

DETERMINING THE ANALYTICAL THINKING LEVELS OF PROSPECTIVE TEACHERS

Duygu BEDİR

Dokuz Eylül Üniversitesi, Eğitim Bilimleri Enstitüsü, İzmir, Türkiye

ORCID: <https://orcid.org/0000-0001-5809-2161>

duygumat35@gmail.com

Süha YILMAZ

Prof. Dr., Dokuz Eylül Üniversitesi, Buca Eğitim Fakültesi, Matematik ve Fen Bilimleri Eğitim Bölümü

Matematik Eğitimi Anabilim Dalı, İzmir, Türkiye

ORCID: <https://orcid.org/0000-0001-5948-0588>

suha.yilmaz@deu.edu.tr

Cenk KEŞAN

Prof. Dr., Dokuz Eylül Üniversitesi, Buca Eğitim Fakültesi, Matematik ve Fen Bilimleri Eğitim Bölümü

Matematik Eğitimi Anabilim Dalı, İzmir, Türkiye

ORCID: <https://orcid.org/0000-0003-2629-8119>

cenk.kesan@deu.edu.tr

Received: August 17, 2022

Accepted: October 11, 2022

Published: October 31, 2022

Suggested Citation:

Bedir, D., Yılmaz, S., & Keşan, C. (2022). Determining the analytical thinking levels of prospective teachers. *International Journal of New Trends in Arts, Sports & Science Education (IJTASE)*, 11(4), 234-239.



This is an open access article under the [CC BY 4.0 license](https://creativecommons.org/licenses/by/4.0/).

Abstract

The most important feature of the human being is the ability of thinking. Human should be able to develop their own thinking skills based on their experiences and ideas. It is aimed to provide the individual's thinking development by taking into account the individual characteristics during the education in our schools. When an individual encounters a problem, he reaches a solution with different ways of thinking. The individual with analytical thinking skills will be able to define the parts of the problem and the steps in the process of solving. It is expected that prospective teachers who will raise individuals of the future will have analytical thinking skills by dealing with individual differences. Therefore, in order to determine the level of thinking styles used by prospective teachers in solving problems, it is aimed to investigate the level of analytical thinking of prospective teachers. The research was carried out on the prospective teachers of mathematics teaching of a public university education faculty. In order to determine the level of analytical thinking of prospective teachers, quantitative research method was preferred and Holistic and Analytical Thinking Scale was applied. Descriptive analysis of data obtained from prospective teachers was evaluated.

Keywords: Prospective teachers, analytical thinking, holistic and analytical thinking scale.

INTRODUCTION

One of the most distinguishing characteristics of humans from other living is the ability of thinking. When a person encounters a problem, he should be able to develop the solution of the problem by using his own thinking skills based on his experiences and ideas. The aim of the education in our schools is to provide the knowledge and skills that will prepare the individual for the future. One of the most important of these skills is to develop a person's thinking skills. One of the most basic tasks of our teachers is to develop the individual's thinking skills by taking into account the individual characteristics during the education.

Before defining thinking skills, it is important to make some definitions related to the subject. According to Türk Dil Kurumu (1992), thinking is defined as examining information, comparing and producing thoughts by using the interests between them in order to come to a conclusion. According to Ariol (2009) from Sigel (1991), thinking is defined as the conditioning of many mental processes to work to solve problems. It is emphasized that the individual should be able to use his mental processes to find a solution to a problem situation he has not encountered before. As another

definition, Style is defined as the way an individual prefers using their skills and processing information. From this point of view, style can be considered as a choice made by the individual in using skills, not a skill or talent on its own. Finishing style as a preference indicates that it differs from skills. Because while skills are about a person's ability to do something, styles are about what a person prefers to do and how. Therefore, various styles are not good or bad, they are just different (İnci, Erten & Çitil, 2012).

Thinking styles, on the other hand, are the approaches and tendencies that individuals exhibit at the end of their mental processes against the problems, events, facts and variables they encounter. Each individual has many thinking styles towards a problem. However, the individual mainly uses some of them according to their special circumstances (Sünbül 2004, Dinç Artut ve Bal 2008). The fact that an individual's thinking styles can change according to his knowledge and experience causes different thinking styles. When the literature is examined, analytical thinking and holistic thinking are among the thinking styles individuals use while solving problems. Analytical and holistic thinking includes the difference between the ways of processing and gathering information. (Hammouri 2003, Konyalıhatipoğlu, 2016).

Various definitions are made about analytical thinking. According to Güneş (2012), analytical thinking includes the processes of disassembling the whole, redefining and classifying them. It is a way of thinking based on analysis. Bloom Taxonomy defined the Analytical thinking in the words as follows : analyze, arrange, connect, divide, separate, classify, compare, contrast, explain, select, order, breakdown, correlate, diagram, discriminate, focus, discriminate, illustrate, infer, outline, prioritize, subdivide and points out. (Larry & Annette, 2010; Montaku, 2011). Analytical thinkers prefer different ways to solve problems compared to other people. According to Dewey (2007), individuals with analytical thinking focusing on details solve problems sequentially. They can divide the problem into sub-problems, describe the steps in the process, and describe each step that they assume to do (Dewey, 2007, Bolça 2015). By their nature, they break down concrete problems into small pieces and collect information (logical, functional, etc.) based on the properties of the pieces, trying to reach the whole. They establish a link between knowledge and events and define the basic relationships between them and examine the complex relationships. Another style of thinking, holistic thinking, can also be expressed as the ability to come to mind small details that are not immediately noticeable in complex problems. Individuals with a holistic thinking style prefer to use the answers they obtain in similar activities as a source and go to the right result instead of going step by step in the solution of a problem or going from the controls to the result (Dewey 2007, Umay & Ariol, 2017). Holistic thinkers like to deal with big paintings, generalizations and abstract things (Dinç Artut, & Bal 2008). Çubukçu (2004) stated that since thinking skills can be taught to the individual, the abilities of an individual can be developed by using effective thinking tools.

Developing the individual's high-level thinking skills in formal education in our schools is one of the most important responsibilities of teachers. In order for teachers to develop the thinking of the individual effectively, it is expected that they must have and be able to use different ways of thinking effectively. For this reason, prospective teachers who will train future individuals are expected to have different thinking styles in addition to their professional knowledge. For this reason, prospective teachers trained in universities are required to have analytical and holistic thinking skills by considering their individual differences. For this reason, determining the thinking styles that prospective teachers use while solving problems has an important place in teacher education.

One of the most important stages of dissemination thinking skills in education is teacher training. First of all, teachers need to acquire thinking skills and apply this to their real life. After teachers gain these skills, they can make their own students do developmental work. For this reason, providing teachers with different thinking skills is an important step in educational studies (Tok & Sevinç, 2010). It is expected that prospective teachers, who will train individuals of the future, will have high level thinking skills by handling their individual differences. For this reason, it is aimed to investigate the analytical thinking levels of prospective teachers in order to determine the thinking styles used by prospective teachers while solving problems.

In this study, answers were sought for the sub-problems

- ✓ What are the distributions of prospective teachers according to their analytical and holistic thinking levels? "
- ✓ "Do the thinking styles scores of the prospective teachers differ significantly according to the gender variable?
- ✓ Is there a significant difference between grades between the analytical and holistic thinking styles of prospective teachers?
- ✓ Do prospective teachers thinking styles scores differ significantly according to the variable of the school they graduated from?

METHOD

In this study, the descriptive approach was used, as the main goal was to thoroughly define, explain the situation studied, make assessments in accordance with standards, and identify possible relationships between events (Çepni, 2007). In our study, the "holistic and analytical thinking scale in Problem solving" consisting of 10 items whose validity and reliability were calculated prepared by Ariol (2009) was used to determine the holistic and analytical thinking styles of prospective teachers. Each item on the scale contains two different expressions that explain analytical and holistic thinking styles. The "No Idea" option was used for those who remained unstable between these two substances. In the scoring of the scale, the option expressing analytical thinking was rated as 1 point, the option "I have no idea" was rated as 2 points, and the option expressing holistic thinking was rated as 3 points. The lowest score to be taken from the scale was calculated as 5 and the highest score was calculated as 15. It is mentioned that as the score from the scale approaches 5, it is prone to analytical thinking, and as it approaches 15, it is prone to holistic thinking. The SPSS-23 package program was used in the analysis of the data in the study. In order to test sub-problems in the study, it was first tested whether the data provided the assumption of normality and homogeneity. The Kolmogorov-Smirnov test was applied to find out if it was normal distribution or not. The value obtained from this test ($p < .05$) it was found that the data did not show a normal distribution in the working universe. For this reason, it was decided to apply the Mann-Whitney U test from nonparametric analysis methods.

RESULTS, DISCUSSION, and CONCLUSION

In this study, answers were sought for the sub-problems

1. What are the distributions of prospective teachers according to their analytical and holistic thinking levels? "
2. "Do the thinking styles scores of the prospective teachers differ significantly according to the gender variable?
3. Is there a significant difference between grades between the analytical and holistic thinking styles of prospective teachers?
4. Do prospective teachers thinking styles scores differ significantly according to the variable of the school they graduated from?

Findings of the sub-problems of our study are given below.

1. "What is the distribution of prospective teachers according to their analytical and holistic thinking levels? " the answer to the question was sought. The results obtained are shown in Table 1.

Table1. Distribution of Prospective Teachers According to their Thinking Styles

Thinking Styles	N	Min.	Max.	$\bar{X}$	Ss	Thinking Styles			
						Analytical		Holistic	
						f	%	f	%
	97	5.00	15.00	8,88	2,3	40	41,2	10	10,3

The lowest score that can be obtained from the Holistic and Analytical Thinking Scale in Problem Solving was calculated as 5 and the highest score as 15. In the study, it was determined that the analytical thinking style of the prospective teachers who got 5, 6, 7 and 8 points was dominant, and

the holistic thinking style of the prospective teachers who got 15, 14, 13 and 12 points was determined as dominant. It was found that 41.2% of prospective teachers preferred analytical thinking predominantly and 10.3% preferred holistic thinking predominantly.

2. "Do the thinking styles scores of the prospective teachers differ according to the gender variable?" the answer to the question was sought. The results obtained are shown in Table 2.

Table 2. Mann Whitney U Test Results of Thinking Styles Scores by Gender Variable

Gender	N	$\bar{X}$	Average of Rank	Sum of Rank	U	P
Female	66	8,6	45,33	2991,50	780,50	.056
Male	31	9,5	56,82	1761,50		

According to the table, it is seen that the thinking styles of the prospective teachers do not differ significantly according to the gender variable ($p > .05$).

3. "Is there a significant difference between prospective teachers analytical and holistic thinking styles between grades?" the answer to the question was sought. The results obtained are shown in Table 3.

Table 3. Kruskal-Wallis Test Results of Prospective Teachers Thinking Styles Scores According to Grades

Grade Level	N	Average of Rank	Sd	X^2	p
1. Grade	21	52,64	2	,779	.678
2. Grade	9	52,83			
3. Grade	67	47,34			
Total	97				

When the table is examined, it is seen that the thinking styles scores of the prospective teachers do not show a significant difference ($p = .678$; $p > .05$) according to the grade level variable.

4. "Do thinking styles scores of prospective teachers differ significantly according to the variable of the type of school they graduated from?" the answer to the question was sought. In order to determine whether the thinking styles scores of the prospective teachers differ significantly according to the graduates school type, Kruskal Wallis test was conducted and the results obtained are given in Table 4.

Table 4. Kruskal Wallis Test Results for Thinking Styles Scores of Prospective Teachers to the Graduated School Type Variable

Graduated School	N	Average of rank	Sd	X^2	p
Anatolian High School	52	48,13	3	2,014	.570
Anatolian Teacher High School	30	53,62			
Science High School	9	46,28			
Basic / private High School	6	37,50			
Total	97				

When the table is examined, it is seen that the thinking styles scores of the prospective teacher do not show a significant difference $p = .570$ ($p > .05$) according to the school variable they graduated from.

It is expected that prospective teacher, who will train individuals of the future, will have high-level thinking skills by handling individual differences. For this reason, in our study to determine the level of thinking styles used by prospective teacher while solving problems, the mean score according to the Analytical and Holistic Thinking scale we applied to prospective teacher was $\bar{X} = 8,88$. According to this result, we can say that the prospective teacher are a little closer to analytical thinking.

In our study, which examined the thinking styles that prospective teacher preferred while solving problems, 41.2% of prospective teacher preferred analytical thinking predominantly and 10.3% preferred holistic thinking predominantly. We can say that 48.5% of the remaining prospective

teacher prefer both analytical and holistic thinking without being dominant. In general, in our study, it is seen that the prospective teacher prefer analytical thinking style predominantly. Similarly, in the studies of Ariol (2009) and Kabaran, Altıntaş, Kabaran and Sidekli (2016), it coincides with the result that prospective teacher prefer analytical thinking predominantly.

According to the other sub-problem we examined, the thinking styles of prospective teacher did not differ significantly according to gender, variable $p=.056$ ($p>.05$). Dinçer and Saracaloğlu (2011) concluded that the thinking styles of prospective teacher differ according to the gender variable, while Özbaş and Sağır (2014) and Çubukçu (2004) concluded that the thinking styles of teachers do not change according to gender, although individual differences are involved.

As a result, we can say that the thinking styles of the prospective teacher do not differ according to the gender variable. In other words, we can state that thinking styles of prospective teacher are not effective according to gender. Finally, in our study, it is seen that the thinking styles of prospective teacher did not change significantly at grade level $p = .678$ ($p>.05$) and $p = .570$ ($p>.05$) according to the type of school they graduated from. In other words, we can say that there is no difference between thinking styles of prospective teacher according to grade level and school types.

Suggestions

- ▶ It should not be forgotten that each individual will have a unique thinking style. It should be remembered that no one thinking style is superior to another, and that thinking style is the individual's own preference.
- ▶ Although the solution steps are divided into pieces and the result is reached as in analytical thinking in problem solving due to its nature in mathematics, it is also important to reach the result by evaluating the whole without focusing on the details as in the holistic thinking approach.
- ▶ In Umay and Ariol (2011), they noted that different thinking styles did not cause the problem-solving performance of prospective teacher to differ. For this reason, no matter what style of thinking the individual has, thinking and problem-solving efforts should be supported.
- ▶ Considering individual differences in educational environments, the development of individual thinking should be given importance in the education.
- ▶ Prospective teacher should be given the opportunity to recognize their own thinking styles in education and to develop themselves.
- ▶ Nisbett et al. (2001), in their study comparing analytical and holistic thinking culturally, stated that the most popular game was “Go” in Eastern culture and “Chess” in Western culture, and that “Go” game is a more holistic, complex and analytical game than “Chess”. For this reason, we can say that the development of both holistic and analytical thinking can be achieved by supporting education with games.

REFERENCES

- Ariol, Ş. (2009). *Matematik öğretmen adaylarının bütüncül (holistik) ve analitik düşünme stillerinin matematiksel problem çözme becerilerine etkisi*, Yayınlanmamış Yüksek Lisans Tezi, Hacettepe Üniversitesi Sosyal Bilimler Enstitüsü, Ankara .
- Bolça, M. (2015). *Probleme dayalı öğrenme yönteminin öğrencilerin analitik düşünme becerileri, kavramsal anlamaları ve fene yönelik tutumları üzerine etkileri*, Yayınlanmamış Yüksek Lisans Tezi, Dokuz Eylül Üniversitesi İzmir .
- Çepni, S. (2007). *Araştırma ve proje çalışmalarına giriş*. Celepler Matbacılık, Trabzon
- Çubukçu, Z. (2004). Öğretmen adaylarının düşünme stillerinin öğrenme biçimlerini tercih etmelerindeki etkisi, 12. Ulusal Eğitim Bilimleri Kurultayı İnönü Üniversitesi, Malatya.
- Dinç Artut, P., & Bal, A. P. (2008). Lise öğrencilerin geometrik başarıları ve düşünme stillerinin karşılaştırılması. *Çanakkale Üniversitesi, Sosyal Bilimler Enstitüsü Dergisi*, 17(1), 1-10.
- Dinçer, B., & Saracaloğlu, A. S. (2011). Öğretmen adaylarının düşünme stilleri profillerinin çeşitli değişkenler açısından incelenmesi. *Türk Eğitim Bilimleri Dergisi*, 9(4), 701-744.
- Güneş, F. (2012). Öğrencilerin düşünme becerilerini geliştirme, *Türklük Bilimi Araştırmaları TÜBAR* Sayı:32.

- İnci ,N., & Erten, H., Çitil, N. (2012) Fen bilgisi öğretmen adalarının düşünme stilleri. *E-Journal Of New World Sciences Academy* Sayı:3.
- Kabaran Gökçen, G., Altıntaş, S., Kabaran, H., & Sidekli, S.(2016). Analitik ve holistik düşünen sınıf öğretmeni adaylarının kullandıkları okuduğunu anlama stratejileri, *Trakya Üniversitesi Sosyal Bilimler Dergisi*, 18(1), 37-57.
- Konyalıhatipoğlu, M.E. (2016). *Ortaokul 7.sınıf öğrencilerin analitik ve bütüncül düşünme stillerinin solo taksonomisine ile incelenmesi*. Yayınlanmamış Yüksek Lisans Tezi, Recep Tayyip Erdoğan Üniversitesi Sosyal Bilimler Enstitüsü, Rize.
- Montaku, S. (2011). Results of analytical thinking skills training through students in system analysis and design course. *Proceedings Of The IETEC'11 Conference*, 2011, Kuala Lumpur, Malaysia
- Nisbett, R. E., Peng, K., Choi, I., & Norenzayan, A. (2001). Culture and systems of thought: holistic versus analytic cognition. *Psychological review*, 108(2), 291.
- Özbaş, N., & Sağır, Ş. U. (2014). Sınıf öğretmenlerinin düşünme stilleri ve kullandıkları ölçme-değerlendirme yöntemleri arasındaki ilişkinin incelenmesi. *Ondokuz Mayıs Üniversitesi Eğitim Fakültesi Dergisi*, 33(1), 305-321.
- Tok, E., & Sevinç, M. (2010). Düşünme becerileri eğitiminin eleştirel düşünme ve problem çözme becerilerine etkisi, *Pamukkale Üniversitesi Eğitimi Fakültesi Dergisi*, 27, 67-82
- Türk Dil Kurumu (1992). Atatürk kültür dil ve tarih yüksek kurumu, *Türk Dil Kurumu Sözlüğü*, İstanbul.
- Umay, A., & Arıol, Ş. (2011). Baskın olarak bütüncül stilde düşünenlerle baskın olarak analitik stilde düşünenlerin problem çözme davranışlarının karşılaştırılması, *Pamukkale Üniversitesi Eğitim Fakültesi Dergisi*, 30, 27-37.