




Lateral Thinking Self-Assessment Scale: Validity and Reliability Study

Research Article

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ABSTRACT

The aim of this study is to develop a valid and reliable scale to determine teachers' lateral thinking self-evaluation levels. For this purpose, the Six Hats Thinking Technique developed by De Bono (1986) and other thinking styles in the literature were reviewed, a 42-item draft scale was created, and data was collected from the teachers. The study group consists of 348 teachers working in public preschool institutions, primary schools, secondary schools, and high schools. The study was conducted in the 2019-2020 fall semester in schools on the European side of Istanbul. A convenience sampling technique was used to collect the data. EFA and CFA analysis were performed for the data obtained, and it was found that 48.34% of the total variance of the scale, consisting of 6 dimensions and 20 items, was explained. The internal consistency coefficient of the scale was .710, .734 in the first factor, .688 in the second factor, .695 in the third factor, .703 in the fourth factor, .680 in the fifth factor, and .698 in the sixth factor. According to EFA analysis, item loads are between .531 and .806. It was found that the data was normally distributed in total and in all factors. According to the results of the CFA analysis, the fit indices of the scale are acceptable and at a good fit level. Based on these results, a valid and reliable scale was developed.

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Keywords:

Lateral Thinking, Six-Hat Thinking, Thinking Skills.

Introduction

Thinking is a mental process that is carried out through symbols such as the concepts acquired by the person in the learning process, the images used, thoughts and movements, words and terms (Cevizci, 2000). Thinking is also defined as any of the mental activities performed consciously, such as reasoning, remembering, doubting, wanting, feeling, understanding, and comprehending. Mental processes such as making comparisons, analyzing, synthesizing, connecting, and comprehending are also defined as thinking. According to another definition, thinking is the whole of information revealed through activities of intuition, perception, comprehension, abstraction, and generalization (Türker, 2002). Thinking is also explained as the disciplined state of kneading and shaping the raw data obtained through observation, experience, intuition, reasoning, and other means (Özden, 2005). Thinking is a mental process and refers to the mental operations

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of the mind regarding a situation, phenomenon, or event. According to Lipman's (2003) definition, thinking is made up of such abilities and competencies as logical reasoning, perceiving similarities intelligently, separating them, forming a whole, identifying unique aspects, problem-solving capacity, and creating evaluation criteria. Webster's dictionary defines thinking as "the act of using one's mind to generate thoughts." The mind is defined as "the element or complex of elements that feels, perceives, thinks, wants, and especially causes emotions in an individual" (Athreya & Mouza, 2016). Thinking skills are mental activities that are used to process information, make connections, make decisions, and generate new ideas. Thinking skills can be used to understand experience, solve problems, make decisions, ask questions, make plans, or organize information (Perkins, 1987). The act of thinking is accepted as a mental process and is handled in different ways:

Logical thinking: Logical thinking is a way of thinking that has been emphasized for years in decision-making and reasoning studies. Logical thinking includes such features as being conscious, open, controlled, effortful, slow, rule-based, general and abstract (Evans, 2008). The logical system is an interpretive system that operates according to the individual's understanding of the rules of reasoning and proof, which are basically transferred culturally (Epstein, 2002). These are the variables included in the logical thinking style used to evaluate the ability to get rid of belief bias, to adopt the attitudes and thoughts of others as well as their own, to prevent their own bias, and to separate them from the context (Sa, Kelley, & Stanovich, 2005). An important function of the logical system is that it can overcome overgeneralization, and therefore it is associated with metacognitive reasoning (Kokis et al., 2002). The motivation of the logical system is important in the emergence of logical reasoning (Klaczynski & Cottrell, 2004), but it is not sufficient. Logical thinking occurs in working memory. Conscious thinking is slow, sequential, and has a lower capacity than intuitive thinking since it also has executive and suppressive functions due to its relationship with working memory (Baddley & Hitch, 1974; cited in Evans, 2008).

Reflective thinking: Reflective thinking is defined as the active, determined, and careful formation of a knowledge structure that supports any belief or knowledge and its intended results (Semerci, 2007). According to Ünver (2003), reflective thinking is also expressed as determining the positive and negative conditions, advantages, and disadvantages related to the learning-teaching method and their level. It is argued that in order for reflective thinking to be realized, individuals should have such affective characteristics as open-mindedness, sincerity, and responsibility (Doğan-Dolapçioğlu, 2007). In order to raise individuals who have reflective thinking skills and can solve the problems that they encounter, the individual must be able to evaluate his practice, learn lessons from his teaching experiences, and use his experiences for problem solving and future situations (Gür, 2008). In reflective teaching, there are three levels of reflection: technical level, contextual level, and critical level. The basic step of reflective thinking is the technical level. The technical level is the stage of testing the validity of possible solutions for solving the problem, making observations, and applying the knowledge. The contextual level, which is the second level of reflection, involves uncovering the underlying foundations of assumptions, elaborating, and applying appropriate strategies. The highest level of reflection is critical reflection. According to Wakefield (1996), critical reflection is a reflection field that includes education, the economy, politics, and social issues that can balance social inequalities. Self-evaluation is important in this reflection.

Creative thinking: Creative thinking is defined as being able to do what has not been done before, to think about the unthinkable, and to establish a relationship between objects or thoughts that are not related (Saban, 2005). It is necessary to have a certain level of intelligence for creativity. However, it is not a prerequisite for a creative person to have a high level of intelligence. Creative thinking takes place in four stages: preparation, incubation, enlightenment, and evaluation.

1. Preparation Stage: At this stage, the individual acquires knowledge, generates ideas about the problem, and catches good ideas. In the preparation stage, the problem is explained, defined, data is collected, and existing materials are reviewed. Briefly, at this stage, detailed information about the problem is collected (Özden, 1997).

2. Incubation Stage: This stage is the stage of mental scrutiny and examination of the situation.

At this stage, abilities such as pensive thinking, deep thinking, subconscious processes, visualization, and sensory perception also work. In the incubation stage, the individual does not think consciously about the problem. Even when the individual is busy with other activities, he continues to think about the related problem.

3. Enlightenment Stage: This is the stage where ideas, feelings, and thoughts suddenly harmonize and the solution becomes clear. At this stage, also called the grasping stage, the emergence of thought is a long process, but the solutions are sudden.

4. Verification Stage: In this stage, the solution to the problem is evaluated in terms of suitability, practicality, and validity. This stage, in which ideas are made more detailed with logical thinking, is also called the validation stage. Weaknesses in thought are identified and some changes can be made when necessary to implement the solution (Starko, 2001).

Critical Thinking: Critical thinking is a cognitive process associated with the active use of the mind.

Critical thinking means using mental processes such as analytical and evaluative thinking, attention, categorization, selection, and judgment. Ennis (1987) emphasizes the need for the skills of skeptical thinking and logical thinking in critical thinking. Critical thinking requires using skepticism and doubt constructively to analyze what is available. The focus of critical thinking should usually be on a specific argument. This argument can be thought of as the message conveyed through speaking, writing, performance, or other means. Critical thinking creates an environment for determining the clear and hidden messages correctly and understanding the process by which the argument is constructed (Einstein, Podolsky, and Rosen, 1935).

Analogical Thinking: The concept of analogy, which means reasoning based on similarities, is defined as the association of two or more phenomena based on their common points (Holyoak & Thagard, 1995; Mumford & Porter, 1999). According to another definition, an analogy is defined as the similarities that can be used to make future inferences between different situations (Gentner, 1998). According to these definitions, analogies can be used to explain the solution to the target groups or to solve the problem (Gentner & Jeriorski, 1993). There are two basic stages in analogy generation: diagnosis and mapping. The diagnostic stage is the process of determining the most appropriate source in mind in accordance with the target situation, event, or phenomenon. On the other hand, in mapping, relationships are formed between the determined source and the target situation, event, or phenomenon (Duit, Roth, Komorek & Wilbers, 2001; Rachkovskij, 2004).

Analytical Thinking: In analytical analysis, there are processes such as breaking down a problem situation into its constituent parts and establishing logical relationships between those parts and between each part and the whole (Anderson et al., 2010). Analytical thinking is the whole of the process of breaking the whole into its parts and redefining and classifying them (Güneş, 2012). According to Sternberg (2006), analytical thinking is a four-stage process. The first is breaking down the problem into parts and making sense of the parts; the second is explaining the reasons for the emergence of the problem and the solution steps; the third is making comparisons between the collected data; the fourth is the evaluation of the resulting data and reaching a critical conclusion. Examining the characteristics of making logical inferences with the deductive method, Aristotle revealed that the logical consistency of a proposition can be evaluated by expressing any

thesis in terms of such variables as A, B, and qualifiers such as "some," "all," and "none" (Smith, 2012). This process constitutes the foundation of analytical thinking.

Flexible Thinking: Flexibility is the ability to develop different perspectives on objects, thoughts, and processes. Categorical flexibility is the ability to establish different relationships between concrete objects, to handle objects from different angles, and to classify and categorize them (Blaye et al., 2006). Cognitive flexibility is the ability to establish relationships between different perspectives, to focus, and to seek answers to problems in a versatile and conscious way (Jacques & Blaye, 2003). Flexible thinking is the ability to create fluent thoughts while verifying information or changing thoughts. Flexible thinking takes two forms: natural flexibility and adaptive flexibility. Natural flexibility is flexibility that happens without you realizing it. Adaptive flexibility includes awareness and conscious flexibility. Flexible thinking is the ability to establish different relationships between shapes, processes, objects, and problems in different contexts.

Lateral Thinking (De Bono, 1986): Lateral thinking does not have to be sequential. A person can move from one point to another in different ways and then also let the different points converge at one point. In lateral thinking, the validity of the result can never be verified by the method of arriving at it. However, once the conclusion is reached, the solution can verify itself. It doesn't matter how this path/method arose once a link has been created retrospectively to connect the starting point and the solution. In lateral thinking, one accepts the approach that will lead to the best result, but instead of following it, one prefers to generate as many different alternative approaches as possible. The lateral thinking method is not to find or follow the best approach but to generate alternatives. Success is measured by the number of alternatives produced. In short, lateral thinking is about generating new ideas (De Bono & Zimbalist, 1970). In lateral thinking, one does not deal with single approaches, however effective they may be. In lateral thinking, it is consciously aimed at producing as many alternative approaches as possible rather than the approach that is thought to be the most effective. Success is measured by the number of alternatives that are produced. Sometimes one of these approaches can produce a very effective solution, but it may need to be further developed with vertical thinking. In general, lateral thinking techniques fall into four main categories (De Bono, 1969):

Awareness: Awareness includes an appreciation of the nature of the mind's information processing system and the inherent limitations of such a system. Awareness also includes awareness of the limitations of vertical thinking. Direct participation and practice, as well as understanding of the processes involved, are the only ways to achieve awareness. The theoretical framework can only be useful in guiding this insight.

Random stimulation: Random stimulation refers to the use of external and unplanned stimuli for situations that do not follow the natural order of development of an idea. Such stimulants may arise through deliberate exposure to unrelated stimuli by the thoughts of others and in interdisciplinary discussion, as in a brainstorming session, or by the stimulus effects of random words or concepts.

Alternatives: Alternatives involve deliberately developing different approaches and different ways of looking at things. This method also involves directing the group's attention to all units of a problem.

Modification: This group of methods is the use of what is available to produce something new. There are various techniques, such as changing the direction to go where the direction is pointed, reversing a relationship, and this also includes rejecting what is given. Another technique is to break large pieces into as small pieces as possible. Relationships can be abstracted and then transferred to an analogy that is developed and re-transformed to see what happens next. These and many other techniques can be explained clearly and practically. What is important, however, is to understand the fundamental nature of lateral thinking and how the nature of the system makes it so necessary. Structural features of lateral thinking (De Bono, 1969):

Six Hats of Thinking: The first value to think about is the representation of a defined thinking system. In this theory, hats represent thoughts. The second value is the one that directs attention. Given that thinking

is simply non-reactive, a way must be found to redirect attention from one thought to another dimension. The third value is convenience. The symbolization of the six different hats offers individuals a recommendable way to ask them to change in some way. Here you have the choice of which of the hats, i.e., ways of thinking, you want or not. The fourth value is the possible fundamental changes in cerebral chemistry experienced in the previous field of thinking. In a way, it is a matter of taking action to continue the arguments that go beyond the current knowledge and the current situation, and the mind takes a position accordingly. The fifth value is to establish the rules of the game. One of the most effective ways to teach someone something is to learn the rules of the game (De Bono, 1969). The hats for lateral thinking defined by De Bono are as follows:

White Hat (Target Hat): The target is the hat and is objective. The white hat attaches importance to objective facts and data.

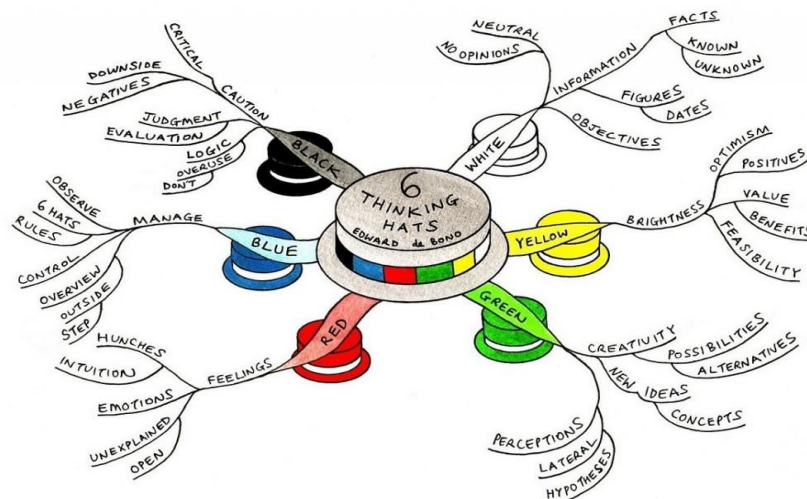
Red Hat: Red represents an emotional point of view as well as irritability, anger, and emotions.

Black Hat: Black is the color of distress and negativity. This hat covers the negative aspects. It also requires caution.

Yellow Hat: Yellow represents happiness and positivity. The yellow hat covers optimism and positive thinking.

Green Hat: It represents sprouting, that is, living and developing, fertile growth-like vegetation. The green hat is geared towards creativity, the creation of new and original ideas.

Blue Hat: Blue is cold, but it is also the color of the all-encompassing sky. The blue hat has the property of control and represents the organization of the thought process. It is also like the synthesis of other hats. The six hats technique is an effective parallel thinking exercise that stimulates creativity by interrupting habitual thinking patterns (Liang, 2014). The creativity areas related to the six hats predicted in lateral thinking are given in Figure 1.



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Figure 1. Lateral thinking creativity areas

Thinking, especially multidimensional thinking, is among the basic skills that should be acquired by individuals in educational activities. Schools are the production subsystems of the education system. Students' learning to think may be possible in schools where they spend a significant part of their lives. In students' learning to think, the most effective factor is teachers. Knowing how teachers think can provide you with insight into how the institution functions. Among these, it is very important to know the teacher competencies that can be effective in students' learning to think. It is also very important to develop the ability of working teachers or teachers to be employed to think in accordance with the six thinking styles. For these reasons, it is

an important necessity to develop a valid and reliable measurement tool and to use it effectively. A literature review has shown that there is only one study conducted in Turkey (Semerci, 2016) titled the "Lateral Thinking Tendency Scale" that determines lateral thinking, and this study is one-dimensional and consists of nine items. Considering that it would be useful to develop a more comprehensive scale for lateral thinking self-assessment, the problem statement of this study was determined as "*Can a valid and reliable lateral thinking scale be developed?*"

Methodology

Research Design

This study is descriptive in nature since the validity-reliability analyses were carried out by collecting quantitative data. The relational screening model is defined as "a research model that aims to determine whether there is a change between two or more variables and the degree of change" (Karasar, 2005).

Study Group

The study group of this research consists of 348 teachers working in the districts on the European side of Istanbul in the 2019-2020 academic fall semester and determined by convenience sampling technique. Of the 348 participants, 67.9% were female and 32.1% were male. Of study group, 6.7% were working in pre-school institutions, 28.2% in primary schools, 49.7% in secondary schools, and 15.4% in high schools. Of these teachers, 24.6% have 1-5 years of experience, 31.6% have 6-10 years, 15.9% have 11-15 years, 12.0% have 16-20 years and 15.9% have 21 years and above experience. Although there are different opinions about the size of the sample, the generally accepted rule is to include 10 or 15 participants per item in the analysis (Field, 2005). In addition, there are opinions that there can be five participants per item as the lower limit (Snook & Gorsuch, 1989). Accordingly, the number of participants in the sample is 6.5 times more, and one may see that it is congruent with the number of participants envisaged in the scale development.

Data Collection

A 90-item draft was created by the review of the related literature for the purpose of the scale planned to be developed. Then it was reduced to 52 items by taking the opinions of the scale assessment experts, the pre-evaluation of the instructors from different fields, and a group of 75 teachers. Finally, rewriting and item corrections were made. The options on the scale were determined as 1-Never, 2-Rarely, 3-Sometimes, 4-Often, and 5-Always. The 52-item scale (Yıldırım, 2019), which was previously presented as a paper in a congress, was revised and reduced to 42 items. Out of the six thinking dimensions determined in lateral thinking, there are 42 items in the draft scale, consisting of 7 items for the white hat, 9 items for the red hat, 7 items for the black hat, 6 items for the yellow hat, 6 items for the green hat, and 7 items for the blue hat.

Data Analysis

When 30 data affecting the normal distribution were deleted as a result of the normality analysis, it was discovered that the data were in the range of +1 to -1 (Skewness: -.221; Kurtosis:.038), and it was therefore decided to perform the parametric analyses (Tabachnick and Fidell, 2007). The Cronbach's Alpha reliability value of the draft scale was determined as $R=.805$.

In the second stage, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy value ($KMO=.779$) was found to be suitable for factor analysis. In order to perform factor analysis, the KMO value should be greater than 0.60 and the significance value should be less than 0.05. The KMO criterion is the ratio of the sum of the squares of the total correlation values of the variables to the sum of the squares of the total and piecewise correlation values. It is stated that the correlation pattern is tight as this ratio approaches 1, and there is a spread in the pattern as it approaches 0 (Field, 2005). In addition, an Exploratory Factor Analysis (EFA) was conducted regarding the data by taking the item load as .30, and it was found that the structure consisted of 11

factors. After this stage, it was decided to perform EFA separately for each factor according to the six factors determined by De Bono (1986). In the third stage, EFA analysis was performed for each sub-dimension of the scale, and the items collected in a single factor for each factor were determined as the items of the scale sub-dimensions with varimax vertical rotation. In the fourth stage, EFA was performed for all items, and data on all items of the scale were obtained. In the fifth stage, Confirmatory Factor Analysis (CFA) was performed.

Findings

In the first stage, EFA analysis was performed with Varimax Rotation with a factor load of .35 for the data consisting of items representing the white hat (1, 8, 15, 21, 29, 36, and 37). In the first analysis, it was found that the structure consisted of two factors, and that two items (21, 29) were included in two different factors, and, therefore, they were excluded. In the second EFA analysis (.35), it was found that this factor consisted of five items (1, 8, 15, 36, and 37) and that 48,980 of the factor variance was explained. In the second stage, EFA analysis was performed for nine items (2, 7, 9, 14, 16, 20, 22, 30, and 35) representing the red hat. In the second analysis, it was found that two items (22, 14) were below the determined factor load value (.35) and were excluded from the scale. In the third analysis, it was found that three items (7, 30, and 44) were under a second factor and were excluded. It was found that 64,345 of the variance related to this factor, which consisted of three items (2, 9, and 16), was explained.

In the third stage, EFA analysis was performed for the seven items (3, 10, 17, 23, 25, 31, and 38) representing the black hat, and it was observed that two items (23, 25) were grouped under a second factor and, accordingly, were excluded. In the second EFA analysis for this factor, it was determined that one item consisted of five items (3, 10, 17, 31, and 38) and 39,295 of the factor variance was explained. In the fourth stage, EFA analysis was performed for the six items (4, 11, 26, 32, 39, and 42) representing the yellow hat. According to the results of this analysis, the structure is single-factorial and 37,233 of the variance related to the factor is explained. According to the results of the EFA analysis made for six items (5, 12, 24, 27, 33, and 41) representing the green hat in the fifth stage, the structure was single-factorial, and 46,154 of the factor's variance was explained. In the EFA analysis performed for seven items (6, 13, 18, 19, 28, 34, 40) representing the blue hat in the sixth stage, two items (6, 28) were excluded from the scale because they were under a second factor. In the second EFA analysis, it was found that the structure consisted of five items (13, 18, 19, 34, and 40) with a single factor and 39,087 of the variance of the factor was explained. In the seventh stage, after the EFA for each factor, the item load value for the remaining 30 items (1, 8, 15, 36, 37- 2, 9, 16-3, 10, 17, 31, 38-4, 11, 26, 32, 39, 42-5, 12, 24, 27, 33, 41-13, 18, 19, 34, and 40) was taken as .45 and an EFA analysis was performed.

In the final EFA analysis with thirty variations, it was found that 57,880 of the total variance was explained and a 6-factor structure was formed: white hat (1, 36, 37), red hat (2, 9, and 16), black hat (3, 18, and 31), yellow hat (4, 26, 39, and 42), green hat (12, 24, 27, and 41), and blue hat (6, 13, and 34). The Cronbach Alpha value for the scale, which consists of 20 items, was found to be ($R = .710$).

Table 1. Results of the Reliability Analysis

Factor	Number of Items	Cronbach's Alpha
1. Green Hat	4	.734
2. White Hat	3	.688
3. Red Hat	3	.695
4. Yellow Hat	4	.703
5. Black Hat	3	.680
6. Blue Hat	3	.698
Total	20	.710

When Table 1 is examined, one may see that the Cronbach's α values for the scale are .710 in total, which is slightly below the value of .70 in the sub-dimensions and is in the acceptable range. A value below "0.40" for the Cronbach's α coefficient, which is the measure of internal consistency, indicates that the scale is not reliable; a value between 0.40-0.59 means the scale has "low reliability", a value between 0.60-0.79 means the scale has "high reliability" and a value between "0.80-1.00" indicates that the scale has "high reliability" (Tavşancıl, 2002:29).

Table 2. Results of the Normality Analysis

Scale and Sub-Dimensions	Skewness	Kurtosis
White Hat	-.413	-.528
Red Hat	-.454	-.028
Black Hat	-.487	-.100
Yellow Hat	-.463	.370
Green Hat	-.216	-.086
Blue Hat	-.678	.855
Total	-.145	-.326

When Table 2 was examined, it was found that the kurtosis and skewness values of the scale data showed a normal distribution, and it was decided that parametric analysis could be performed. The results of the exploratory factor analysis (EFA) are as in Table 3.

Table 4. Results Regarding the Explained Variance

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.540	17.700	17.700	2.353	11.765	11.765
2	2.126	10.630	28.330	2.092	10.458	22.224
3	1.598	7.991	36.321	1.831	9.153	31.377
4	1.468	7.339	43.660	1.769	8.845	40.222
5	1.336	6.682	50.341	1.624	8.122	48.344
6	1.103	5.516	55.857	1.503	7.514	55.857

When Table 4 is examined, one may see that 17.700% of the total variance is explained by the first factor and 55.857% by the sixth factor.

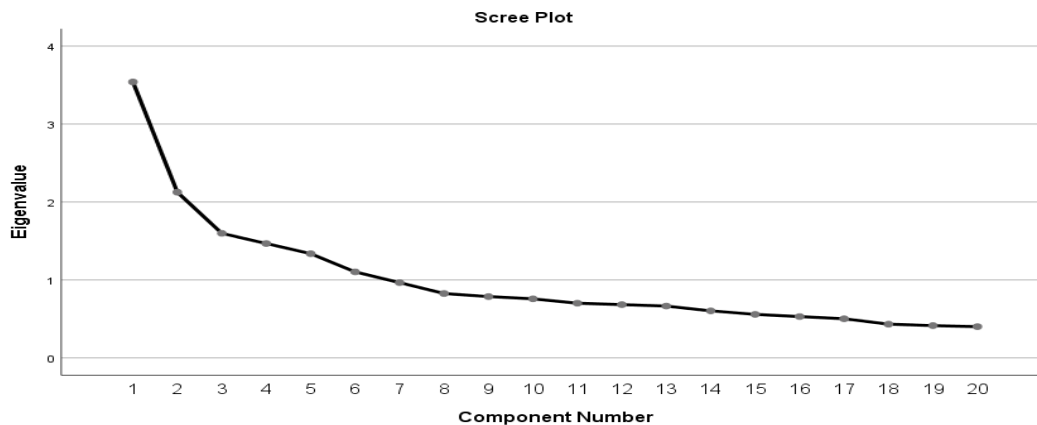


Figure 2. Lateral Thinking Scale Concentration Graph

The number of factors is shown on the horizontal axis, and the eigenvalues are shown on the vertical axis in Figure 1. When the eigenvalue is set to 1, a structure with six elements emerges.

Table 5. Results of Exploratory Factor Analysis

	Rotated Component Matrix ^a Component						Item-Total Correlation
	Green H.	Yellow H.	Blue H.	White H.	Black H.	Red H.	
atc24	.784						,461
atc12	.769						,448
atc27	.753						,522
atc41	.537						,460
atc39		.776					,486
atc42		.748					,473
atc26		.653					,434
atc4		.543					,452
atc34			.727				,495
atc13			.708				,506
atc6			.654				,293
atc37				.806			,408
atc1				.677			,312
atc36				.608			,392
atc31					.765		,198
atc17					.717		,261
atc3					.569		,326
atc16						.769	,225
atc9						.749	,142
atc2						.531	,256

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. After six iterations, the rotation converged.

When Table 5 is examined, one may see that, according to the results of the analysis of variance, the scale consists of a six-factor structure in six rotations, and item factor loads are between .806 and .531. According to these data, it can be accepted that the discrimination of the scale items is high.

Findings Obtained by Confirmatory Factor Analysis (CFA)

Exploratory factor analysis is necessary in scale development, but it is not considered sufficient. It is recommended that the structured scale be evaluated with confirmatory factor analysis (Hinkin, 1995). CFA is used to test whether there is a sufficient level of relationship between the determined factors, which variables are related to which factors, whether the factors are independent from each other, and whether the factors are sufficient to explain the model (Erkorkmaz, Etikan, Demir, Özdamar, & Sanisoğlu, 2013). For this reason, the factor structures of the model consisting of 6 factors and the data of 20 items obtained as a result of the exploratory factor analysis of the Lateral Thinking Self-Assessment Scale were tested with confirmatory factor analysis. The model's fit statistics with standardized results and the primary-level CFA model are shown in Table 6.

Table 6. The CFA Model of the Lateral Thinking Self-Assessment Scale

Fit Criteria	Good Fit	Acceptable Fit	Model	Result
$\chi^2/sd(\text{CMIN}/\text{DF})$	$\chi^2/sd \leq 3$	$\chi^2/sd \leq 4-5$	1.343	Good Fit
RMSEA	$0 \leq \text{RMSEA} \leq .05$	$.05 < \text{RMSEA} \leq .08$	.031	Good Fit
SRMR	$0 \leq \text{SRMR} \leq .05$	$.05 < \text{SRMR} \leq .10$	.050	Acceptable Fit
NFI	$.95 \leq \text{NFI} \leq 1.00$	$.90 \leq \text{NFI} < .95$	.837	Low
CFI	$.97 \leq \text{CFI} \leq 1.00$	$.95 \leq \text{CFI} < .97$	.951	Acceptable Fit
GFI	$.95 \leq \text{GFI} \leq 1.00$	$.90 \leq \text{GFI} < .95$	.944	Acceptable Fit

AGFI	.90≤AGFI≤1.00	.85≤AGFI<.90	.925	Good Fit
IFI	.95≤IFI≤1.00	.90≤IFI<.95	.952	Good Fit
TLI (AMOS)	.95 ≤ TLI ≤ 1.00	.90 ≤ TLI ≤ .95	.940	Acceptable Fit

According to Table 6, it is clear that the Chi-square/freedom level ($X^2/sd=1.343$) is at the level of good agreement. The mean square root of the estimation errors (RMSEA=.031) is at the good fit level, and the goodness of fit index (GFI=.944) is within the acceptable range. It is clear that the adjusted goodness of fit index (AGFI=.925) is at the level of good fit. When the table is examined as a whole, one may see that the scale shows a good fit.

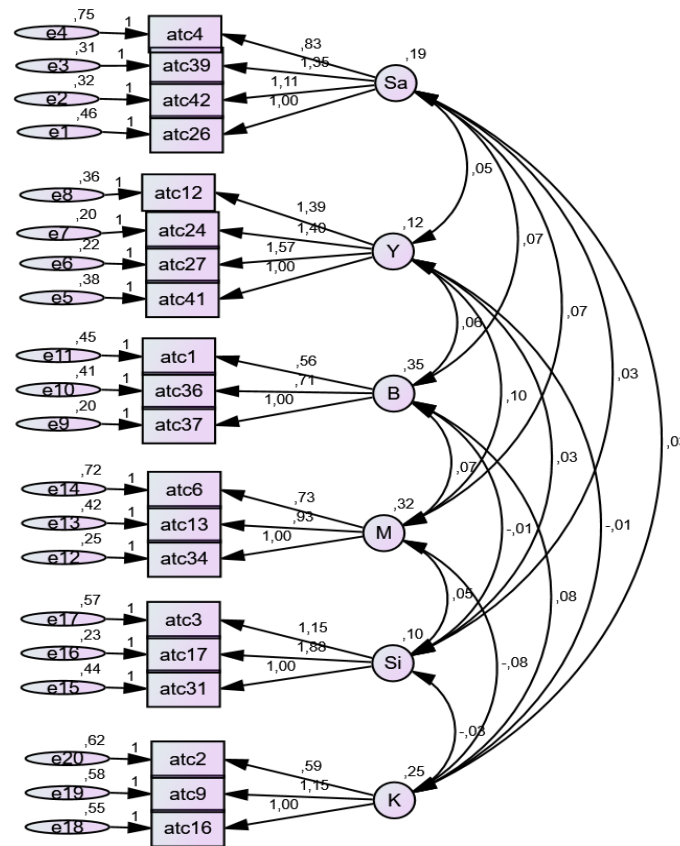


Figure 2. Standardized CFA Model

The basis of the first-level multi-factor model is the collection of observable variables under more than one independent dimension. This model may be a model that has been completely determined by the researcher theoretically and tested with confirmatory factor analysis, or it may be a model obtained as a result of explanatory factor analysis (Akyüz, 2018). In this study, 6 different factors were determined by the researcher according to the structure in the scale development area and a CFA was performed. It was found that the items expected to be collected in the determined factors were gathered under the relevant factor and the relationship of the items with the related factors was between .20 and .75.

Discussion and Conclusion

The act of thinking, which is defined as a mental activity (Cevizci, 2000) performed through symbols such as the concepts acquired by the person in the learning process, the images used, thoughts and movements, words and terms, is considered a human-specific ability and skill in the social sciences, especially in learning psychology. Although there are different perspectives on thinking, the relationship between education and thinking, and working and thinking is a concept that is emphasized more in organizations where social communication is intense. Differences in human thinking, the characteristics of thinking styles,

the ability to develop different thinking skills, social differentiations, as well as constantly changing and diversifying human needs, the functioning of organizations, which are the most basic structures in meeting human needs due to the rapid change in technology, increase the need for individuals with different thinking skills. In this context, it may be necessary to develop the ability of an individual to think differently in different situations and/or to benefit from the thoughts of individuals with different thinking styles.

The importance of lateral thinking is emphasized in the reviewed literature, and it can be used in various professions and even in all areas that require creativity in daily life. One may see that attention is drawn to some critical elements of lateral thinking that require approaching the problem from a different perspective, such as challenging all assumptions surrounding a situation, asking very basic questions, adopting a different perspective intentionally, using random inputs to change thoughts (Sloane, 2016).

Educational institutions are the most basic educational environments in which creative individuals are or should be trained. For this reason, identifying the different thinking skills of teachers is important in terms of teaching students to think, or at least directing them to think (Güneş, 2012). This leads to the idea that there is a need for a scale that can scientifically identify the lateral thinking skills of individuals. The developed Lateral Thinking Self-Assessment Scale consists of 20 items and 6 sub-dimensions. According to the EFA results, it was found that 48.34% of the total variance of the scale could be explained by the 6th factor, and the reliability values of the scale were statistically within acceptable limits. According to the results of the confirmatory factor analysis, the fit indices of the scale were at good (RMSEA, SRMR, CFI, AGFI) and acceptable (NFI, CFI, GFI, TLI) levels, except for one value (NFI). The fact that the chi-square was found as $X^2/sd=1,343$ indicates that the factor structure is well adjusted (Kline, 1998; Segars & Grover, 1993, cited in Semerci, 2016). The fact that the chi-square was found as $X^2/sd=1,343$ indicates that the factor structure is well-adjusted (Kline, 1998; Segars & Grover, 1993, cited in Semerci, 2016). These results are indications that the scale is valid. This scale was developed to reveal the tendencies of general lateral thinking based on the data collected from adults. This scale can be used to obtain information from adults in the field of education. There are 6 sub-dimensions in the scale, and in order to get a total score, the total score must be calculated with the formula developed by the researcher.

English version

Statements about your attitude at work		White	Red	Black	Yellow	Green	Blue
1	I'll speak the truth even if I'm hurt.	x					
2	I act how I feel.		x				
3	I consider the risky sides of every job.			x			
4	I see everything on the positive side.				x		
5	I can make decisions without enough information too.						x
6	I can come up with different solutions in every situation.		x				
7	What my feelings are, so to be my actions.					x	
8	I prefer to consider all possibilities and decide accordingly.						x
9	My emotions never fail me.		x				
10	The negative side of everything attracts my attention first.			x			
11	I believe that if I do good, I will be the one who gets hurt.			x			
12	I prefer to secure my job.				x		
13	Even in the worst situation, I can find something to be happy with.					x	
14	I think there are many factors that affect the result of every job.			x			
15	I believe that there is a way to communicate with every person.						x
16	It makes me very happy to help unreturned.	x					
17	I think of others more than myself.	x					
18	I give positive energy to the environment I am in.				x		
19	I get bored of doing my job on my own.					x	
20	The mistakes I make bother me for a long time.				x		

Türkçe versiyon

Genel olarak tutumunuza ilişkin ifadeler		Beyaz	Kırmızı	Siyah	Sarı	Yeşil	Mavi
1	Zarar göreceğim olsam da gerçeği ifade ederim	x					
2	Nasıl hissediyorsam öyle davranırım		x				
3	Her işin riskli taraflarını dikkate alırım			x			
4	Her şeye olumlu tarafından bakarım				x		
5	Yeterli bilgi olmadan da karar verebilirim						x
6	Her durumda farklı çözümler üretebilirim		x				
7	Duygularım ne ise davranışlarım da öyle olur					x	
8	Bütün ihtimalleri düşünüp öyle karar vermeyi tercih ederim						x
9	Duygularım beni asla yanıltmaz		x				
10	Her şeyin öncelikle olumsuz tarafı dikkatimi çeker			x			
11	İyilik yaparsam zarar görenin ben olacağıma inanırım			x			
12	İşimi garantiye almayı tercih ederim				x		
13	En kötü durumda bile mutlu olacak bir şeyler bulabilirim					x	
14	Her işte sonucu etkileyen birçok etkenin varlığını düşünürüm			x			
15	Her insanla iletişim kurabilmenin bir yolu olduğuna inanırım						x
16	Karşılıksız yardım etmek beni çok mutlu eder	x					
17	Kendimden çok başkalarını düşünürüm	x					
18	Bulduğum ortama olumlu enerji veririm				x		
19	Kendi başıma iş yapmaktan sıkılırım					x	
20	Yaptığım hatalar uzun süre beni rahatsız eder				x		

Ethics committee approval

The name of the committee that made the ethical evaluation: Ethics Committee of the Rectorate of Sabahattin Zaim University.

Date of ethical evaluation decision: 24.02.2022.

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REFERENCES

- Akyüz, H. E. (2018). Yapı geçerliliği için doğrulayıcı faktör analizi: Uygulamalı bir çalışma. *Bitlis Eren Üniversitesi Fen Bilimleri Dergisi*, 7(2), 186-198.
- Athreya, B. H. & Mouza, C. (2016). *Thinking skills for the digital generation: The development of thinking and learning in the age of information*. Springer.
- Can, H. A. & Semerci, N. (2010). Altı şapkalı düşünme tekniğinin ilköğretim sosyal bilgiler dersinde öğrencilerin akademik başarısına etkisi. *Eğitim ve Bilim*, 32(145), 39-52.
- Cevizci, A. (2000). Felsefe sözlüğü. *Basim. Istanbul, Paradigma Yayinlari*.
- Cottrell, S. (2019). *The study skills handbook*. Macmillan International Higher Education.
- De Bono, E. (1969). Information processing and new ideas-lateral and vertical thinking. *The Journal of Creative Behavior*, 3(3), 159-171.
- De Bono, E. (1985). The CoRT thinking program. *Thinking and learning skills*, 1, 363-378.
- De Bono, E. (2017). *Six thinking hats*. Penguin UK.
- De Bono, E. (1985). DeBono's thinking course. New York: Facts on File Publications.
- De Bono, E. (1986). *Six Thinking hats*. England: Viking.
- De Bono, E. & Zimbalist, E. (1970). *Lateral thinking*. London: Penguin.
- Doğan, N., Soysal, S., & Karaman, H. (2017). Aynı örnekleme açmılayıcı ve doğrulayıcı faktör analizi uygulanabilir mi?. *Pegem Atıf İndeksi*, 373-400.
- Einstein, A., B. Podolsky, and N. Rosen, 1935, "Can quantum-mechanical description of physical reality be considered complete?", *Phys. Rev.* 47, 777-780.
- Erkorkmaz, Ü., Etikan, İ., Demir, O., Özdamar, K. ve Sanisoğlu, S. Y. (2013). Doğrulayıcı faktör analizi ve uyum indeksleri. *Türkiye Klinikleri Journal of Medical Sciences*, 33(1), 210-223.
- Field, A. P. (2005). Is the meta-analysis of correlation coefficients accurate when population correlations vary?. *Psychological methods*, 10(4), 444.
- Gorsuch, R. L. (1997). Exploratory factor analysis: Its role in item analysis. *Journal of personality assessment*, 68(3), 532-560.
- Güneş, F. (2012). Öğrencilerin düşünme becerilerini geliştirme. *Türklük Bilimi Araştırmaları*, (32), 127-146.
- Hinkin, T. R. (1995). A review of scale development practices in the study of organizations. *Journal of management*, 21(5), 967-988.
- Karasar, N. (2005). Bilimsel araştırma yöntemi (17. Baskı). *Ankara: Nobel yayın dağıtım*.
- Liang, S. (2014). Lateral thinking: using reativity to get ahead. <https://blog.sandglaz.com/lateral-thinking-using-creativity-to-get-ahead>. [Erişim: 24.03.2022].
- Lipman, M. (2003). *Thinking in education*. Cambridge University Press.
- Perkins, D. N. (1987). Thinking frames: An integrative perspective on teaching cognitive skills. *Teaching thinking skills: Theory and practice*, 41-61.
- Semerci, Ç. (2016). Developing A Lateral Thinking Disposition (Latd) Scale: A Validity and Reliability Study/Yanal Düşünme Eğilimi (YADE) Ölçeğinin Geliştirilmesi: Geçerlik ve Güvenirlik Çalışması. *Eğitimde Kuram ve Uygulama*, 12(1), 358-371.
- Sloane, P. (2016). Lateral Thinking In Brand Marketing. <http://www.brandquarterly.com/lateral-thinking-in-brand-marketing>. [Erişim: 23.03.2022].
- Snook, S. C. & Gorsuch, R. L. (1989). Component analysis versus common factor analysis: A Monte Carlo study. *Psychological bulletin*, 106(1), 148.
- Tabachnick, B. G. & Fidell, L. S. (2007). *Using Multivariate Statistics*. Fifth Edition. Pearson: AB.
- TDK. (2020). Güncel Türkçe Sözlük, (Hata! Köprü başvurusu geçerli değil.. [Erişim:20.10.2020].
- Yıldırım, B. (2019). Altı Şapkalı Düşünme Tekniği Ölçeği: Geçerlik ve Güvenirlik Çalışması 14. Uluslararası Eğitim Yönetimi Kongresi Özet Bildiri Kitapçığı, s.326-327. 2-4 Mayıs 2019, Çeşme-İzmir, Türkiye.