürk, 2016a). The

research was designed using a 2x2 mixed pattern. As part of this design, the first factor indicates the independent process groups (1 experimental group and 1 control group) while the other factor indicates the repetitive measurements of the dependent variable (pre-test and post-test). In line with this, the acquisition of the concept of time among the children in the experimental group subjected to mind mapping, and the children in the control group who continued with the existing curriculum were assessed.

A private preschool in Istanbul whose teachers received mind mapping training made up the work group of the study. The work group was chosen from preschool teachers who attended mind mapping training given by the researchers and who stated that they wanted to carry out mind mapping activities with children in their institution and requested guidance for this. After the request from school management and teaching staff, the researchers met the teachers and introduce the "Concept of Time" program. The concept of time is abstract, hence the study was limited to only 60-72 month-old children, considering their development. The mean age of the children in the control and experimental groups were 63.13 and 63.06, respectively. The income status indicated by the families of all children was described as middle and high level. The distribution of the children in the work group by experimental and control groups is shown in Table 1.

Table 1. *Distribution of the Children in Work Group by Experimental and Control Groups*

	Gender		
Groups	Male	Female	Total
Experimental	7	8	15
Control	9	6	15
Total	16	14	30

In Table 1, the children in the experimental and control groups and their distribution by gender are shown. As can be seen, in the experimental group there were 7 males and 8 females and in the control group there were 9 males and 6 females. Each of the experimental and control groups contained 15 children each. The study was conducted with 30 children.

DATA COLLECTION TOOLS

Time Concept Achievement Assessment Scale

A total of 72 questions were included in the scale developed by Kurtuluş (1999). The scale comprises of 19 questions for time related listing skills, 36 questions for classification and sorting of units of time and 17 questions for evaluating skills of using the time indicator tools. As a result of the evaluations made to test the validity and reliability of the measurement tool, it was agreed that 4 items from the measurement tools would be excluded and a change in the sub-dimension of an item Thus, the total number of questions was reduced to 68. The final composition of the scale is as follows: 14 questions for time-wise sorting skills, 37 questions for classification and sorting of time units and 17 questions for evaluating skills of using the time indicator tools. Cronbach's alpha internal consistency coefficient of the scale was determined as .95 while consistency of the test-retest performed with 30 children was calculated as .98 (Kurtuluş, 1999).

DATA COLLECTION PROCESS

The research process began with the pre-test practice performed after getting the necessary permissions for using the scale and consent from the families. Researchers gave training to class teachers for the application of the TCAAS. Later the researcher monitored the practices made with 3 children out of the school who were contacted, by each teacher and provided feedback on their evaluation. In this way, measurements regarding the differences which may arise during the application of the scale were taken and the necessary feedback were shared with the teachers to ensure their standard performance. In the middle of October in the 2018-2019 academic year, "Mind

Mapping: Concept of Time Program" developed for 60-72 month-old children was started following the practices of the Time Concept Achievement Assessment scale which was carried out by the teacher of each class and lasted one week.

Mind Mapping: Concept of Time Program

The activities related to the relevant concept of the week were planned and implemented by class teachers after the completion of pre-tests. These activities which were for both experimental and control groups would be performed for 12 weeks for four days a week. Each activity would take 30 minutes. On day five, the experimental group carried out a mind mapping activity while a work sheet was given to the control group. Table 2 contains information on the weeks and goals of the application, and the activities performed.

Table 2. *Mind Mapping: Frame of the Concept of Time Program*

Week	Goal	Group	Application
Week 1	Comprehension of the mind mapping method	Experimental group	Class schedule Mind mapping activity
		Control group	Class schedule
Week 2	Use of before-now-after concepts according to their meanings	Experimental group	Class schedule Day 1 Games Activities Day 2 Turkish Day 3 Experiment Day 4 Math Day 5 Mind Mapping
		Control group	Class schedule Day 5 Work Sheet
Week 3	Use of yesterday-today concepts according to their meanings	Experimental group	Class schedule Day 1 Turkish Day 2 Drama Day 3 Observation Day 4 Math Day 5 Mind Mapping
		Control group	Class schedule Day 5 Work Sheet
Week 4	Use of morning-noon-evening-night concepts according to their meanings	Experimental group	Class schedule Day 1 Play-Activity Day 2 Turkish Day 3 Observation Day 4 Math Day 5 Mind Mapping
		Control group	Class schedule Day 5 Work Sheet
Week 5	Use of the concept of day according to its meaning	Experimental group	Class schedule Day 1 Observation Day 2 Turkish Day 3 Art Day 4 Science

		Control group	Day 5 Mind Mapping Class schedule Day 5 Work Sheet
Week 6	Proper use of the days of the week and related concepts	Experimental group	Class schedule Day 1 Turkish Day 2 Drama Day 3 Games Day 4 Math Day 5 Mind Mapping
		Control group	Class schedule Day 5 Work Sheet
Week 7	Recognition of months and proper use of related concepts	Experimental group	Class schedule Day 1 Turkish Day 2 Drama Day 3 Games Day 4 Math Day 5 Mind Mapping
		Control group	Class schedule Day 5 Work Sheet
Week 8	Recognition of seasons and proper use of related concepts	Experimental group	Class schedule Day 1 Observation Day 2 Turkish Day 3 Experiment Day 4 Drama Day 5 Mind Mapping
		Control group	Class schedule Day 5 Work Sheet
Week 9	Use of the concept of year and correct use according to its meaning	Experimental group	Class schedule Day 1 Turkish Day 2 Games Day 3 Drama Day 4 Math Day 5 Mind Mapping
		Control group	Class schedule Day 5 Work Sheet
Week 10	Recognition of the time indicator tools and areas they would be used	Experimental group	Class schedule Day 1 Games Day 2 Turkish Day 3 Drama Day 4 Math Day 5 Mind Mapping
		Control group	Class schedule Day 5 Work Sheet

Week 11	Proper use of the time indicator tools	Experimental group	Class schedule Day 1 Games Day 2 Turkish Day 3 Science Day 4 Maths Day 5 Mind Mapping
		Control group	Class schedule Day 5 Work Sheet
Week 12	Repeated practices of the concept of time	Experimental group	Class schedule Day 1 Games -Activities-Activity Day 2 Turkish Day 3 Drama Day 4 Maths Day 5 Mind Mapping
		Control group	Class schedule Day 5 Work Sheet

As is seen in Table 2, the rules of carrying out large group mind mapping were explained to the children in a session, which the experimental group and the researcher participated in in week one. Mind mapping was carried out collectively in this session. A total of four large group mind mapping activities were carried out twice a week in order to teach mind mapping to children. As part of the time related themes, the same activities were conducted with children in the experimental and control groups for 30 minutes, four days a week beginning from week two. Day five was reserved for the individual mind mapping activities about the concept focused by the experimental group (Figure 1, Figure 2).

Figure 1. *Mind Mapping Activity Themed Seasons*

In individual mind mapping processes of the children, their teacher guided them by writing what they drew below their pictures. However, the teacher did not give any direction to children. In control group, individual work sheets regarding the concept focused were provided to the children.

After reading the instructions, the class did not direct the individual work of the children. Instead, they were expected to complete them by themselves.

Following the activities on sub-dimensions of the concepts of time performed for 11 weeks, the program was finalized with the repeated activities about the concept of time in week 12. TCAAS post-test was implemented by teachers of both the experimental and control groups upon completion of the program. Once the study was over, the children in the control group were subjected to mind mapping activities as part of the same program.

Figure 1. *Mind Mapping Activity Themed Days of the Week*

DATA ANALYSIS

Data sets were generated by carrying out the necessary coding in the analysis of data obtained from the study. The distribution of data was examined through an appropriate statistical package program. A homogeneous distribution was detected. For this reason, it was decided to use nonparametric comparison techniques. Comparisons were made using the Mann Whitney-U Test with the aim of testing whether or not the scores attained from the experimental and control groups, which are two unrelated work groups, differ (Büyüköztürk, 2016b). Furthermore, the Wilcoxon Signed Rank Test was applied in the comparisons to test significance of the difference between the scores of the two measurement sets (pre-test and post-test) in the experimental group and the scores of the two measurement sets (pre-test and post-test) in the control group (Büyüközürk, 2016b).

FINDINGS

The results of the Mann Whitney-U Test, performed to test the significance of the difference in scores of TCAAS's Sub-Scales between the experimental and control groups, are provided in Table 3.

According to Table 3, the pre-tests scores of the Before-Now-After Sub-Scale (u=78.50; p>0.05), Yesterday-Today Sub-Scale (u=97.50; p>0.05), Morning-Noon-Evening-Night Sub-Scale (u=67.50; p<0.05), Day Sub-Scale (u=96.00; p>0.05), Week Sub-Scale (u=100.50; p>0.05), Month Sub-Scale (u=102.00; p>0.05), Season Sub-Scale (u=91.50; p>0.05), Year Sub-Scale (u=100.50; p>0.05), Time Indicator Tools Sub-Scale (u=112.50; p>0.05), and the Time Indicator Tools Usage Sub-Scale (u=87.00; p>0.05) obtained from the experimental and control groups do not differ significantly.

Table 4. *Results of Wilcoxon Signed Rank Test for Pre-test and Post-test Scores of TCAAS's Sub-Scales*

		Ranks	N	Mean Ranking	Total Ranking	Z	p
Before-Now-After Sub-Scale							
Experimental	Post-test	Negative S.	0	0.00	0.00		
	Pre-test	Positive S.	12	6.50	78.00	-3.13	0.02
		Equal	3				
		Total	15				
Control	Post-test	Negative S.	2	4.75	9.50		
	Pre-test	Positive S.	5	3.70	18.50	-0.78	0.49
		Equal	8				
		Total	15				
Yesterday-Today Sub-Scale							
Experimental	Post-test	Negative S.	0	0.00	0.00		
	Pre-test	Positive S.	6	3.50	21.00	-2.45	0.01
		Equal	9				
		Total	15				
Control	Post-test	Negative S.	2	5.00	10.00		
	Pre-test	Positive S.	5	3.60	18.00	-0.70	0.48
		Equal	8				
		Total	15				
Morning-Noon-Evening-Night Sub-Scale							
Experimental	Post-test	Negative S.	0	.00	.00	-2.45	0.01
	Pre-test	Positive S.	6	3.50	21.00		
		Equal	9				
		Total	15				
Control	Post-test	Negative S.	3	4.33	13.00	-5.40	0.59
	Pre-test	Positive S.	3	2.67	8.00		
		Equal	9				
		Total	15				
Day Sub-Scale							
Experimental	Post-test	Negative S.	5	5.80	29.00	-0.36	0.72
	Pre-test	Positive S.	6	6.17	37.00		
		Equal	4				
		Total	15				
Control	Post-test	Negative S.	5	4.60	23.00	-0.72	0.47
	Pre-test	Positive S.	3	4.33	13.00		
		Equal	7				
		Total	15				
Week Sub-Scale							
Experimental	Post-test	Negative S.	1	3.00	3.00	-1.24	0.22
	Pre-test	Positive S.	4	3.00	12.00		
		Equal	10				
		Total	15				

Control	Post-test	Negative S.	2	2.50	5.00	-0.00	1.00
	Pre-test	Positive S.	2	2.50	5.00		
		Equal	11				
		Total	15				
Month Sub-Scale							
Experimental	Post-test	Negative S.	0	.00	.00	-3.30	0.00
	Pre-test	Positive S.	14	7.50	105.00		
		Equal	1				
		Total	15				
Control	Post-test	Negative S.	6	7.33	44.00	-0.11	0.93
	Pre-test	Positive S.	7	6.71	47.00		
		Equal	2				
		Total	15				
Season Sub-Scale							
Experimental	Post-test	Negative S.	1	6.50	6.50	-1.32	0.19
	Pre-test	Positive S.	6	3.58	21.50		
		Equal	8				
		Total	15				
Control	Post-test	Negative S.	1	2.00	2.00	-0.48	0.66
	Pre-test	Positive S.	1	1.00	1.00		
		Equal	13				
		Total	15				
Year Sub-Scale							
Experimental	Post-test	Negative S.	0	.00	.00	-2.89	0.00
	Pre-test	Positive S.	10	5.50	55.00		
		Equal	5				
		Total	15				
Control	Post-test	Negative S.	3	3.67	11.00	-0.52	0.60
	Pre-test	Positive S.	4	4.25	17.00		
		Equal	8				
		Total	15				
Time Indicator Tools Sub-Scale							
Experimental	Post-test	Negative S.	0	.00	.00	-3.09	0.00
	Pre-test	Positive S.	12	6.50	78.00		
		Equal	3				
		Total	15				
Control	Post-test	Negative S.	2	1.50	3.00	-1.41	0.16
	Pre-test	Positive S.	0	.00	.00		
		Equal	13				
		Total	15				
Time Indicator Tools Usage Sub-Scale							
Experimental	Post-test	Negative S.	1	6.50	6.50	-3.05	0.00
	Pre-test	Positive S.	14	8.11	113.50		

		Equal	0				
		Total	15				
Control	Post-test	Negative S.	1	2.00	2.00	-1.13	0.26
	Pre-test	Positive S.	3	2.67	8.00		
		Equal	11				
		Total	15				

As is seen in Table 4, there is a significant difference between the pre-test and post-test scores of the experimental group for the Before-Now-After Sub-Scale (z=-3.13; p<0.05), Yesterday-Today Sub-Scale (z=-2.45; p<0.01), Morning-Noon-Evening-Night Sub-Scale (z=-2.45; p<0.01), Month Sub-Scale (z=-3.30; p<0.05), Year Sub-Scale (z=-2.89; p<0.05), Time Indicator Tools Sub-Scale (z=-3.09; p<0.01), and the Time Indicator Tools Usage Sub-Scale (z=-3.05; p<0.01). However, a significant difference between the pre-test and post-test scores of the control group for Before-Now-After Sub-Scale (z=-0.78; p>0.05), Yesterday-Today Sub-Scale (z=-0.70; p>0.05), Morning-Noon-Evening-Night Sub-Scale (z=-5.40; p>0.05), Month Sub-Scale (z=-0.11; p>0.05), Year Sub-Scale (z=-0.52; p>0.05), Time Indicator Tools Sub-Scale (z=-1.41; p>0.05), and the Time Indicator Tools Usage Sub-Scale (z=-1.13; p>0.05) could not be found.

According to Table 4, there is not significant difference between the pre-test and post-test scores of the experimental group for the Day Sub-Scale (z=-0.36; p>0.05), Week Sub-Scale (z=-1.24; p>0.05), and the Season Sub-Scale (z=-1.32; p>0.05). Similarly, it is seen that there is not a significant difference between the pre-test and post-test scores of the control group for the Day Sub-Scale (z=-0.72; p>0.05), Week Sub-Scale (z=-0.00; p>0.05), and the Season Sub-Scale (z=-0.48; p>0.05).

The results of the Mann Whitney-U Test performed to test the significance of the difference in total TCAAS scores obtained from the Time Concept Achievement Scale between the experimental and control groups are provided in Table 5.

Table 5. *Results of the Mann Whitney-U Test for the Total Scores of the Time Concept Achievement Scale*

		N	Mean Ranking	Total Ranking	U	Z	p
Pre-test	Experimental	15	15.47	232.00			
	Control	15	15.53	233.00	112.00	-0.02	0.98
	Total	30					
Post-test	Experimental	15	22.53	338.00			
	Control	15	8.47	127.00	7.00	-4.38	0.00
	Total	30					

According to Table 5, the scores of the Time Indicator Tools Usage Sub-Scale obtained by the experimental and control groups in the pre-tests do not differ significantly (u=112.00; p>0.05). However, it was seen that the post-test scores received from the sub-scale differ significantly and the difference was in favor of the experimental group (u=7.00; p<0.01).

The results of the Wilcoxon Signed Rank Test made to test the significance of the difference in the TCAAS pre-test and post-test scores between the experimental and control groups are given in Table 6.

Table 6. *Results of the Wilcoxon Signed Rank Test for the Total Scores of the Time Concept Achievement Scale*

	Score	Ranks	N	Mean Ranking	Total Ranking	Z	p
Experimental	Post-test	Negative S.	1	1.00	1.00	-3.35	0.00
	Pre-test	Positive S.	14	8.50	119.00		
		Equal	0				
		Total	15				
Control	Post-test	Negative S.	5	10.30	51.50	-4.49	0.63
	Pre-test	Positive S.	10	6.85	68.50		
		Equal	0				
		Total	15				

As is seen in Table 6, there is a significant difference between the total pre-test and post-test scores of the TCAAS for the experimental group ($z=-3.35$; $p<0.01$). However, a significant difference between the total pre-test and post-test scores of the control group could not be found ($z=-4.49$; $p>0.05$).

DISCUSSION, CONCLUSION AND IMPLICATIONS

The present study aims to examine the effect of mind mapping studies on the acquisition of the concept of time among 60-72 month-old children. In this section, we discuss the present interpretations of the main findings, and make suggestions for policy and practice. The results of the research reveal that the Mind Mapping: Concept of Time Program generated a positive and significant difference in children on the acquisition of the concept of time.

In the study, it was concluded that mean scores of the experimental group obtained from the concepts of before-now-after, morning-noon-evening-night, month, year and time indicator tools were significantly higher than those of the control group. In literature, it is specified that children aged three or four can understand that a day consists of morning, noon, evening and night (Smith, 1997). Children aged between four and seven use “before, after, now and later” words to interpret the concepts of beginning, past, present and future (Simchowitz, 1995). However, the children aged about five may have difficulty in deciding whether or an event happened a few months after or one year before (Freidman, 1991). At this point, it can be said that the mind mapping activities performed, support children in using these concepts. Concrete thoughts about time indicator tools such as watches and calendars are formed between the age of six and eight (Freeman, Lehman & Scharer, 1999). Based on the results of this study, it can be stated that the mind mapping studies conducted to promote the concepts of time support the skills of using the time indicator tools among 60-72 month-old children.

In the study, it was concluded that a significant difference between the post-test scores of the experimental and control groups obtained from yesterday and today concepts did not form. Yesterday and today are thought to be the concepts which are most heard by children in their daily social lives. Children should comprehend the transformation and continuity of the day to understand concepts such as, today and tomorrow. However, it is known that children use time-related sentences used in early childhood education by their teachers such as “see you tomorrow”, “we’ll go for a picnic today” or “bring an apple tomorrow”, and it is such expressions help them learn concepts of time (Smith, 1997). On the basis of this information, the children who took part in this study are thought to frequently witness the use of yesterday and tomorrow concepts in daily life.

As a result of this study, it was found out that there is not a significant difference in terms of day, week and season concepts between the pre-test and post-test scores within both the experimental and control groups. According to the researcher, this fact may arise from the weekly

curriculum of the preschool included alongside the study. The curriculum of the school contains an activity type determined for each day of the week. For example, Monday and Tuesday were specified as toy day and chess day, respectively. Thus, children can follow the days according to the related activity type. However, it was observed that children usually come across concepts related to the seasons, through the materials and practices in class, included in the existing school curriculum. In this respect, it is thought that children have experiences with seasons, weeks and week days, so therefore, the pre-test and post-test results did not differ significantly.

According to the last finding of the study, the total post-test scores of the experimental group obtained from the Time Concept Achievement Assessment Scale are significantly higher than those of the control group. Various studies in literature indicated the effect of the curriculum supported with different approaches on children's acquisition of the concept of time. The effect of the three-week educational toys program supported with enhanced play materials, on the concept development of preschoolers was examined in a study carried out by Çelik (2005). As a result of the study, it was revealed that there was a significant increase in the skills of the children attending the program in terms of temporal sequencing, classification of time units and using the tools that show time. Yılmaz (2005) proved that a creative activity program which contains duration, before-now-after, morning-evening, yesterday-today-tomorrow, week, month, season, year, calendar and hour dimensions of the concept of time supports children's skills in terms of temporal sequencing, classification of time units and using the tools that show time. A study by Çeliköz and Kol (2016) found that the use of computer-aided instruction is an effective technique for children aged six to acquire the concepts of time and space. In a study by Ergişi Birgül et.al. (2017), it was concluded that the activities prepared on the basis of concepts of time influences children's perception of the concept of time in a positive way. It can be said, based on such studies, that different educational approaches affect the support in learning the concept of time. In this study, the mind mapping technique had an effect on the acquisition of the concept of time.

It was set forth in the research that mind mapping studies generated a positive and significant difference in children's acquisition of the concept of time. By means of mind mapping, children can make correlations between their past learning experiences and the existing materials (Long & Carlson, 2011) and can organize the learning process by recalling the former learning reflections (Wheeldon, 2011). In this context, it can be said that mind mapping activities enable children to correlate past and present, thereby promoting their acquisition of the concept of time. Literature does not contain any studies which examine the effect of mind mapping studies on young children's acquisition of the concept of time. However, Loc & Loc (2020) revealed that mind mapping studies increase the mathematical skills of secondary school students towards the concept of time. These results show that the mind mapping technique increases the knowledge and skills about the concept of time in different age groups.

Mind mapping enables individuals to materialize the associations of ideas about a subject or concept in his/her mind and allow for correlating of the new ideas with their existing knowledge. Mind mapping activities are an entertaining note-taking technique that promotes creativity, both for adults and children. Children develop their memory skills as well as their imagination during mind mapping activities. In such activities, the ideas that children have in their minds deepen, and relationships, concepts and symbols regarding the focus subject are produced. For these reasons, it is thought that the application of mind mapping activities is a useful strategy during the preschool period.

This study contributes to the current knowledge by asserting that mind mapping activities have a positive effect on the acquisition of the concept of time among 60-72 month-old children. We, therefore, recommend the following to researchers and educators:

- In literature, it is stated that mind mapping activities promote various developmental skills in children. To effectively use the mind mapping technique as an educational or assessment

method, teachers first should have sufficient knowledge and skills about mind mapping. Therefore, providing the required training to teachers is suggested.

- In literature, the very limited numbers of mind mapping studies performed with preschoolers stands out. It is thought that mind mapping activities promote a wide variety of skills among children. Hence, we believe that the studies which analyze the effect of mind mapping studies on different skills of young children should be increased.
- Research should be increased in order to reveal how children interpret and structure the mind mapping process, through qualitative studies which allow for the deep analysis of children's experiences.

Limitations

The study is limited with the working group. Another limitation is that monitoring tests could not be conducted, because sufficient time was not left for children to comprehend the mind mapping practices, complete the practices and perform the monitoring test. Furthermore, the data which can be presented as findings for the study about the training provided to teachers could not be collected, although teachers gave positive feedback, and the feedback which would contribute to the results of the study could not be included.

AUTHOR CONTRIBUTION

-First author have made substantial contributions to conception and design, analysis and interpretation of data, and given final approval of the version to be published
-The second author have made acquisition and analysis of data, and been involved in drafting the manuscript
-The third author have been involved in drafting the manuscript and given final approval of the version to be published

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