



Uşak Üniversitesi Eğitim Araştırmaları Dergisi
Usak University Journal of Educational Research
<https://dergipark.org.tr/tr/pub/usakead>
e-ISSN: 2149-9985



Research Article

An Investigation of Thinking Skills in Preschool Children

Dilek Ünal Demir^{1*}, Vedat Bayraktar²

¹Ministry of National Education, Ankara, Türkiye, unaldilek97@gmail.com, ORCID ID: 0000-0002-3656-9122

²Gazi University, Ankara, Türkiye, vbayraktar@gazi.edu.tr, ORCID ID: 0000-0003-1076-4736

Article History

Received : 29.04.2025

Revised : 19.08.2025

Accepted : 20.08.2025

Keywords

Preschool Education

Thinking

Thinking Skills

Abstract

The study was conducted to examine the thinking skills of preschool children according to various variables. The survey model, which is one of the quantitative research methods, was used in the research. A total of 146 children constituted the study group. In the research, the "Thinking Scale for Children in Early Childhood (60-72 Months)" was used as a data collection tool to measure children's thinking skills, and a personal information form containing information about children's and parents' demographic characteristics was used. A data analysis program was used to analyze the data obtained in the study. In the analysis of the data, t-test, one-way analysis of variance (ANOVA) and Tukey-B multiple comparison test was used for intergroup differences. No significant difference was found in all sub-dimensions of the thinking towards children scale according to gender variable. According to the mother's level of education, there was a significant difference in the analogy, classification, following instructions and knowledge sub-dimensions of the thinking towards children scale, but no significant differences were found in the other sub-dimensions. While there was a significant difference in the analogy, classification, similarities, differences, sorting and knowledge dimensions according to the level of father's education, there was no significant difference in the other sub-dimensions. According to the number of siblings, there was a significant difference only in the irrationality sub-dimension of the thinking scale for children.

Okul Öncesi Eğitim Alan Çocukların Düşünme Becerilerinin İncelenmesi

Makale Geçmişi

Alındı : 29.04.2025

Düzeltildi : 19.08.2025

Kabul Edildi: 20.08.2025

Anahtar Kelimeler

Okul Öncesi Eğitim

Düşünme

Düşünme Becerileri

Öz

Çalışma, okul öncesi dönem çocuklarının düşünme becerilerini çeşitli değişkenlere göre incelemek amacıyla yapılmıştır. Araştırmada nicel araştırma yöntemlerinden biri olan tarama modeli kullanılmıştır. Toplam 146 çocuk çalışma grubunu oluşturmuştur. Çalışma grubunun belirlenmesinde kolay ulaşılabilir örnekleme yöntemi kullanılmıştır. Araştırmada veri toplama aracı olarak çocukların düşünme becerilerini ölçmek amacıyla "Erken Çocukluk Dönemindeki (60-72 Ay) Çocuklar İçin Düşünme Ölçeği", çocukların ve ebeveynlerin demografik özelliklerine ilişkin bilgileri içeren kişisel bilgi formu kullanılmıştır. Araştırmada elde edilen verilerin analizinde bir veri analiz programı kullanılmıştır. Verilerin analizinde t-testi, tek yönlü varyans analizi (ANOVA) ve gruplar arası farklılıklar için Tukey-B çoklu karşılaştırma testi kullanılmıştır. Cinsiyet değişkenine göre çocuğa yönelik düşünce ölçeğinin tüm alt boyutlarında anlamlı bir farklılık bulunmamıştır. Anne eğitim düzeyine göre çocuğa yönelik düşünce ölçeğinin benzetme, sınıflandırma, yönergeleri takip etme ve bilgi alt boyutlarında anlamlı bir fark bulunurken; diğer alt boyutlarda anlamlı bir fark bulunmamıştır. Baba eğitim düzeyine göre benzetme, sınıflandırma, benzerlikler, farklılıklar, sıralama ve bilgi boyutlarında anlamlı bir fark bulunurken; diğer alt boyutlarda anlamlı bir fark bulunmamıştır.



OPEN ACCESS



CrossMark



*Corresponding Author: vbayraktar@gazi.edu.tr

Introduction

The preschool period is an important period in child development. The foundation of children's future knowledge, skills, habits, and attitudes is laid during this period through their experiences (Bayraktar, 2016; Preidyte, 2025). During this period, children are open to learning, new experiences, and self-improvement. For this reason, understanding the skills they need to acquire in the preschool years and being aware of their competencies allow them to be consciously supported (Erşahin Şafak, 2016). One of the most important skills they need to develop during this period is the ability to think. The ability to think enables people to control and direct their own lives. In other words, it gives individuals the responsibility of shaping their future as they wish (Tuğrul, 2006).

The most important feature that distinguishes humans from other living beings is their ability to think. The ability to think enables humans to control their own lives and give direction to their lives. In other words, the ability to think gives humans the responsibility to shape their future as they wish (Başarer, 2021; Heyes, 2012).

In terms of cognitive development, one of the most important skills to be developed in preschool children is thinking skills. Thinking is a sub-dimension of learning and directly affects the learning process (Bilgiç, 2010; Cano-Garcia & Hughes, 2000; Çubukçu, 2004). Thinking is unique to humans, everyone thinks, but it is important for everyone to know the right way of thinking (Ennis, 2011; Pithers & Soden, 2000). Processes related to thinking skills are the capacity to think consciously in order to achieve one's goals. These processes include expressing thoughts in words, planning, imagining, generating hypotheses, remembering, questioning, and establishing cause-and-effect relationships (Fisher, 2013). The preschool period is considered important in the acquisition of thinking skills. For this reason, it is necessary to lay the foundations of correct thinking skills in the preschool period. In the literature, it is seen that theorists address the thought development of preschool children with different approaches. During this period, creative thinking and critical thinking skills stand out among children's thinking abilities (Butterworth & Thwaites, 2013; Robson & Hargreaves, 2007; Şahin & Akman, 2018).

Studies in the field of education acknowledge that creative thinking is a fundamental and critical skill in life. Creativity is vital for coping with the constant demands of ever-changing living and working conditions. Creative thinking skills in children enable them to find innovative solutions, overcome challenges, develop self-confidence and courage, and enrich their experiences and knowledge of the world around them (Nurjanah et al., 2024; Suharyat et al., 2023). Creative thinking skills are very important aspect of preschool children's development. Creative thinking influences a child's cognitive development and shapes their personality and independence (Dilshod, 2019).

In the literature, it is generally seen that being able to think correctly is associated with critical thinking (Pithers & Soden, 2000). Critical thinking is acknowledged as a 21st century skill that allows humans to make considered and informed decisions based on the information available to them (O'Reilly et al., 2022). Critical thinking is defined as using mental processes in decision making and problem solving (Sternberg, 1997), making realistic judgments (Facione, 1990), and thinking with logic or reasoning, or judgment (Paul & Elder, 2012; Ruggerio, 2019). Critical thinking is often considered under creative thinking (Vincent-Lancrin et al., 2019). In fact, creative thinking and critical thinking are intertwined (O'Reilly et al., 2022).

It is becoming increasingly important for individuals to possess critical thinking skills. In this context, it is important to consider how these skills can be imparted to individuals. Maturity alone is not considered sufficient for the development of these skills; environmental factors are also emphasized as important in this regard (Tozduman Yaralı, 2019). From this perspective, critical thinking is considered a matter of mental habits (Ruggerio, 2019). Mental habits are internalized thinking models and skill sets that individuals resort to when faced with events or situations that require decisions and actions (Costa & Kallick, 2002). Mental habits not only involve the ability to determine when and which problem-solving skills and attitudes to use, but also the tendency to use them when a situation requires a solution or answer that is not easily found (Schallock, 2020; Yang et al., 2025). For this reason, it is considered important to develop critical thinking into a mental habit.

Critical thinking is a skill that can be developed at any age (Ruggiero, 2019). However, critical thinking develops over a long period of time. Therefore, it is very important to lay the foundations for critical thinking in early childhood (Facione, 2019). From a developmental perspective, each experience builds on the previous one. As a higher-order thinking skill, the foundations of critical thinking are also based on the basic thinking skills acquired in early childhood (Nosich, 2016). Studies argue that children's critical thinking skills can be supported through various methods and approaches (Aubrey et al., 2012; Fernández-Santín & Feliu-Torruell, 2020; Tozduman Yaralı & Güngör Aytaç, 2021). In this context, it is crucial that teachers not only serve as role models for critical thinkers but also create conducive environments for children (Lewis & Smith, 1993; Tozduman Yaralı & Ozkan Kunduracı, 2024).

The preschool period is very important in terms of laying the foundation for children's thinking skills and developing them. Adults can support children and facilitate their thinking so that their thinking skills develop in the desired direction. In addition, adults can create learning environments that encourage children to discuss different perspectives and stimulate thinking processes that facilitate this process. The family factor can be quite decisive in the development of thinking skills in preschool children (Ünal Demir, 2023). The family is where a child's first learning experiences take place. The foundation of a child's beliefs, attitudes, and behaviors is laid in the family. As in other areas of development, parents' attitudes and behaviors are highly influential in a child's cognitive development (Gander & Gardiner, 2015; Piaget, 1952).

The attitudes of parents that children are exposed to in their environment form the basis of their future relationships with the outside world (Bayraktar & Özçelik Öğretir, 2019). A study conducted by Karasan (2015) found a relationship between parents' attitudes and thinking styles. In this context, it can be said that this will affect the child's thinking processes. Thinking styles are decisive in the use of the skills and knowledge that individuals possess. Thinking styles affect all activities that individuals carry out in their daily lives. In this context, it can be said that they also affect parents' child-rearing behaviors (Buluş, 2005). Therefore, for parents to effectively support their children's thinking skills, they need to be aware of what these skills are and how they can be developed.

In addition, children's critical and creative thinking skills can be developed through various educational practices. These practices should encourage children to think, question, generate new ideas, and express their ideas in accordance with their developmental level (Polat & Aydın, 2020). Preschool children who have acquired thinking skills can evaluate arguments and conclusions and recognize assumptions and situations in everyday life (Özden, 2024). In the study conducted by Polat and Aydın (2020), it was stated that children's critical thinking skills could be improved with individual mind mapping. In addition, the 2024 Preschool Education Program also includes the principle of developing children's cognitive flexibility, critical thinking and creative skills, imagination and metacognitive skills. This emphasis highlights that the support of children's thinking skills during the preschool period is important (Ministry of National Education [MoNE] 2024).

Considering the studies conducted during the preschool period, it is evident that the number of studies on children's thinking skills is limited in our country (Akar Genç, 2014; Can Yaşar & Aral, 2010; Dağlıoğlu & Çakır, 2007, Ezmeçi & Akman, 2016, Gök Çolak, 2021, Karadağ et al., 2017, Mutlu, 2010; Pekdoğan, 2015; Ünal & Aral, 2014; Ünal Demir, 2023). In addition, studies in the literature emphasized the limitations of the studies on thinking education in preschool period (Kanlıpıçak, 2022; Kefeli & Kara, 2008; Mutlu & Aktan, 2011; Ünal Demir, 2023).

In the 21st century, individuals need to have developed critical thinking, creative thinking, questioning, and problem-solving skills in order to be successful in both their educational and professional lives and to keep pace with the times (Johnson & Johnson, 2010; Oliver, 2016; Saavedra & Opfer, 2012). The preschool period plays a key role in nurturing individuals with these skills. If children acquire these skills at an early age, it becomes easier for them to incorporate these skills into their lives as mental habits and become aware of their own thinking processes.

Children should not be taught what to think in their lives, but how to use their thinking skills in situations they encounter, and the factors affecting their thinking skill development should be examined and identified. Children's thinking skills should be supported from the preschool period. The environment should provide the child with an environment that supports thinking skills (Güneş, 2012). Adults can facilitate the development of children's thinking skills. Especially when adults are conscious, rich stimulating environments can be created to understand, discuss and evaluate children's different perspectives and facilitate this process for the child. For these reasons, it is important to identify the factors affecting children's thinking skills. Determining the factors affecting children's thinking skills is important in terms of supporting children's thinking skills. This study aims to investigate how variables such as gender, parental education level, and number of siblings affect preschool children's thinking skills. In order to achieve this aim, the sub-problems of the study were determined as follows:

1. Is there a significant difference in the thinking skills of children attending preschool institutions according to gender?
2. Is there a significant difference in the thinking skills of children attending preschool institutions according to their mother's level of education?
3. Is there a significant difference in the thinking skills of children attending preschool institutions according to their father's level of education?
4. Is there a significant difference in the thinking skills of children attending preschool institutions according to the number of siblings?

Limitations of the Study

The study was limited to 60-72-month-old children with normal development who attended two public preschool education institutions in Zeytinburnu district of Istanbul in the 2015-2016 academic year. The identification of the thinking skills of the children in the sample group was limited to the responses received during the administration of the "Thinking Scale for Children in Early Childhood (60-72 Months)".

Method

Research Design

The research is in the general survey model. Survey research aims to describe an existing situation in the present or past as it is without changing it (Karasar, 2019). The main purpose of the survey model research is to describe the characteristics of a group (Fraenkel & Wallen, 2009).

Study Group

The sample of the study was determined according to the convenience sampling method. This type of sampling refers to the researcher's ability to reach participants who are relatively easier to reach in the immediate vicinity within the scope of the research (Yıldırım & Şimşek, 2018). The study group consisted of children and parents attending two public preschool education institutions operating in the Zeytinburnu district of Istanbul in the 2022-2023 academic year. The research involved a total of 146 children, 67 girls and 79 boys, aged 60-72 months, from these institutions. The distribution of demographic information of the children and parents who participated in the study is given in Table 1.

Table 1. *Distribution of Demographic Characteristics of the Study Group*

		n	%
Gender	Girl	67	45.9
	Boy	79	54.1
Mother's education level	Primary school graduates	36	24.7
	Secondary school graduates	14	9.6
	High school graduates	65	44.5
	University graduates	31	21.2
Father's education level	Primary school graduates	38	26.0
	Secondary school graduates	30	20.5
	High school graduates	50	34.2
	University graduates	28	19.2
Number of siblings	None	25	17.1
	1 sibling	45	30.8
	2 siblings	48	32.9
	3 siblings and above	28	19.2

Of the children, 45.9% were girls and 54.1% were boys. Regarding the mothers' education levels: 44.5% were high school graduates, 24.7% were primary school graduates, 21.2% were university graduates and 9.6% were secondary school graduates. As for the fathers, 34.2% were high school graduates, 26.0% were primary school graduates, 20.5% were secondary school graduates, and 19.2% held bachelor's degrees. In terms of siblings: 17.1% had one sibling, 30.8% had two siblings, 32.9% had three siblings, and 19.2% had four siblings.

Data Collection Tools

Personal Information Form

The form was developed to collect demographic information about the children in the study group. The form included questions about the child's gender, mother's and father's education level and the number of siblings.

Thinking Scale for Children in Early Childhood (60-72 Months)

The scale has eight sub-dimensions and a total of 85 items. The sub-dimensions were determined on the basis of critical thinking. The activities were created in accordance with Bloom's (1974) taxonomy, paying attention to the developmental characteristics of children according to their ages. The activity materials were prepared in three dimensions and used during the implementation. The scale is applied individually to each child. The scale has eight sub-dimensions: "Analogy", "Irrationality", "Classification", "Similarities", "Sorting", "Differences", "Following Instructions" and "Knowledge".

These are;

- Analogy is the expression of an event in various ways by means of various examples and analogies. This method is often used to teach children comprehension and higher level cognitive behaviors. Analogy is a fun way of thinking for children based on relationships.
- Classification is the grouping and evaluation of objects based on their similar characteristics. This grouping process is called "classification". The child first determines the properties of concepts and then compares these concepts with each other. As a result of his/her comparisons, he/she gathers the concepts with similar properties in a cluster. When the cluster is given a name, the "classification" process is completed.
- In the Irrationality sub-dimension, children are asked to find irrationalities that are not normally possible in the activity presented to them. Children should be given the necessary time to find the given irrationalities and should be encouraged to explain why they made this decision with their justifications. Irrationalities are humorously funny and entertaining for children.
- After cognitively categorizing, children can find similarities and differences. Similarity is actually within the classification. However, it is important to find similarities and differences between groups. At this stage, children are expected to learn critical thinking in higher grades.
- Sorting is the gradual arrangement of objects by taking into account certain characteristics. It is also important for children to be able to sort objects relationally.
- Children are expected to realize a directive (command) by thinking with the instructions given to them, including motor development.
- Information is the working step in which children find a shape or object for which a definition or description is given.

If the child answers the questions in the scale correctly, he/she is given a score of +1; if the child does not answer or answers incorrectly, he/she is given a score of "zero". Since the scale has sub-dimensions based on a theoretical basis and the test was prepared by paying attention to this, and since it is a cognitive scale, factor analysis procedures were not performed, but reliability analysis procedures were performed. In order to conduct reliability analyses, "Cronbach's Alpha" and "Spearman-Brown and Gutmann coefficients", "Test-Retest method" and "Continuity and item reliability coefficients" were calculated based on the variance obtained from each question. Item Remainder values were taken as item reliability coefficient. In order for an item to remain within the scope of the test, it was taken as a basis that the item residual value was statistically significant at a level of at least .05. Items that did not meet this criterion were excluded from the scale. Reliability analyses were repeated after the item elimination process. As a result of the analysis, the highest Cronbach's alpha coefficient among the reliability coefficients was found in the "Classification" sub-dimension with ".980". The lowest result was calculated in the "similarities" sub-dimension of the Guttman technique with .519. The values obtained from the analyzes were statistically significant at the level of .001. The fact that the total reliability of the test did not fall below .90 in general, it can be said that the scale has high reliability (Mutlu, 2010).

In order to determine the internal validity of the CSA, the correlations of the sub-dimensions with the total score and among themselves were examined. In a scientifically valid scale, the correlations between the sub-dimension scores and the total test score should be statistically significant and high. All correlations between the total scores of the scale and the subscale scores were statistically significant at the .001 level. The highest correlation was obtained in the "Differences" sub-dimension with .773, while the lowest correlation was obtained between the "Classification" sub-dimension and the total test scores with .284. Scientifically, the correlations between the sub-dimensions should be neither too high nor too low and should yield a statistically significant result. Among the correlations between the sub-dimensions, the highest correlation was obtained from the "Irrationalities" and "Differences" sub-dimensions with a correlation of .438. The lowest correlation was obtained between "Classification" and "Differences" sub-dimensions with .184. The fact that all results were statistically significant at a level of at least .05 indicates that the scale has internal validity (Mutlu, 2010).

Data Collection

In the research, firstly, the permission to use the scale of the data collection tool was obtained. After receiving permission to use the scale, ethics committee approval was obtained from the Gazi University Ethics Commission (approval number E.364205). Next, the necessary permissions were obtained from the Ministry of National Education for the study to be conducted in preschool education institutions. Following this, the teachers and families of the children to be included in the study were interviewed and informed about the purpose of the

study and what would be done. It was also communicated that the research would be shared with the participants after the research was completed. The 'Voluntary Consent Form for Participants', approved by the Gazi University Ethics Commission, was sent to the parents. The researcher then administered the 'ÇDÖ' to the children individually. Before administering the scale, the children were introduced to each other and spent time together. The scale was then administered, with the process taking an average of 20-25 minutes per child.

Data Analysis

The normality assumption of the data was examined according to two criteria in the SPSS program. In the first stage, the median values and the difference between the means were checked to be low. In the second stage, it was checked whether the value obtained by multiplying the skewness and kurtosis values by the standard error values was within ± 2.00 . Since the sub-dimensions of the scale met two criteria, the assumption of normal distribution was considered to be met and parametric tests were used.

Findings

In this study, data were analyzed to determine whether children's thinking skills varied based on gender, number of siblings, and parents' education level. The data were examined using "one-way analysis of variance (ANOVA)", a "t-test" and the "Tukey-B multiple comparison test" to identify which groups contributed to the differences.

Table 2. *The Difference Between the Subdimension Scores of the Thinking Scale for Children According to Gender Variable*

Scale/Sub Dimensions	Gender	N	$\bar{x}$	Ss	t	Sd	P
Analogy	Girl	67	11.01	1.710	-0.933	144	0.352
	Boy	79	11.29	1.841			
Classification	Girl	67	27.34	2.573	0.116	144	0.908
	Boy	79	27.29	2.806			
Illogicality	Girl	67	7.04	1.846	0.220	144	0.826
	Boy	79	6.97	1.974			
Similarities	Girl	67	11.54	1.627	0.672	144	0.503
	Boy	79	11.35	1.649			
Differences	Girl	67	9.09	1.807	-0.036	144	0.972
	Boy	79	9.10	2.110			
Ordering	Girl	67	4.90	1.208	-0.385	144	0.700
	Boy	79	4.97	1.261			
Following Instructions	Girl	67	1.88	0.749	-2.535	144	0.127
	Boy	79	2.08	0.781			
Knowledge	Girl	67	3.58	1.220	-0.244	144	0.808
	Boy	79	3.63	1.283			

*p<0,05

According to Table 2, it is seen that children's thinking skills scores were analyzed according to gender in terms of analogy ($p=0.352>0.05$), classification ($p=0.908>0.05$), illogicality ($p=0.826>0.05$), similarities ($p=0.503>0.05$), differences ($p=0.972>0.05$), ordering ($p=0.700>0.05$), following instructions ($p=0.127>0.05$), and knowledge ($p=0.808>0.05$). 05), differences ($p=0.972>0.05$), sorting ($p=0.700>0.05$), following instructions ($p=0.127>0.05$) and knowledge ($p=0.808>0.05$) sub-dimension mean scores, there was no significant difference between them.

Table 3. *The Difference Between the Sub-dimension Scores of the Thinking Scale for Children According to Mother's Level of Education*

Scale/Sub Dimensions	Mother's Level of Education	N	$\bar{x}$	Ss	F	Sd	P	Mean difference
Analogy	Primary School (1)	36	10.72	1.734	2.447	3	0.046*	2>3
	Middle School (2)	14	11.57	0.994				
	High School (3)	65	11.29	1.895				
	License (4)	31	10.77	1.726				
Classification	Primary School (1)	36	26.25	3.246	3.911	3	0.010*	2>3
	Middle School (2)	14	28.21	2.424				

<i>Illogicality</i>	High School (3)	65	27.91	2.104	1.609	3	0.190	—
	License (4)	31	26.90	2.844				
	Primary School (1)	36	6.50	1.935				
	Middle School (2)	14	7.29	1.816				
	High School (3)	65	7.00	1.768				
<i>Similarities</i>	License (4)	31	7.48	2.143	1.637	3	0.183	—
	Primary School (1)	36	11.00	1.656				
	Middle School (2)	14	11.57	1.505				
	High School (3)	65	11.45	1.490				
	License (4)	31	11.87	1.893				
<i>Differences</i>	Primary School (1)	36	9.11	1.879	1.497	3	0.218	—
	Middle School (2)	14	8.64	1.393				
	High School (3)	65	8.89	2.173				
	License (4)	31	9.71	1.774				
	Primary School (1)	36	4.72	1.085	1.115	3	0.345	—
<i>Ordering</i>	Middle School (2)	14	5.14	0.949				
	High School (3)	65	4.88	1.281				
	License (4)	31	5.23	1.383				
	Primary School (1)	36	1.61	0.803	4.126	3	0.008*	1<3.4
<i>Following Instructions</i>	Middle School (2)	14	2.14	1.027				
	High School (3)	65	2.08	0.594				
	License (4)	31	2.16	0.820				
	Primary School (1)	36	3.31	1.283	2.491	3	0.041*	2>3
<i>Knowledge</i>	Middle School (2)	14	4.14	1.027				
	High School (3)	65	3.52	1.348				
	License (4)	31	3.90	0.978				

*p<0,05

According to Table 3, a significant difference ($F(2.447)=0.046$; $p=0.046<0.05$) was found in the sub-dimension of analogy thinking skills according to the mother's education level. Tukey-B multiple comparison test was conducted to determine which group was the source of the difference. According to the analysis, in the analogy sub-dimension, the mean analogy sub-dimension score of the mothers whose mother's education level graduated from secondary school ($\bar{X}=11.57$) was significantly higher than the mean score of the mothers who graduated from high school ($\bar{X}=11.29$).

A significant difference was found in the classification sub-dimension ($F(4.126)=0.008$; $p=0.008<0.05$). Tukey-B multiple comparison test was conducted to find out which group was the source of this difference. According to the analysis, in the sub-dimension of following instructions, the mean score of the classification sub-dimension of mothers whose mother's education level graduated from secondary school ($\bar{X}=28.21$) was significantly higher than the mean score of mothers whose mother's education level graduated from high school ($\bar{X}=3.52$).

A significant difference was found in the sub-dimension of following instructions ($F(3.911)=0.010$; $p=0.010<0.05$). Tukey-B multiple comparison test was conducted to determine which group was the source of the difference. According to the analysis, in the classification sub-dimension, it is seen that the mean scores of the mothers with bachelor's degree ($\bar{X}=2.16$) and high school graduates ($\bar{X}=2.08$) in the following instructions sub-dimension are significantly higher than the mean score of the mothers with primary school graduates ($\bar{X}=1.61$).

A significant difference was found in the knowledge sub-dimension ($F(2.491)=0.041$; $p=0.041<0.05$). Tukey-B multiple comparison test was conducted to determine which group was the source of this difference. According to the analysis, in the classification sub-dimension, the mean knowledge sub-dimension score of mothers who graduated from secondary school ($\bar{X}=4.14$) was significantly higher than the mean score of mothers who graduated from high school ($\bar{X}=3.52$).

In addition, there was no significant difference between the mean scores of the irrationality ($F(1.609)=0.190$; $p=0.190>0.05$), similarities ($F(1.637)=0.183$; $p=0.183>0.05$), differences ($F(1.497)=0.218$; $p=0.218>0.05$) and ordering ($F(1.115)=0.345$; $p=0.345>0.05$) sub-dimension scores of mothers' thinking skills scores according to their level of education.

Table 4. *The Difference Between the Sub-dimension Scores of the Thinking Scale for Children According to Father's Level of Education*

Scale/Sub Dimensions	Father's Education Level	N	$\bar{X}$	ss	F	Sd	P	Mean difference
<i>Analogy</i>	Primary School (1)	38	11.29	1.916	2.401	3 142	0.041*	3>1
	Middle School (2)	30	11.00	1.736				
	High School (3)	50	11.77	1.616				
	License (4)	28	10.64	1.810				
<i>Classification</i>	Primary School (1)	38	26.55	2.777	2.769	3 142	0.044*	3>1
	Middle School (2)	30	27.57	2.674				
	High School (3)	50	28.04	2.390				
	License (4)	28	26.79	2.859				
<i>Illogicality</i>	Primary School (1)	38	6.53	2.037	1.333	3 142	0.266	—
	Middle School (2)	30	7.23	1.612				
	High School (3)	50	7.02	1.635				
	License (4)	28	7.39	2.393				
<i>Similarities</i>	Primary School (1)	38	10.87	1.630	2.613	3 142	0.044*	4>1
	Middle School (2)	30	11.63	0.964				
	High School (3)	50	11.48	1.693				
	License (4)	28	11.93	1.942				
<i>Differences</i>	Primary School (1)	38	8.89	2.024	6.589	3 142	0.000*	2<3.4
	Middle School (2)	30	7.90	1.749				
	High School (3)	50	9.64	1.816				
	License (4)	28	9.68	1.847				
<i>Ordering</i>	Primary School (1)	38	5.13	0.963	3.983	3 142	0.009*	1>2.3
	Middle School (2)	30	4.30	1.368				
	High School (3)	50	4.98	1.116				
	License (4)	28	5.29	1.410				
<i>Following Instructions</i>	Primary School (1)	38	1.92	0.818	0.633	3 142	0.595	—
	Middle School (2)	30	2.03	0.556				
	High School (3)	50	1.92	0.829				
	License (4)	28	2.14	0.803				
<i>Knowledge</i>	Primary School (1)	38	3.63	1.195	3.105	3 142	0.029*	4>2
	Middle School (2)	30	3.03	1.273				
	High School (3)	50	3.76	1.349				
	License (4)	28	3.93	0.940				

*p<0,05

According to Table 4, there was a significant difference ($F(2.401)=0.041$; $p=0.041<0.05$) in the analogy thinking skill sub-dimension of father thinking skills scores according to father's education level. Tukey-B multiple comparison test was conducted to determine which group was the source of the difference. According to the analysis, in the analogy sub-dimension, the mean analogy sub-dimension score ($\bar{X}= 11.77$) of the fathers whose father's education level was high school graduate was significantly higher than the mean score ($\bar{X}= 11.29$) of the fathers whose father's education level was primary school graduate.

A significant difference was found in the sub-dimension of classification thinking skill ($F(2.769)=0.044$; $p=0.044<0.05$). Tukey-B multiple comparison test was conducted to determine which group was the source of the difference. According to the analysis, in the classification sub-dimension, it is seen that the mean classification sub-dimension score of the fathers whose father's education level is high school graduate ($\bar{X}= 28.04$) is significantly higher than the mean score of the fathers who graduated from primary school ($\bar{X}= 26.55$). This difference was in favor of the children of fathers who graduated from high school in the classification sub-dimension of thinking skills.

A significant difference was found in the sub-dimension of similarities thinking skills ($F(2.613)=0.044$; $p=0.044<0.05$). Tukey-B multiple comparison test was conducted to determine which group was the source of the difference. According to the analysis, in the similarities sub-dimension, the mean similarities sub-dimension score of the fathers with a bachelor's degree ($\bar{X}= 11.93$) was significantly higher than the mean score of the fathers with a primary school degree ($\bar{X}= 10.87$).

A significant difference was found in the sub-dimension of thinking skills ($F(6.589)=0.000$; $p=0.000<0.05$). Tukey-B multiple comparison test was conducted to determine which group was the source of the difference. According to the analysis, it is seen that the mean scores of the differences sub-dimension of the fathers with bachelor's degree ($\bar{X}= 9.68$) and high school graduates ($\bar{X}= 9.64$) are significantly higher than the mean scores of the fathers with secondary school graduates ($\bar{X}= 7.90$).

A significant difference was found in the sub-dimension of sequencing thinking skills ($F(3.983)=0.009$; $p=0.009<0.05$). Tukey-B multiple comparison test was conducted to find out which group was the source of the difference. According to the analysis, in the sorting sub-dimension, the mean scores of the fathers with primary school education level in the sorting sub-dimension ($\bar{X}= 5.13$) were significantly higher than the mean scores of the fathers with secondary school education ($\bar{X}= 4.30$) and high school education ($\bar{X}= 4.98$).

A significant difference was found in the sub-dimension of information thinking skill ($F(3.105)=0.029$; $p=0.029<0.05$). Tukey-B multiple comparison test was conducted to determine which group was the source of the difference. According to the analysis, it was determined that the mean score of the knowledge sub-dimension of the fathers with a bachelor's degree in the sorting sub-dimension ($\bar{X}= 3.93$) was significantly higher than the mean score of the fathers with a secondary school degree ($\bar{X}= 3.03$).

In addition, there was no significant difference between the mean scores of the irrationality ($F(1.333)=0.266$; $p=0.266>0.05$) and following instructions ($F(0.633)=0.595$; $p=0.595>0.05$) sub-dimensions of fathers' thinking skills scores according to the level of education.

Table 5. *The Difference Between the Subdimension Scores of the Thinking Scale for Children According to the Number of Siblings Variable*

Scale/Sub Dimensions	Number of Siblings	n	$\bar{x}$	ss	F	Sd	P	Mean Difference
<i>Analogy</i>	only child (1)	25	11.44	1.387	1.681	3 142	0.174	—
	one sibling (2)	45	11.27	2.071				
	two siblings (3)	48	11.31	1.613				
	three siblings and above (4)	28	10.50	1.795				
<i>Classification</i>	only child (1)	25	27.08	2.857	0.476	3 142	0.699	—
	one sibling (2)	45	27.64	2.524				
	two siblings (3)	48	27.04	2.953				
	three siblings and above (4)	28	27.46	2.396				
<i>Illogicality</i>	only child (1)	25	7.12	1.740	3.279	3 142	0.023*	2>3
	one sibling (2)	45	7.58	1.971				
	two siblings (3)	48	6.38	1.606				
	three siblings and above (4)	28	7.07	2.193				
<i>Similarities</i>	only child (1)	25	11.72	1.021	1.996	3 142	0.117	—
	one sibling (2)	45	11.73	1.587				
	two siblings (3)	48	11.35	1.062				
	three siblings and above (4)	28	10.86	2.606				
<i>Differences</i>	only child (1)	25	9.32	1.406	1.533	3 142	0.209	—
	one sibling (2)	45	9.18	2.239				
	two siblings (3)	48	9.31	2.064				
	three siblings and above (4)	28	8.39	1.685				
<i>Ordering</i>	only child (1)	25	4.40	1.607	1.968	3 142	0.122	—
	one sibling (2)	45	5.02	1.177				
	two siblings (3)	48	5.06	0.954				
	three siblings and above (4)	28	5.07	1.303				
<i>Following Instructions</i>	only child (1)	25	2.00	0.577	0.906	3 142	0.440	—
	one sibling (2)	45	2.13	0.625				
	two siblings (3)	48	1.90	0.831				

	three siblings and above (4)	28	1.89	0.994				
<i>Knowledge</i>	only child (1)	25	3.72	0.980				
	one sibling (2)	45	3.42	1.485	0.607	3	0.611	—
	two siblings (3)	48	3.75	1.194		142		
	three siblings and above (4)	28	3.57	1.168				

*p<0,05

According to Table 5, a significant difference was found in the sub-dimension of irrationality ($F(3.279) = 0.023$; $p = 0.023 < 0.05$) according to the number of siblings' thinking skills scores. Tukey-B multiple comparison test was conducted to determine which group was the source of the difference. According to the analysis, it was determined that the mean score of the irrationality sub-dimension of children with one sibling ($\bar{X} = 7.58$) was higher than the mean score of the extrinsic sub-dimension of children with two siblings ($\bar{X} = 6.38$).

On the other hand, according to the number of siblings according to thinking skills scores, analogy ($F(1.681) = 0.174$; $p = 0.174 > 0.05$), classification ($F(0.476) = 0.699$; $p = 0.699 > 0.05$), similarities ($F(1.996) = 0.117$; $p = 0.117 > 0.05$), differences ($F(1.533) = 0.209$; $p = 0.209 > 0.05$), sequencing ($F(1.968) = 0.122$; $p = 0.122 > 0.05$), following instructions ($F(0.906) = 0.440$; $p = 0.440 > 0.05$) and knowledge ($F(0.607) = 0.611$; $p = 0.611 > 0.05$) subscale mean scores.

Discussion, Conclusion and Recommendations

The findings obtained in this part of the study were compared and discussed with the findings of previous studies in the literature.

According to the findings presented in Table 2, children's thinking skills do not differ according to gender in the sub-dimensions of “analogy, classification, illogicality, similarities, differences, sequencing, following instructions, and knowledge. According to this finding, it can be said that gender variable does not have any effect on children's thinking skills.

In the study conducted by Chua Yan Piaw (2014), it was also stated that the gender did not have an effect on children's creative thinking skills. Similarly, according to the findings of Aydemir Özalp and Durmuşoğlu (2023), it was determined that gender was not determinative on critical thinking skills. Again, Kanaki and Kalogiannakis (2022) found that algorithmic thinking skills are not related to children's gender in early childhood. In the study conducted by Mutlu (2010), it was stated that there was a significant difference in the “classification and sequencing” sub-dimension of according to gender, while there was no significant difference in the “analogy, illogicality, similarities, differences and knowledge” dimension. Again, Sunay Tavlı (2007) reported that gender did not make a difference on children's problem solving skills. In the literature, there are research results similar to these research results as well as different research results. In a study conducted by Tchernigova (1995), it was found that girls were more successful than boys in problem-solving skills. Similarly, Walker, Irving, and Berthelsen (2002) found that girls were more advanced in problem-solving skills than boys.

According to the findings presented in Table 3, it was observed that there were significant differences in the “analogy, classification, following instructions and knowledge” sub-dimensions of children's thinking skills scores according to the mother's education level variable. The significant difference in the sub-dimensions of “analogy, knowledge and classification” was in favor of the children of mothers who graduated from secondary school. According to this result, it can be said that mother's education level is effective in the sub-dimensions of analogy, classification and knowledge. In the “following instructions” sub-dimension, the significant difference is due to the fact that the mean scores of mothers whose mother's education level is undergraduate and high school graduates are significantly higher than the mean scores of children's whose mother's education level is primary school graduates. It was concluded that this difference was in favor of the children of mothers with a bachelor's degree and high school graduates in the sub-dimension of thinking skills following instructions. According to this finding, it can be said that mother's education level is effective in the sub-dimension of following instructions. Considering that children acquire their first skills, knowledge and attitudes in the family environment from the moment they are born, it is stated that it is important for parents to have an attitude that supports children's thinking skills and to be a role and model for them (Akyol, 2021). Durmuşoğlu and Yıldız-Taşdemir (2022) stated that the higher the level of education of parents, the more likely they are to obtain accurate information. A parent with a higher level of education can act more consciously. For this reason, it can be said that parents with a higher level of education can reach the right sources in the process of obtaining information and approach their children more consciously, and this situation is also effective on thinking skills. In the studies conducted by Caynak (2024), Yıldız and Karaman (2017), and Yumurtacı and Özbey (2024), it was

stated that as the mother's education level increases, children's creative thinking skill scores increase. It can be said that the results of the researches are consistent with the finding of the study that the level of maternal education has an effect on the sub-dimensions of children's thinking skills: analogy, classification, following instructions, information and following instructions. This situation is thought to be due to the fact that the differences in the mothers' education level are reflected in their child-rearing styles and that the higher the mother's education level, the more they are interested in children's education and the more quality time they spend. On the other hand, no significant difference was found between the mean scores of the "irrationalism, similarities, differences and ordering" sub-dimension of children's thinking skills scores according to the mother's education level variable. According to these findings, it can be said that children's thinking skills are similar in the sub-dimensions of "irrationalism, similarities, differences and sequencing" and that mothers' level of education does not affect these sub-dimensions. In the studies conducted by Gök Çolak (2021) and Thirumurthy (2003), it was stated that the level of maternal education did not affect children's spatial memory scores. It can be said that the result of the research overlaps with the result of the study that the level of mother's education is effective on some sub-dimensions of children's thinking skills such as irrationality, similarities, differences and ordering. It can be said that mothers are not conscious about some sub-dimensions of thinking skills such as irrationalism, similarities, differences and sequencing.

Another finding presented in Table 4 of the study revealed that there was a significant difference in children's thinking skills scores in the sub-dimensions of "comparison and classification," "similarities and differences," "ranking," and "knowledge" according to the father's educational level. This difference was in favor of the children of fathers who graduated from high school in the analogy and classification sub-dimensions of children's thinking skills; in favor of the children of fathers who graduated from undergraduate school in the "similarities" sub-dimension; in favor of the children of fathers who graduated from undergraduate school and high school in the differences sub-dimension; in favor of the children of fathers who graduated from primary school in the sequencing sub-dimension; and in favor of the children of fathers who graduated from undergraduate school in the knowledge sub-dimension. The results suggest a potential association between the father's level of education and specific sub-dimensions of children's thinking skills. Can Yaşar and Aral (2011) stated in their study that as the father's level of education increased, the creative thinking skills scores of their children also increased. Again, in the studies conducted by Arıcı (2019), Caynak, S. (2024), Yıldız and Karaman (2017) and Yumurtacı and Özbey (2024), it was concluded that as the father's education level increases, children's creative thinking skills increase in parallel. Similarly, Gök Çolak (2021), in his study, stated that the level of father's education was effective on children's spatial thinking skills. Levine et al. (2012) also reported that father's level of education positively affected children's performance in spatial transformation skills. It can be said that the findings of these studies are consistent with the finding of the study that the level of father's education is effective on children's thinking skills analogy and classification, similarities, differences, sorting and knowledge sub-dimensions. It is thought that this may be due to the fact that the differences in fathers' education level cause differences in their child-rearing styles, and the higher the father's education level, the more they are interested in children's education and spend quality time with them. On the other hand, it was observed that children's thinking skills scores did not reveal a significant difference in the sub-dimensions of "irrationality and following instructions" according to the father's education level. According to the finding obtained, it can be said that children's thinking skills are similar in the sub-dimensions of "irrationality and following instructions" and that children's thinking skills are not affected by fathers' education level in the sub-dimensions of irrationality and following instructions. In the study conducted by Özalp and Durmuşoğlu (2023), it was found that the father's education level was not effective on children's decision-making and critical thinking skills. Again, in the studies conducted by Köksal Akyol (2012) and Gökmen (2017), it was stated that the father's education level was not effective on children's creativity. It can be said that the research results overlap with the study's finding that the father's education level is effective on some sub-dimensions of children's thinking skills, such as illogicality and following instructions. It can be said that this situation is because the care and responsibility of children is usually on the mother. However, nowadays, with the participation of women in business life and the increase in the father's education level, it can be said that the father now takes a more active role in the child's care, development and education.

Parents' attitudes and behaviors have a significant impact on children (Gander & Gardiner, 2015), and parents are important role models in their children's development. Children take the people they identify with as examples and imitate them (Yavuzer, 2017). Thinking styles are decisive in the use of the skills and knowledge that people possess. Parents' thinking styles affect all activities they perform in their daily lives (Buluş, 2005). Therefore, depending on their thinking styles, parents' daily activities serve as role models for their children's behavior. A study conducted by Karasan (2015) found a relationship between parents' attitudes and thinking styles. Knowing one's thinking style can enable one to replace dysfunctional thinking styles with functional ones in the future (Buluş, 2000; Çubukçu, 2004). In this context, it is likely that parents' educational level also affects

their thinking styles. Conscious parents are thought to have a positive influence on their children's thinking skills. Studies emphasize that children's critical thinking skills can be supported through various methods and approaches (Fernández-Santín and Feliu-Torruell, 2020; Tozduman Yaralı and Güngör Aytar, 2021). In this context, it is considered very important for adults not only to serve as role models for critical thinkers but also to create conducive environments for children.

According to another finding presented in Table 5 of the study, it was determined that children's thinking skills scores were significant in the irrationality sub-dimension according to the number of siblings. In the sub-dimension of irrationality, the mean scores of children with one sibling were higher than the mean scores of children with two siblings in the external sub-dimension. This difference was found to be in favor of children with one sibling in the irrationality sub-dimension. According to this result, it can be said that the number of siblings has an effect on the irrationality sub-dimension of thinking skills. In the study conducted by Seçer et al. (2009), it was concluded that the number of cognitive errors made by children with only one sibling was lower than children without siblings. Uçar (2021) also found that the scores of children's creative thinking skills were higher in single children than in children with two or more siblings. Likewise, in the study conducted by Özalp and Durmuşoğlu (2023), it was stated that significant differences emerged in favor of those without siblings in the total score of critical thinking skills according to the number of siblings variable. These results support the finding of the study that children's thinking skills affect the sub-dimension of irrationality according to the number of siblings. This situation is thought to be due to the fact that the mother naturally reduces the time and attention she devotes to the child as a result of having more children, and that the number of children in families at lower socioeconomic levels is generally high and families at lower socioeconomic levels have deficiencies in spending quality time with their children. According to the findings of Aydemir Özalp and Durmuşoğlu (2023), it was concluded that children without siblings in the family could think more critically. Based on this study, it is thought that with the increase in the number of children the mother has, the possibility of the mother spending quality time with all of her children will decrease and this may negatively affect the development of the child's thinking skills. On the other hand, parents with only one child may have positively affected the child's thinking skills by spending more time with the child due to the lack of siblings. On the other hand, it was determined that there was no significant difference between the mean scores of the sub-dimensions of "analogy, similarities, classification, differences, following instructions, information and sequencing" according to the thinking skills scores of children with siblings. According to these results, it can be said that children's thinking skills are similar in these sub-dimensions and the number of siblings of children is not effective in these sub-dimensions. According to the research conducted by Çeliköz (2017), it was stated that the number of siblings variable did not affect children's creativity levels. Again, Özalp and Durmuşoğlu (2023) reported that the number of siblings had no effect on children's analysis and decision-making skills. It can be said that these results coincide with the finding of the study that the number of siblings has an effect on the sub-dimensions of children's thinking skills.

When the research findings were examined, no significant difference was observed in all sub-dimensions of the scale of thinking towards children according to gender variable. According to the mother's level of education, significant differences were found in the sub-dimensions of "analogy, classification, following instructions and knowledge" of the scale of thinking towards children, while no significant differences were found in the other sub-dimensions. According to the father's education level, significant differences were found in the "analogy, classification, similarities, differences, ordering and knowledge" dimension, but no significant differences were found in the other sub-dimensions. According to the number of siblings, a significant difference was found only in the irrationality sub-dimension of the thinking scale for children.

Recommendations

- In our country, it is seen that studies on thinking skills in preschool period and studies conducted to develop these skills are not sufficient. Studies on thinking skills of preschool children can be conducted with larger samples in different age groups and socioeconomic levels. This study was conducted using quantitative research method. Children's thinking skills can also be examined with in-depth qualitative methods.
- Educational programs to support children's thinking skills can be prepared and implemented for children of different age groups and different socioeconomic levels, and their results can be tested.
- Parents have a critical role in a child's life. Because the foundations of children's first knowledge, skills and attitudes are laid in the family. Therefore, within the scope of family and community engagement activities, seminars and conferences can be organized for parents in order to raise awareness about children's thinking skills and to support children's thinking skills consciously.

Declarations

The authors have nothing to declare.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors

Ethics Statements

The Gazi University Ethics Committee decided on May 25, 2022, with its approval number E.364205, that the research is in compliance with ethical rules.

Conflict of Interest

They have no conflict of interest.

Informed Consent

Informed consent was obtained from their parents or legal guardians. Parents/guardians were given a detailed explanation of the study's purpose, procedures, potential risks, and benefits. The voluntary nature of the study and confidentiality were emphasized, ensuring they understood the right to withdraw their child at any time without any consequences.

Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

References

- Akar Gençler, A. (2014). *Examining the effect of reggio emilia based projects on creative thinking skills of kindergarten children*. [Unpublished master's thesis,]. Hacettepe University, Türkiye.
- Akyol, T. (2021). Examining the relationship between parental attitudes and preschool children's decision-making skills. *Dialectologist International Journal of Social Sciences* 26, 73-93.
- Arıcı, S. (2019). *Examining the relationship between authenticity levels of parents of preschool children and their children's creativity*. [Unpublished master's thesis,]. Ege University, Türkiye.
- Aubrey, C., Ghent, K., & Kanira, E. (2012). Enhancing thinking skills in early childhood. *International Journal of Early Years Education*, 20 (4), 332-348. doi: 10.1080/09669760.2012.743102
- Aydemir Özalp, T., & Durmuşoğlu, M. C. (2023). Investigation of decision-making and critical thinking skills of preschool children. *Journal of Education for Life*, 37 (2), 405-427. <https://doi.org/10.33308/26674874.2023372548>
- Başarer, D. (2021). *Thinking training*. Ankara: Pegem.
- Bayraktar, V. (2016). Definition and importance of preschool education. F. Alisinanoğlu and V. Bayraktar (Ed.), *Introduction to preschool education*. (1-12). Ankara: Vize
- Bayraktar, V., & Özçelik Öğretir, D. (2019, November, 15-17). *Examination of the maternal attitudes perceived by children aged 9-17*. In International Symposium on Academic Studies in Educational and Social Sciences (ISES). Ankara, Turkey
- Bilgiç, E. (2010). *Comparison of thinking styles of primary school administrators and teachers*. [Unpublished master's thesis,]. Niğde University, Türkiye.
- Buluş, M. (2000). *Attributional complexity, thinking styles and preference for cognitive consistency in relation to some psychosocial characteristics and academic achievement in student teachers*. [Unpublished Doctoral dissertation]. Dokuz Eylül University, Türkiye.
- Buluş, M. (2005). *The Investigation of the Thinking Styles Profile of Students in the Department of Elementary Education*. *Ege Journal of Education*, 6(1), 1-24.
- Butterworth, J., & Thwaites, G. (2013). *Thinking skills: Critical thinking and problem solving* (2nd ed.). Cambridge, UK: Cambridge University Press.
- Can Yaşar, M., & Aral, N. (2010). The effect of preschool education on creative thinking skills. *Journal of Theoretical Educational Science*, 3 (2), 201-209.
- Can Yaşar, M., & Aral, N. (2011). Examining the effect of socio-economic level and parental education level on creative thinking skills of six-year-old children. *Journal of Theoretical Educational Science*, 4 (1), 137-145.
- Caynak, S. (2024). *The effect of kitchen skills training on creativity levels of preschool children*. [Master's thesis, Karatay University]. Council of Higher Education Thesis Center.
- Cano-Garcia, F., & Hughes, E. H. (2000). Learning and thinking styles: An analysis of their interrelationship and influence an academic achievement. *Educational Psychology*, 20 (4), 413-430.
- Chua Yan Piaw, C. (2014). Effects of gender and thinking style on student's creative thinking ability. *Procedia Social and Behavioral Sciences* 116, 5135-5139.
- Çeliköz, N. (2017). Investigation of creativity levels of preschool children aged 5-6 years. *Yıldız Journal of Educational Research*, 2 (1), 1-25.
- Çubukçu, Z. (2004). Determination of pre-service teachers' thinking styles. *Trakya University Journal of Social Science*, 5 (2), 87-106.
- Dağlıoğlu, H. E., & Çakır, F. (2007). Developing planning and deep thinking among thinking skills in early childhood. *Education and Science*, 32 (144), 28-35.
- Dilshod, M. (2019). Improvement of ability and creativity in pre-school children. *International Journal of Recent Technology and engineering* 8 (3 S), 220-222
- Durmuşoğlu, M. C., & Yıldız- Taşdemir, C. (2022). Determining the parent education preferences and needs of parents with children in preschool education institutions in Turkey. *Theory and Practice in Child Development*, 2 (1), 1-21.
- Ennis, R. (2011). Reflection and perspective. *Part II Inquiry* 26 (2), 5-20
- Ergen, Z. G., & Akyol, A. K. (2012). Investigating the creativity of children attending kindergarten. *Journal of Theoretical Educational Science*, 5 (2), 156-170.
- Erşahin Şafak, N. (2016). *Investigation of the relationship between temperament characteristics, receptive language and attention skills of preschool children*, [Unpublished master's thesis,]. Beykent University, Türkiye.
- Ezmeci, F., & Akman, B. (2016). Thinking skills in early childhood reggio emilia approach and high/scope program. *International Journal of Early Childhood Education Studies*, 1 (1), 1-13.
- Facione, P. (1990). *The california critical thinking skills test: College level*. California Academic Press, Millbrae, CA.
- Fisher, R. (2013). *Teaching thinking: Philosophical enquiry in the classroom (kindle edition)*. USA: Blooms.

- Fraenkel, R. J., & Wallen, E. N. (2009). *How to design and evaluate research in education*. New York: McGraw-Hill.
- Gander, M., & Gardiner, H. (2015). *Child and adolescent development*. B. Onur (Çev.), Ankara: İmge.
- Gök Çolak, F. (2021). *Developing a spatial thinking skills test for preschool children and examining children's spatial thinking skills*. [Unpublished Doctoral dissertation]. Marmara University, Türkiye.
- Gökmen, A. (2017). *Investigation of creative problem-solving skills in 60–84-month-old children*. [Unpublished master's thesis,]. Istanbul Aydın University, Türkiye.
- Güneş, F. (2012). Developing students' thinking skills. *Journal of Turkology Research*, (32), 127-146.
- Heyes, C. (2012). New thinking: The evolution of human cognition. *Phil. Trans. Roy. Soc. B, Biol. Sci.*, 367, 1599, 2091–2096, Aug. 2012, doi: 10.1098/rstb.2012.0111.
- Johanson, D.W., & Johnson, R. T. (2010). Cooperative learning and conflict resolution: Essential 21st century skills. Eds (James Bellanca and Ron Brandt) *21st century skills: rethinking how students learn*. (s.201-219). Bloomington: Solution Tree Press.
- Kanaki, K., & Kalogiannakis, M. (2022). Assessing algorithmic thinking skills in relation to gender in early childhood. *Educational Process: International Journal*, 11 (2), 44-59.
- Kanlıpıçak, B. (2022). *The effect of thinking skills development practices on preschool children's thinking skills*. [Unpublished Doctoral dissertation]. Ankara University, Türkiye.
- Karasan, S. (2015). *They showed their parents the parents of individuals with attitude owned relationship between thinking style*. [Unpublished master's thesis,]. Istanbul Haliç University, Türkiye.
- Karasar, N. (2019). *Scientific research method*. Ankara: Nobel.
- Karabörklü İlgin, G. (2024). *Investigation of preservice preschool teachers' positive thinking skills and metacognitive thinking skills in terms of various variables*. [Unpublished master's thesis,]. Mehmet Akif University, Türkiye.
- Karadağ, F., Yıldız Demirtaş, F., & Yıldız, T. (2017). Development of a scale for the assessment of critical thinking through philosophical inquiry for 5-6 year old children. *International Online Journal of Educational Sciences*, 9 (4), 1025-1037.
- Kefeli, İ., & Kara, U. (2008). The development of philosophical and critical thinking in children. *Ankara University Journal of Faculty of Educational Sciences*, 41 (1), 339-357. <http://dergiler.ankara.edu.tr/dergiler/40/154/1159.pdf>
- Levine, S. C., Ratliff, K. R., Huttenlocher, J., & Cannon, J. (2012). Early puzzle play: a predictor of preschoolers' spatial transformation skill. *Developmental Psychology*, 48 (2), 530.
- Lewis, A., & Smith, D. (1993). Defining higher order thinking. *Theory Into Practice*, 32 (3), 131-137. doi:10.1080/00405849309543588
- Ministry of National Education (MoNE). (2024). *Preschool education program*. General Directorate of Basic Education, Ankara
- Mutlu, E. (2010). *Investigation of early childhood children's (60-72 months) thinking levels and preschool teachers' attitudes towards thinking education*. [Unpublished master's thesis,]. Çanakkale On Sekiz Mart University, Türkiye.
- Mutlu, E., & Aktan, E. (2011). Investigation of preschool teachers' attitudes about thinking education. *Turkish Journal of Educational Sciences*, 9. (4), 799-830.
- Nosich, G. M. (2016). Critical thinking and interdisciplinary critical thinking guide]. (B. Aybek, trans.), Ankara: Anı.
- Nurjanah, N. E., Yetti, E., & Sumantri, M. S. (2024). Developing creative thinking in preschool children: A comprehensive review of innovative. *European Journal of Educational Research*, 13 (3), 1303-1319.
- Oliver, B. (2016). *Strategies that promote 21 st century skills*. <https://justaskpublications.com/just-ask-resource-center/e-newsletters/just-for-the-asking/strategies-that-promote-21st-century-skills/>
- O'Reilly, C., Devitt, A., & Hayes, N. (2022). Critical thinking in the preschool classroom – A systematic literature review, *Think Skills Creat*, 46, 101110, doi: 10.1016/j.tsc.2022.101110.
- Özalp, T. A., & Durmuşoğlu, M. C. (2023). Investigation of decision-making and critical thinking skills of preschool children. *Journal of Education for Life*, 37 (2), 405-427. <https://doi.org/10.33308/26674874.2023372548>
- Özden, Y. (2024). *Learning and the teacher*. Ankara: Pegem.
- Paul, R.W. & Elder, L. (2012). Critical thinking: The nature of critical and creative thought. *Journal of Developmental Education*, 30, 34.
- Pekdoğan, S. (2015). *Examination of the effect of the Decision Making Skills Education Programme 5-6 year old children's decision making skills*. [Unpublished Doctoral dissertation]. Gazi University, Türkiye.
- Pithers, R., & Soden, R. (2000). *Critical thinking in education: A review Educational Research*, 42 (3), 237-249.
- Polat, Ö., & Akay, D. (2020). A review article on philosophy education as a stimuli for early brain development. *İlköğretim Online* 19 (2), 1105-1115.
- Preidyte, K. (2025). *What is preschool and why it's essential for early learning*. <https://www.hatching-dragons.com/blog/what-is-preschool-and-why-its-essential-for-early-learning>

- Robson, S., & Hargreaves, D. J. (2007). What do early childhood practitioners think about young children's thinking? *European Early Childhood Education Research Journal*, 13 (1), 80.
- Ruggerio, V. R. (2019). *The art of thinking: A guide to critical and creative thought* (10th edition). New York: Harper Collins College Publishers.
- Saavedra, A. R., & Opfer, V. D. (2012). *Teaching and learning 21 st Century Skills: Lessons from the Learning Sciences*. <https://www.aare.edu.au/data/publications/2012/Saavedra12.pdf>.
- Schallock, L. L. (2020). *STEAM and habits of mind in early childhood teacher training*. [Unpublished Doctoral dissertation]. California State University, United States.
- Seçer, Z., Sarı, H., Çeliköz, N., & Üre Ö. (2009). Investigation of cognitive styles of preschool children in terms of some variables. *The Journal of Selcuk University Social Sciences Institute*, 21, 407-420.
- Sunay Tavlı, B. (2007). *The survey of 6-age preschool students problem solving skills as comparatively*. [Unpublished master's thesis,]. Abant İzzet Baysal University, Türkiye.
- Sternberg, R. J. (1997). *Thinking styles*. Newyork: Cambridge University.
- Şahin, M. K., & Akman, B. (2018). Development of thinking skills in early childhood. *Journal of National Education*, 47 (218), 5-20.
- Tchernigova, S. (1995). Puzzling boys and girls (gender differences in problem-solving in preschoolers through puzzles). *Educational Resources Information Center*, 143, 90- 114.
- Thirumurthy, V. (2003). *Children's cognition of geometry and spatial reasoning: A cultural process*. (ProQuest Dissertations and Theses). State University of New York, Department of Learning and Instruction. UMI Number: 3102411.
- Walker, S., Irving, K., & Berthelsen, D. (2002). Gender influences on preschool children's social problem-solving strategies. *J. Gen. Psychol.* 163, 197–209. doi: 10.1080/00221320209598677
- Tuğrul, B. (2006). Drama as a creative process in developing thinking skills in preschool period, *Creative Drama Journal*, 1 (2), 99-110.
- Uçar, A. M. (2021). *Investigating the relationship between parent-child reading activities and creative thinking skills of preschool children*. [Unpublished master's thesis,]. Necmettin Erbakan University, Türkiye.
- Ünal, M., & Aral, N. (2014). Investigation of the effect of the education program based on the experimental method on the problem-solving skills of 6-year-old children. *Education and Science*, 39 (176), 279-291
- Ünal Demir (2023). *Investigation of thinking styles of parents of preschool children and children's thinking skills*. [Unpublished master's thesis,]. Gazi University, Türkiye.
- Yang, W., Liang, L., Xiang, S., & Yeter, I. H. (2025). Making a makerspace in early childhood education: Effects on children's STEM thinking skills and emotional development. *Thinking Skills and Creativity*, 56, Article 101754. <https://doi.org/10.1016/j.tsc.2025.101754>
- Yavuzer, H. (2017). *Parent school*. (21. Basım). İstanbul: Remzi.
- Yıldırım, A., & Şimşek, H. (2018). *Qualitative research methods in social sciences*. İstanbul: Seçkin.
- Yıldız, C., & Karaman, N. G. (2017). Creativity and perspective taking in early childhood period. *Ankara University Journal of Faculty of Educational Sciences (JFES)*, 50 (2), 33 – 58.
- Yumurtacı, M., & Özbey, S. (2024). Preschool children's motivation levels: the predictive effect of creative thinking skills. *International Journal of Education and Welfare*, 2 (2), 161–183. <https://doi.org/10.62416/ijwb-51>
- Vincent-Lancrin, S., Gonzalez-Sancho, C., Bouckaert, M., de Luca, F., Fernández-Barrerra, M., Jacotin, G., . . . Vidal, Q. (2019). *Fostering students' creativity and critical thinking: What it means in school*. *Educational Research and Innovation*, OECD Publishing. <https://doi.org/10.1787/62212c37-en>