

Learning How to Learn Scale: A Study of Validity and Reliability

Mürşet ÇAKMAK¹

Mardin Artuklu University

Faysal ÖZDAŞ²

Mardin Artuklu University

Mehmet Ali AKIN³

Mardin Artuklu University

Abstract

The aim of this study is to develop a valid and reliable scale that can be used in investigating learning process of secondary school students. The study was carried out with students attending to different secondary schools in Mardin in 2018. Survey method was employed, and sampling was chosen with the help of simple random sampling method in this study. In order to create an item pool, 26 students having education in the 10th grade were asked to write an essay about the concept and process of learning how to learn. Then the literature was searched, and a 5-point likert-type 66-item draft scale was formed out of the data obtained from this essay. The draft scale was revised in accordance with the expert views. The data achieved after the application of the scale were analysed using SPSS and AMOS programs. In the analysis, item total correlation, exploratory and confirmatory factor analysis and reliability analysis techniques were benefited. According to analyses performed, it was seen that the scale was of 21 items and had a structure of 5 factors, and the variant ratio that it explained was 52.630% and that also fit index values were acceptable, and they were at an excellent harmony level. It was observed that there was a positive direction and medium level relation Among all factors. Cronbach alpha internal consistency reliability coefficient of the scale changes between 0.655 and 0.864. As a result, it is comprehended that Learning How to Learn Scale prepared as 5 Likert type can be employed as a valid and reliable measuring tool for students attending secondary school according to findings obtained.

Keywords: Learning How To Learn, Secondary Education, Scale, Validity And Reliability

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¹Mardin Artuklu University, Literature Faculty, Department of Educational Sciences, ORCID: 0000-0001-9472-8200

Correspondence: mursetcakmak@artuklu.edu.tr

²Mardin Artuklu University, Literature Faculty, Department of Educational Sciences, ORCID: 0000-0002-2261-9504, Email: faysalozdas@hotmail.com

³Mardin Artuklu University, Literature Faculty, Department of Educational Sciences, ORCID: 0000-0002-9387-0149, Email: akina7215@hotmail.com

Introduction

Learning how to learn necessitates to know learning strategies an individual has and to be aware of strengths and weaknesses and to investigate appropriate education, guidance or opportunities (MEB, 2019). Competence of learning how to learn is the ability to continue learning and organize their own learning, including effective management of time and information, individually and in groups. These abilities consist of awareness of learning process and needs and determining available opportunities and overcoming the obstacles of a successful learning. In learning how to learn approach, students' previous learning and experiences are also important so that they will be able to achieve knowledge and skills (Education Council, 2006). Learning how to learn is expressed to be an experiential process based on interrogation (Priestly & Humes, 2010) and to be able to produce the necessary knowledge for new situations using available information (Özden, 2013: 77) and to provide the achievement of effective learning qualities (Özer, 2003). In addition, when learning how to learn approach is effective when it contains emotional and social aspects such as autonomy, self-confidence, relations depending on corporation among the participants of process and participation of families and community (Moreno & Martin, 2007).

Learning how to learn is very important for motivation, confidence and competence of the individual (Education Council, 2006). The skill of learning how to learn takes place among the properties of student oriented education. Among the other characteristics of the students, the ability to have scientific thinking, produce knowledge and use this knowledge, have the ability to communicate and learn to learn (MEB, 2007). The skills that the students should possess the ability to think scientifically and can produce knowledge and can use this knowledge and the approach of learning how to learn are accepted among these characteristics (MEB, 2007). It is necessary that the student receive support to be equipped with the competence of learning how to learn. Attaining this competence is a case which student cannot overcome alone. The reason for this is that this competence necessitates inquiry of competence, examination, investigation, high motivation, patience and continual learning (Özdaş, 2018). Since learning how to learn is a mental activity, this skill cannot be assessed as any kind of knowledge or method. Learning how to learn is possible through the fact that the individual can use his/her intelligence and develop his/her thinking ability (Özden, 2013). Therefore, individual motivation plays a crucial role in continual learning how to learn and it's maintaining (MEB, 2019).

Learning how to learn is important as a requirement of living in an information society. Knowledge bases of all disciplines and tools and methods used in these knowledge bases may change in a short time. In this process, the most important skill that the school will equip students with is to create desire in them to learn (Özden, 2013). The information society needs individuals who process and use the knowledge rather than the individuals who store the knowledge (Doğanay, 2012). It is

impossible for the school to equip the students with enough information at a time when information changes rapidly. Instead of uploading knowledge to the students of the school, it is necessary to educate them in order to adapt to new situations and learn the information they need (Özden, 2013) because school is not just a place where knowledge is learned. The school is also the place where the individual is educated about the behaviours that he / she will gain to become a productive, happy and successful member of the society (MEB, 2007). To provide students with the necessary knowledge and skills to develop their interests and abilities and to prepare them for life in this way are among the main duties of the school (MEB, 1973). In this process, the school should encourage individuals to be more conscious and selective, create an environment for how they should be learned, enable them to explore in learning, and perhaps most importantly, teach systematic ways of accessing information (Balay, 2004). Learning how to learn consist of social, cultural and cognitive characteristics (Hoskins & Frederiksson, 2008). Within this context, learning how to learn is a very crucial tool for life-long learning. Therefore, there is a great need for providing learning environment to improve this qualification in education and training for all citizens including the ones who have less opportunity (Frederiksson & Hoskins, 2008).

Today, how to access information, structuring the acquired information and generating new information have gained significance; not what information is. Therefore, basic learning skills that should be prioritized in schools are active learning, problem solving, learning how to learn, cooperation and communication skills. These learning skills are important in terms of achieving and maintaining 21st century skills (Louis, 2012; Cited in Bozkurt & Çakır, 2016). In this context, it is important how learners experience the learning-teaching process. In recent years, it has been observed that researchers have been carrying out studies to develop various data collection tools in order to reveal the learning-teaching process of individuals. Some of these studies can be given as examples as follows: Learning School Scale (Uğurlu, Doğan & Yiğit, 2014), M-Learning Attitude Scale (Çelik, 2013), Metacognitive Learning Strategies Determination Scale (Gündoğan-Çögenli & Güven, 2014), Learner Autonomy Support Scale (Oğuz, 2013), Teacher Candidates Competency Scale on Constructivist Learning (Yeşilyurt, 2012), Attitude Scale for Problem Based Learning (Turan & Demirel, 2010), Development of Metacognitive Learning Strategies Measurement Tool (Namlu, 2004), Attitude Scale for Learning (Kara, 2010), Lifelong Learning Competence Scale (Uzunboylu & Hürsen, 2011).

Again in the same way, it is seen that there are some studies about learning prepared abroad yet their Turkish arrangements have been made. The following studies can be given them as examples: Rovai, Wighting, Baker & Grooms (2009) Perceived Learning Scale (Albayrak, Güngören & Horzum, 2014), Grasha-Reichmann Learning (1974) and teaching (1994) Style Scale (Sarıtaş & Süral, 2010), Chan and Elliot (2004) Teaching and Learning Perceptions Scale (Aypay, 2004), Kolb (1985) Learning Style Inventory (Aşkar & Akkoyunlu, 1993), Macaskill & Taylor (2010) Autonomous

Learning Scale (Arslan & Yurdakul, 2015), Coryn et al. (2009) Social and Emotional Learning (Totan & Kabasakal, 2013), Pintrich, Smith, Garcia and Mckeachie (1991) Motivation and Learning Strategies Scale (Büyüköztürk, Akgün, Özkahveci & Demirel (2004). It is observed that great majority of these studies were conducted in different populations with students attending to different departments of universities and university teachers.

As a result of these studies, it is seen that valid and reliable scales in terms of psychomotor properties which can be employed in the fields of strategies, styles, competency, metacognitive, self-regulation, lifelong learning, sensational characteristics (attitude, perception, motivation) during the process of learning and teaching that the individuals and students use in learning and teaching process have been achieved to literature. In this study, on the other hand, it was tried to develop a data collecting tool that can be used in investigation of learning processes for students attending secondary schools. Thus, this study was designed as a validity and reliability work of learning how to learn scale.

Method

Survey method was used in this study. Survey is a method which is not an experimental type, and which is carried out to collect data by employing questionnaires or interview protocols to establish the characteristics of a group (Christensen, Johnson and Turner, 2015; Büyüköztürk, Kılıç-Çakmak, Akgün, Karadeniz & Demirel, 2012). Survey method is an approach that aims at describing a case of past or present as it is (Karasar, 2005). Via this method, it is tried to explain the attitude of people combining their perceptions, views, attitudes and beliefs about an issue. Within this context, data are collected through survey/scale or interview (Toker-Gökçe, 2018). Therefore, a draft scale was prepared as a data collection tool for the development of learning how to learn scale.

Study Group

The study group was selected by simple random sampling method. In this type of sampling, each unit in the population is likely to be equal and independent in sampling (Balcı, 2018). In other words, all individuals have the same chance of being elected. In addition, the main feature of this method is that the sampling has a high power to represent the population (Büyüköztürk et al, 2012). The study group chosen for the validity and reliability study of the learning how to learn scale consists of students (N=304) studying in different secondary schools in Mardin / Artuklu district in the 2018-2019 academic year. The students of the study group were also selected by using simple random sampling method (Table 1).

Table 1. Distribution of demographic characteristics of the study group

Variables		f	%
Gender	Female	125	41,1
	Male	179	58,9
School type	Industrial Vocational School High School	71	23,4
	Anatolian High School	97	31,9
	Imam Hatip Anatolian High School	97	31,9
	Vocational Technical High School	39	12,8
Total		304	100

When the characteristics of the study group were examined, it is seen that 41,1% of the participants were female, 58,9% were male, 23,4% were industrial vocational high schools, 31,9% were Anatolian high schools, 31,9% were Imam Hatip Anatolian High schools, and 12,8% of them are in vocational technical high school students.

Scale Development Process

The stages that should be followed in the scale development process were taken into consideration. The following stages were performed: 1st defining the problem / setting goals, 2nd forming scale items and seeking expert opinion, 4th pre-application, 5th validity and reliability (Erkuş, 2014; Tezbaşaran, 2008; Büyüköztürk, 2005).

Problem Defining / Determining Goals

Knowledge, skills and attitudes related to learning how to learn take place among the qualifications in the curriculum developed by the Ministry of National Education. Students are expected to acquire these qualifications in primary and secondary education programs (MEB, 2018). Therefore, a need arises to reveal knowledge, skills, attitudes and qualifications related to learning how to learn. In this study, it was targeted to develop a valid and reliable scale about learning how to learn.

Forming Scale Items and Expert View

In order to form the item pool of the draft scale for learning how to learn, the concept of learning how to learn was first explained to 26 students in the 10th grade in secondary education and then asked to write essays on this subject. In the second stage, a literature review was conducted (MEB, 2018; European qualifications framework, 2018; Özdaş, 2018; Oral & Ayaz, 2016; Özden, 2013; Doğanay, 2012; Fredriksson & Hoskins, 2007; MEB, 2007; Moreno & Martín, 2007; Özer, 2003). As a result of the written opinions of the students and literature review, 86 items were formed. Draft scale items were sent to four experts (1 Assoc. Prof. and 3 Dr. Lecturer) for their understanding of comprehensibility and clarity. After the feedback from the experts, the expressions of some items on the draft scale were changed and some items were removed from the draft scale. As a result, 66 items remained on the draft scale of learning how to learn. Each item in the learning how to learn scale form was converted into 5-point Likert-type expressions such as Never (1), Rarely (2), Occasionally

(3), Mostly (4), Always (5).

Conducting the Application

Necessary permissions were obtained from Mardin Provincial Directorate of National Education for implementation. The schools were visited by the researchers in Spring semi-term of 2018-2019 education year and the implementation of draft scale. The students were given 30 minutes for implementation.

Data analysis

SPSS packet program and AMOS program were used for data analysis. The data were analysed by employing item total correlation, exploratory factor analysis and confirmatory factor analysis techniques.

Results

Item Analysis

Item analysis was conducted to examine the relationship between the scores obtained from the items in the draft scale and the total score of the scale prepared to improve the learning to learn scale. Item analysis was performed with corrected item-total score correlations from analysis techniques. Büyüköztürk (2010) recommends that the item total correlation should remain in the scale because items with a value of 0.30 and higher distinguish individuals well. Before exploratory factor analysis, item-total score correlations of 66 items in draft scale were analysed. As a result of this analysis, item-total correlations of all items except 10 items as M36, M48, M49, M54, M60, M62, M63, M64, M65, and M66 were found to be greater than 0,30. However, these 10 items were excluded from the scale because they did not meet the relevant criteria (Table 2).

Table 2. Item-total score correlations belonging to scale items

Item No	Item Total Correlation	Item No	Item Total Correlation	Item No	Item Total Correlation	Item No	Item Total Correlation
M1	0,511	M18	0,505	M35	0,354	M52	0,449
M2	0,376	M19	0,384	M36	0,294	M53	0,433
M3	0,395	M20	0,416	M37	0,432	M54	0,117
M4	0,486	M21	0,382	M38	0,554	M55	0,397
M5	0,394	M22	0,399	M39	0,521	M56	0,446
M6	0,364	M23	0,491	M40	0,550	M57	0,421
M7	0,347	M24	0,459	M41	0,371	M58	0,481
M8	0,339	M25	0,409	M42	0,457	M59	0,365
M9	0,498	M26	0,413	M43	0,514	M60	0,220
M10	0,414	M27	0,530	M44	0,449	M61	0,168
M11	0,381	M28	0,456	M45	0,409	M62	0,315
M12	0,409	M29	0,363	M46	0,407	M63	0,268
M13	0,436	M30	0,191	M47	0,378	M64	0,072
M14	0,493	M31	0,535	M48	0,225	M65	0,248
M15	0,469	M32	0,496	M49	0,229	M66	0,087
M16	0,433	M33	0,523	M50	0,414		
M17	0,377	M34	0,374	M51	0,428		

Construct Validity

In scale development and adaptation studies, factor analysis is the most commonly used method to obtain data on the construct validity of a scale (Seçer, 2017). Factor analysis aims to find a small number of conceptually significant new unrelated variables by bringing together p variables (Tekindal, 2009; Büyüköztürk, 2010). Factor analysis is conducted as exploratory and confirmatory factor analysis (Balci, 2018; Seçer, 2017; Büyüköztürk, 2010). Exploratory and confirmatory factor analyses were conducted to determine the construct validity of the data obtained from the draft form of the learning how to learn scale.

Exploratory Factor Analysis (EFA)

If the number of structures or factors thought to be measured by the measurement tool is not known, within this context, in cases where it is not possible to test a certain hypothesis, exploratory factor analysis is performed in order to obtain information about the nature of the factors measured by the measurement tool (Balci, 2018; 279). In this analysis, there is a process to find and define factors based on the relationships between variables (Tekindal, 2009; Büyüköztürk, 2010). In other words, exploratory factor analysis is done with the aim of determining how many subheadings of the items in a measurement tool can be collected and what kind of relationship there is between them (Seçer, 2017).

The construct validity of the learning how to learn scale was carried out in four stages such as the examination of the suitability of the data for factor analysis, obtaining factors, rotating the factors and naming the factors (Kalaycı, 2005).

While factor analysis is carried out in a scale development study, initially, scale data are controlled whether they are suitable for factor analysis. With this aim, the adequacy of the sample size to which the scale is applied should be considered. For the adequacy of the samplings used in the investigations, Kaiser-Meyer-Olkin (KMO) coefficient, namely sampling adequacy, and Barlett test are used (Büyüköztürk, 2005; Metin, 2015). That KMO coefficient value is greater than 0,60 and Barlett test is meaningful with the data is an indicator that they are suitable for factor analysis (Büyüköztürk, 2010). In addition, in factor analysis, reaching between 300-500 individuals for sample size and reaching 5 or 10 times more individuals can be used for qualification (Seçer, 2017). The data obtained to improve the learning how to learn scale was found to be suitable for factor analysis. Because the KMO coefficient value of the data was obtained as 0,870 and Barlett test Chi-square value was found to be statistically significant ($\chi^2 = 1602, 424; p < 0, 01$). This result can be interpreted as the KMO coefficient is excellent for the data (Field, 2002, cited in Metin, 2015; Leech, Barret Morgan, 2005; Şencan, 2005; Tavşancıl, 2005; cited in Multitude, Şekercioğlu & Büyüköztürk, 2014). In addition, it is observed that the number of students (N=304) and sampling size were in the recommended range.

Principal Component Analysis was used in exploratory factor analysis to create factors. According to Büyüköztürk (2010), in the exploratory factor analysis, the following criteria are generally taken into consideration for the removal of items that do not measure the same structure:

Load values at the factor in which the substances are located are high: Factor load is the relationship between the factor and the factor that is tried to be measured by means of an item. It was stated that factor load value of 0,45 and higher would be a good measure for selection (Büyüköztürk, 2010; Can, 2014).

It should be taken into consideration that the load values of the items in the factors should have high load values in one factor and low load values in the others.

Here, it has been suggested that the difference between a factor in which an item gives a high load value and a load value in a second factor should be at least 0,10. Similarly, it was stated that items with high load values in more than one factor should be removed from the scale (Çokluk, Şekercioğlu & Büyüköztürk, 2014; Büyüköztürk, 2010).

Factors with eigenvalues greater than or equal to 1 were also considered as important factors for the number of factors (Büyüköztürk, 2010).

When exploratory factor analysis was performed, it was seen that the items were collected under 15 factors and mostly 1 item was included in the last 2 factors. 35 factors, which are item factor load value, and which do not provide 0,45 criteria, and which are evaluated as overlapping items since they take place with less difference than 0.10 in more than 1 factor, (M4, M5, M6, M7, M8, M9, M10, M11, M14, M15, M17, M18, M19, M20, M21, M22, M24, M25, M26, M29, M30, M31, M32, M34, M35, M39, M40, M41, M43, M44, M46, M47, M50, M58, M62) were eliminated so that the number of factors were reduced. In order to decrease the factors, the process repeated 6 times. As a result of this process, in each factor, Varimax Vertical Rotating (Büyüköztürk, 2010) analysis technique was employed so that the items exhibiting high relations could be brought together. It was found that the 21 items remaining in learning how to learn by Varimax rotation were distributed under 5 factors (Table 3).

Table 3. Rotated component matrix

Items	F1	F2	F3	F4	F5
s27	0,767				
s23	0,671				
s28	0,635				
s42	0,623				
s52		0,662			
s38		0,635			
s53		0,623			
s37		0,618			
s51		0,470			
s33			0,736		
s3			0,639		

s45			0,614		
s16			0,614		
s12				0,676	
s2				0,647	
s1				0,628	
s13				0,586	
s55					0,721
s56					0,639
s59					0,579
s57					0,577

According to the result obtained from rotated component matrix of exploratory factor analysis, it is seen that in factor 1, there took place 4 items (factor load value is between 0,767-0,623), and in factor 2, there took place 5 items (factor load value is between 0,662-0,470), in factor 3, there took place 4 items (factor load value is between 0,736-0,607), in factor 4, there took place 4 items (factor load value is between 0,776-0,586), in factor 5, there took place 4 items (factor load value is between 0,721-0,577) (Table 4).

Table 4. Variance explanation percentages of factors

Factors	Eigenvalues	Variance Percentage	Total Variance Percentage
Factor1	5,741	27,339	12,127
Factor 2	1,545	7,359	23,088
Factor 3	1,421	6,765	33,030
Factor 4	1,196	5,695	42,935
Factor 5	1,149	5,473	52,630

In factor analysis, the concept of eigenvalue is a condition that shows the variance explained by a factor alone. In factor analysis, the eigenvalue of a sub-dimension is expected to be at least 1 (Seçer, 2015; Büyüköztürk, 2010) and each sub-factor is expected to explain at least 5% of the total variance in the scale (Seçer, 2015).

As a result of varimax rotation applied to the learning to learn scale, it was explained that in eigenvalue greater than 1 and consisting of a total of 21 items, 5-factor structure, factor1 total variance was 27,339%, factor2 was 7,359%, factor3 was 6,765%, factor4 was 5,695% and factor5 5,473%. There are various views about total variance value which should be explained. However, as general tendency, it can be said that the variance rate explained in a measurement tool should definitely be higher than that of unexplained variance rate (Seçer, 2015). As a result, according to this statement, it is seen that the explained variance rate of learning how to learn scale is at the expected level.

Reliability Study

Cronbach's alpha reliability coefficient is a statistical technique used to determine the internal consistency of a test (Demircioğlu, 2012). The Cronbach Alpha coefficient of the developed learning

learning scale was found to be 0,758 for factor1, 0,710 for factor2, 0,655 for factor3, 0,6766 for factor4, 0,650 for factor5 and 0,864 for the whole scale. It is accepted that Cronbach Alpha coefficient is within the range of 0,70 and above (Christensen, Johnson & Turner, 2015; Büyüköztürk, 2011; Tekindal, 2009; Şencan, 2005). However, in some sub-dimensions of the scale, it is seen that Cronbach Alpha coefficient is slightly below this value range. Although the internal consistency coefficients of the factors are not very high, they can be considered sufficient for such scales that try to measure affective sensational characteristics (Özbek & Bindak, 2018). When these data are examined, it is seen that the Cronbach Alpha coefficient of the developed learning how to learn scale is in a reliable range for all factors (Table 5).

Table 5. Cronbach alpha coefficient was calculated to determine the reliability of the scale.

Factor	Cronbach Alpha Coefficient
Factor1	0,758
Factor 2	0,710
Factor 3	0,655
Factor 4	0,676
Factor 5	0,650
Total Scale	0,864

The correlation coefficient is used to find and interpret the amount of the relationship between the two variables (Büyüköztürk, 2010). Pearson correlation coefficient was used to correlate the factors of the learning to learn scale. In the research, when the correlation coefficient was found to be between 1, 00-0, 70, it was interpreted as high, and when it was between 0, 69-0, 30, it was medium; and when it was 0, 29-0, 00, was interpreted as a low level relationship (Büyüköztürk, 2010). According to this, it is seen that there is a weak positive relationship between F4 and F1 ($r = 0,370$, $p < 0, 05$) and F4 and F3 ($r = 0,355$, $p < 0,05$). Again, it is seen that there is a positive relationship between all other factors except these factors. This result is that scale factors are in a positive direction and correlated with each other (Table 6).

Table 6. Correlation coefficient analysis results between factors

		F1	F2	F3	F4	F5
F1	r	1				
	p					
F2	r	0,448**	1			
	p	0,000				
F3	r	0,497**	0,424**	1		
	p	0,000	0,000			
F4	r	0,370**	0,452**	0,355**	1	
	p	0,000	0,000	0,000		
F5	r	0,421**	0,478**	0,336**	0,320**	1
	p	0,000	0,000	0,000	0,000	

** . Correlation is significant at the 0.01 level (2-tailed).

Naming of Factors

As a result of exploratory factor analysis and reliability analysis of the learning how to learn scale, 21 items were named collected in 5 factors. According to this, Factor1 was named as Learning/Thinking Style (Ö/DS), Factor2 was named as Theoretical and Practical Unity in Learning (ÖTPB), Factor3 was named as Individual Awareness in Learning (ÖKF), Factor4 was named as Emotionality in Learning (ÖD).

First Level Confirmatory Factor Analysis

In the scale development and adaptation process, confirmatory factor analysis is based on an advanced technique depending on testing the theories of latent variables of a model or structure previously determined by exploratory factor analysis (Seçer, 2017; Çokluk, Şekercioğlu & Büyüköztürk, 2014). In this analysis, the researcher demonstrates whether the data in his hand conforms to the original structure. In other words, he wants to show whether the data he has in his hand is compatible with the factor structure that was previously constructed. The aim here is to test factor structure of the variable (Meyan & Şeşen, 2015).

In the study, firstly, confirmatory factor analysis was performed for 5 latent variables (Ö/DS, ÖTPB, ÖKF, Öİ, ÖD) which were determined in original scale, and then for the model which consisted of and 21 observed variables. First level confirmatory factor analysis includes the relation between latent variables that were created into the model (Meydan & Şeşen, 2015).

Table 7. Fitness criteria of confirmatory factor analysis

Conformity Index	Excellent Conformity	Acceptable conformity	Model	Conformity Interpretation
RMSEA	Between 0,000 and <0,50	Between =0,50 and =0,80	0,038	Excellent Conformity
RMR	Between 0,000 and <0,50	Between =0,50 and =0,80	0,046	Excellent Conformity
IFI	=0,95 and more	=0,90 and more	0,96	Excellent Conformity
NNFI	=0,95 and more	=0,90 and more	0,98	Excellent Conformity
NFI	=0,95 and more	=0,90 and more	0,97	Excellent Conformity
CFI	=0,97 and more	=0,95 and more	0,97	Excellent Conformity
GFI	=0,90 and more	=0,85 and more	0,87	Acceptable Conformity
AGFI	=0,90 and more	=0,85 and more	0,86	Acceptable Conformity
$\chi^2/sd < 3$			1,441	

(Table 7: Schumacher and Lomax, 2004; as cited in Seçer, 2017)

As stated in Table 7, when the conformity index values related to first level conformity factor analysis are examined, it is seen that the obtained conformity index values are [$\chi^2(sd, N)=257,95 ;179, 304$], $\chi^2/sd=1,441$, $RMSEA=0,038$, $RMR=0,046$, $IFI=0,96$, $NNFI=0,98$, $NFI=0,97$, $CFI=0,97$, $GFI=0,87$, $AGFI=0,86$.

According to this result, if the ratio of the chi-square value to the degree of freedom is χ^2/df

≤ 2 , it is seen that it shows a perfect conformity (Tabachnick and Fidell, 2001; cited., Çokluk, Şekercioğlu and Büyüköztürk, 2014). In addition, it is found that *RMSE*, *RMR*, *IFI*, *NNFI*, *NFI*, *CFI* values exhibited excellent conformity and *GFI*, *AGFI* values displayed acceptable conformity.

It is also found that *RMSEA*, *RMR*, *IFI*, *NNFI*, *NFI*, *CFI* values exhibited excellent conformity and *GFI* and *AGFI* values displayed acceptable conformity.

When these data are taken into consideration, the model conformity of 21 items and 5 factor structure of learning how to learn scale was tested; and it was seen that the model was confirmed in general. Path diagram of t-values of first level conformity factor analysis takes place in Figure 1.

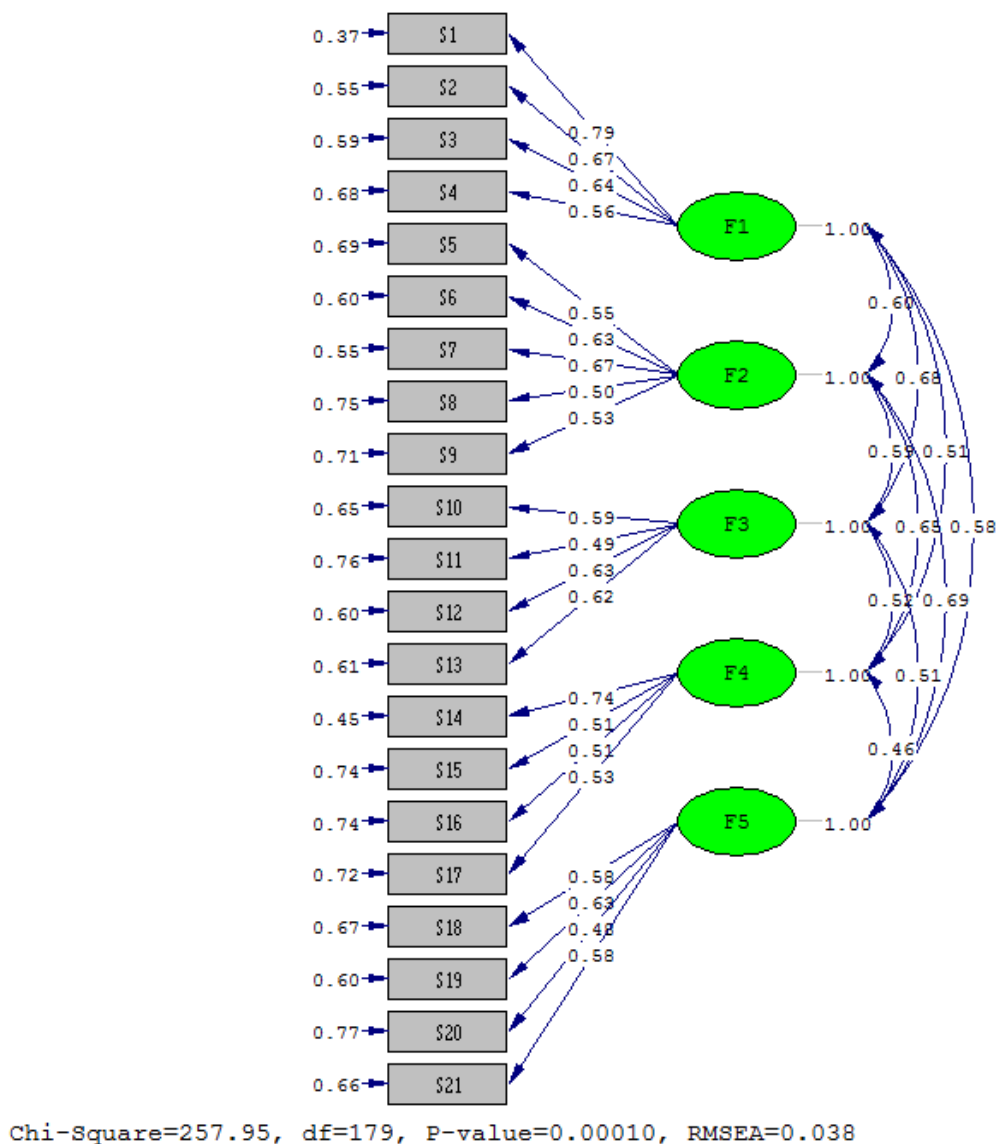


Figure 1. Learning How To Learn Scale Path Diagram

Discussion, Conclusion and Recommendations

This study was carried out in order to develop a valid and reliable scale on learning how to learn. For the purpose of the study, in order to form the item pool of the scale for learning to learn, 26 students in the 10th grade of secondary education were first explained the concept of learning how to learn, and then they were asked to write essays on this subject. In the second stage, literature review was done. As a result of the opinions obtained, a draft scale of 86 items was formed. The draft scale was shared with the instructors who are experts in the related field and their opinions were obtained. As a result of expert opinions, 22 items from the draft learning scale were deleted and 66 items remained. Each item in the learning how to learn scale form was transformed into 5-point Likert-type expressions such as Never (1), Rarely (2), Occasionally (3), Mostly (4), Always (5). After the permissions obtained, the scale was applied.

Theoretically proposed analysis techniques were considered in order to develop the learning how to learn scale. Learning to learn items were analysed by item total correlation. The total correlation criterion of at least 0.3 items proposed for each item was considered and as a result, 10 items were eliminated.

The learning how to learn scale was analysed by Kaiser-Mayer-Olkin (KMO) coefficient, that is to say, sample adequacy and Barlett test. KMO coefficient of the scale was obtained as 0,870 and it was seen that the Chi-square value of the Barlett test was also statistically significant ($\chi^2=1602, 424$; $p < 0, 01$). These results can be interpreted as the KMO coefficient is excellent. Principal Component Analysis technique was used for factor extraction for the scale. In the analysis, it is considered that the load values of the items in the factor in which they are located is 0, 45 and higher will be a good measure for selection. In addition, it was taken into consideration that the difference between a factor that gives a high load value of a substance and a load value given in a second factor should be at least 0,10. In order to determine the number of factors, the factors with eigenvalues greater than or equal to 1 were considered as important factors.

According to the results of the first exploratory factor analysis, the items were collected in 15 factors and the last 2 factors included at most 1 item. 35 items, which do not meet the criteria load factor of 0,45 and are also considered to be overlapping items, were eliminated by factor reduction because they were included in more than one factor with a difference of less than 0.10. This process was applied six times in total to reduce the number of items. However, 10 items were eliminated from the scale with total item correlation. As a result, 45 items were eliminated from the learning how to learn scale.

As a result, it was seen that 21 items remained in the developed learning how to learn scale and these items were collected under 5 factors. Varimax Vertical Rotation technique analysis was used to bring together the items that are highly correlated with each factor.

When the data obtained from the rotated component matrix were examined, it was seen that 4 items were collected in the Ö/DS factor, 5 in the ÖTPB factor, 4 in the ÖKF factor, 4 in the Öİ factor and 4 in the ÖD factor. In addition, it was observed that the item load values were between at least 0,470 and 0,767 for all factors.

Factor1 was named as Learning/Thinking Style (Ö/DS), and Factor2 was named as Theoretical and Practical Unity in Learning (ÖTPB), and Factor3 was named as Individual Awareness in Learning (ÖKF), and Factor4 was named as Willingness in Learning (Öİ), and Factor5 was named as Emotionality in Learning.

As a result of varimax rotation applied to the learning to learn scale, the Ö/DS factor with an eigenvalue greater than 1 in 5 factored structures explains 27,339% of the total variance, 7,359% of the ÖTPB factor, 6,765% of the ÖKF factor, 5,695% of the Öİ factor and 5,473% of ÖD factor. 52,630% of the total variance was explained with the help of 5 factors.

The developed learning how to learn scale was between 0.655 and 0.864 for the Cronbach Alpha coefficient. It is understood that this value is a highly reliable scale by having a value in the value range of Cronbach Alpha coefficient which is theoretically suggested.

When Pearson correlation coefficient for learning how to learn scale is examined, it is seen that there is a positive relationship between all factors. However, it can be said that this relationship is weak and moderate.

For the confirmatory factor analysis, first level confirmatory factor analysis was performed for the model which consisted of 5 latent variables (Ö/DS, ÖTPB, ÖKF, Öİ, ÖD) and 21 observed variables which were originally determined in the original scale in the study. When the fit indexes of first level confirmatory factor analysis were examined, it was found that the obtained conformity index values were [$\chi^2(sd,N)=257,95;179, 304$), $\chi^2/sd =1,441$, RMSEA=0,0038, RMR = 0,046, IFI = 0,96 NNFI = 0,98, NFI = 0,97, CFI = 0,97, GFI = 0,87, AGFI = 0.86. According to this result, if the ratio of the chi-square value to the degree of freedom is $\chi^2 / df \leq 2 =$, it can be seen that it is perfectly compatible (Tabachnick and Fidell, 2001; cited, Çokluk, Şekercioğlu and Büyüköztürk, 2014). In addition, it was found that RMSE, RMR, IFI, NNFI, NFI, CFI values exhibited an excellent conformity and GFI, AGFI values displayed an acceptable conformity. As a result, it is seen that the learning how to learn scale obtained with the applications suggested for scale development studies is a valid and reliable scale. This scale is recommended to be used by researchers.

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Appendix

Learning How to Learn Scale

	Learning/Thinking Style
1.	I know how to learn
2.	I know how to be able to be learnt.
3.	I have confidence in learning
4.	I know how I should be thought.
	Theoretical And Practical Unity In Learning
5.	I use new knowledge I learn in my daily life.
6.	I evaluate my learnings.
7.	I can set new imaginations with what I have learnt.
8.	I can give original ideas about a topic
9.	I can implement the instructions.
	Individual Awareness In Learning
10.	I am aware of the knowledge, skills and qualifications required for my goals.
11.	I know my strengths and weaknesses.
12.	I have the problem solving skills.
13.	I can cope with the obstacles I face.
	Willingness In Learning
14.	I'm searching for learning opportunities.
15.	I like doing research.
16.	I'm always trying to learn new things.
17.	I really want to learn.
	Emotionality In Learning
18.	I ask questions about what I'm curious about.
19.	I can easily say my mind when asked questions..
20.	I use my feelings when I learn.
21.	When I feel happy, I can easily learn difficult subjects.