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Self Regulated Learning Questionnaire: Reliability and Validity Study

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Abstract

The research was carried out to develop a measurement tool for measuring self-regulated learning skills of secondary school students. For this purpose, the validity and reliability study of the “Self-Regulation Learning Questionnaire” was conducted on 688 students who studied in different classes in the middle school (fifth, sixth, seventh, eighth grade) and selected by random sampling method. As a result of the exploratory factor analysis conducted to ensure the construct validity of the scale, a five-factor structure consisting of 39 items was obtained. These factors are “1. Studying Method, 2. Self Evaluation, 3. Receiving Support, 4. Time Management and Planning, 5. Seeking Information”. The Cronbacheris Alpha value of the scale was .94. Confirmatory factor analysis (CFA), which was conducted to test whether the five-factor structure of the scale was consistent with the previously defined factor structure, supports the structure obtained. These results show that the Self-Regulated Learning Questionnaire is an appropriate tool for the measurement of self regulated learning skills of secondary school students.

Keywords: Self Regulated Learning, Self Regulated Learning Questionnaire, Secondary School Students, Likert Scale, Statistical Analysis

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Introduction

Learning sense and perception differentiates as based on the necessities of the time. Information that is rapidly emerging and changing necessarily adds a new, dynamic dimension to learning. At the present time, learning emphasizes an understanding by which students structure and evaluate their own learning, instead of the one within the scope of which information prepared and available is provided them. In this regard, one of the concepts which have emerged recently as a result of the seeking for enhancing the quality of learning is the self-regulation, as well.

Pintrich (2000) defines self-regulation as a constructivist process in which students set their goals and/or objectives for learning at first, and then, regulate their cognition and behaviors and also control these. Self-regulation is not a mental ability or an academic performance skill; it is rather a self-regulated process from which learners benefit in order to convert their mental abilities into academic skills. Therefore, learning is considered as an activity that students influentially do for themselves, not an inherent one that is realized as an outcome of teaching. Self-regulation refers to the opinions, feelings and behaviors emerging by themselves towards achieving the goals and/or objectives (Zimmerman, 2000). According to Schunk and Ertmer (2000), self-regulation means the one's generating ideas and feelings which he needs to learn and also for his motivation and putting his actions into practice in a systematic manner by planning them in line with these ideas and feelings.

When literature is reviewed, positive effects which self-regulation has on both academic achievement (Chung, 2000; Paris and Paris, 2001; Winne, 1995; Zimmerman, 1990; Zimmerman and Bandura, 1994; Zimmerman and Martinez-Pons, 1988; Ruban and Reis, 2006) and self-efficacy (Pintrich and De Groot, 1990), and also on motivation (Pintrich, 2000; Schraw Crippen, K. J., and Hartley, K. , 2006; Zimmerman, 2000; Zimmerman and Schunk, 2004) are seen obviously. In this context, field specialists have established various strategies for raising individuals with self-regulation skills, as well. According to Zimmerman (1989; 1990), self-regulation strategies are actions and/or processes that students think these will all serve well for them and perform in an attempt to acquire knowledge or skills they have already aimed for. These actions are self-regulation which includes metacognitive strategies for the planning, following and alteration of cognition, the management of effort that students put forth in order to be able to carry out an academic duty in the class by themselves and cognitive strategies such as repetition, interpretation and organization of which they make use in order to learn, remember and comprehend (Pintrich and De Groot, 1990). Students with advanced self-regulation skill make a plan, set an objective, perform organizations, follow-up themselves and also evaluate themselves (Corno, 1989).

In Özbay (2008)'s thesis study, to determine the self regulation processes and strategies used in the field of informative writing in foreign language, to examine the relationships between the

elements of the structure, the motivation and the use of cognitive strategies specific to the field, to demonstrate the relationships between the level of use of these strategies and the success of writing. In this way, it is aimed to develop a more comprehensive understanding of strategic learning. Turan and Demirel (2010) used the Self Regulated Learning Skills Scale and the interview form in order to make a description of the self-regulating learning skills of medical school students and to examine their self-regulating learning skills according to their success level. Quantitative data were collected by using descriptive method in another study examining the relationship between self regulation strategies and motivation used by Yağlı (2014). Motivated Strategies for Learning Questionnaire (MSLQ) was developed by Pintrich, (1991) and adapted to Turkish by Büyüköztürk, Akgün, Karadeniz, Çakmak, Demirel, (2008). Self Regulated Learning Scale and ve Self Regulated Learning Support Scale were developed by Haşlaman ve Aşkar (2015), in order to evaluate self-regulatory learning behaviors of teachers. Eom and Reiser (2000) examined the effect of the use of self regulation strategies on success and motivation. In the study of Schraw et al., (2006), the effect of self-regulated learning on science teaching was investigated. Cheng (2011) examined the relationship between self-regulation skills and academic performances of students, working with 6524 students from 20 schools; it has addressed the issue with learning motivation, goal setting, action control and learning strategies.

Although there are many researches about self regulated learning in our country and in the world; scales for measuring self-regulated learning skills of secondary school students are limited. Within the scope of this research, it is thought that the studies on determining self regulation skill levels of individuals will have an important place in the literature.

Method

Research Model

In this research carried out in general survey model, to perform the study for the validity and reliability of Self Regulated Learning Questionnaire (SRLQ) developed for secondary school students was aimed. This research is intended to develop a scale for assessing self-regulated learning skills of secondary school students. In order to reach a judgment in the universe consisting of many elements in the screening model, it is studied on a whole group or from a group to be taken from it (Karasar, 2017).

Study Group

The study group consisted of students from three different secondary schools located in Kırıkkale city center. A total of 688 secondary school students studying in the fifth, sixth, seventh and eighth grades were selected by simple random sampling method. In the simple random sampling method (neutral sampling method) each element has the same chance to enter the sample and take the task (Karasar, 2017). The responses of the 688 students to the questionnaire were examined. As a

result of the study, it was found that some of the students did not respond on the questionnaire and some other students put more than one mark on the same item. Thus, the survey of 156 students who were considered to be incomplete or invalid answers were considered invalid. With the elimination of the surveys which were not suitable for the analyzes, a total of 532 students were employed. The acceptable number for the sample size is expected to be 5 or 10 times the number of items on the scale (Kline, 1994; Pett, Lackey and Sullivan, 2003; Tavşancıl, 2005). Therefore, it can be accepted that the sample is sufficient for the study. Of the 532 students participating in the study, 171 were fifth grade, 189 sixth grade, 99 seventh grade, and 73 eighth grade students. In addition, 307 of the students are girls and 225 of them are male students. Also for confirmatory factor analysis, 400 students were studied at the middle school level with different sample groups.

Development of Assessment Instrument (Questionnaire)

In this research, which aimed to develop a self-regulated learning scale for secondary school students, a literature review was done. In the scans carried out within the scope of the subject, the qualifications required to be found in a student with self-regulation skills were tried to be determined. In particular, Zimmerman (2002)'s self regulated learning strategies were based on the scale. According to Zimmermman (2002); contemporary research tells us that self regulation of learning is not a single persona trait that individual students either possess or lack. Instead, it involves these lectiveuse of specific processes that must be personally adapted to each learning task. The component skills include: setting specific proximal goals for one self, adopting powerful strategies for attaining the goals, monitoring one's performance selectively for signs of progress, restructuring one's physical and social context to make it compatible with one's goals, managing one's time use efficiently, self-evaluating one's methods, attributing causation to results, and adapting future methods. A students' level of learning has been found to vary based on the presence or absence of the self-regulatory processes (Schunk&Zimmerman, 1994;1998). Self-regulated learning is the concept whereby learner stake an active role in improving their knowledge and ability while studying. As the concept of 'learner-centered learning' become sincreasingly accepted, self-regulated learning becomes a key topic in distance education (Hong,Im&Li, 2016). In the process of drafting scale, interviews were made with teachers (n = 5) in different branches (Turkish, Science, Mathematics, Social Studies and English). The data obtained as a result of the interviews contributed to the draft scale. For the draft articles, interviews were conducted with students (n = 10) who were studying in different classes (fifth, sixth, seventh and eighth grade) in secondary school. As a result of the interviews with the students, four items that students have difficulty understanding are excluded from the scale. In line with the screening and opinions received, the draft scale, consisting of 84 items, was reshaped as 81 items. In order to ensure the content validity of the draft scale, five faculty members and three teachers were consulted. According to Karasar (2017), the content (content) validity refers to the suitability of the

items of the scale to the measurement tool and to the group they represent and this situation is determined according to the expert opinion. In this context, the necessary amendments have been made and the scope validity of the scale has been provided. The scale which was given its final form was then examined by two Turkish language experts and piloted. The pilot application was carried out on 50 students in the fifth and eighth grade secondary school. The opinions and suggestions of the students on the comprehensibility of the items were taken and the scale was finalized. As a result of the studies conducted in this context, 17 items from the 81-item pool were eliminated and some items were revised and a draft scale consisting of 64 items was obtained. Of the items in the scale, two items were negative. Items in the scale were graded according to 5-point Likert-type, as "never = 1", "seldom = 2", "sometimes = 3", "usually = 4" "always = 5". Likert's scale building technique is easier and understandable. Likert scales also contribute to the emergence of each proposition on the scale, on the one hand the determination / determination of the intrinsic property to be measured (contributing to the determination of the intrinsic property as the components of the intrinsic property to be measured) and on the other hand a total score related to the intrinsic property to be measured. It also allows to obtain. Therefore, Likert type scaling has a clear advantage in providing information to the researcher (Bayat, 2014).

Findings

With the object of determining the structural validity of data obtained from the draft form of Self Regulated Learning Questionnaire, exploratory and confirmatory factor analyses were carried out. The validity of the scale and SPSS 21.0 and LISREL 8.54 programs were used for reliability analysis.

Findings for Exploratory Factor Analysis

In order to prove the applicability of proceedings performed in factor analysis, KMO values are examined by Bartlett Test (Pallant, 2005). As based on the statistical process carried out, it was detected that the KMO value of the scale was .945. It is a fair condition that Kaiser-Meyer-Olkin (KMO) value is approximate to 1 (Tavşancıl, 2002). The result of the Bartlett Test was $X^2_{(532)} = 7320.964$; $p < .01$. These values indicate the suitability of the data set for factor analysis. Since Cronbach's Alpha value is .94, it can be said that the reliability of the data is quite high. The data are presented in Table 3.1.

Table 3.1. Values of applicabilities

Kaiser-Mayer-Olkin (KMO)		.945
Bartlett Value	Chi Square	7320.964
	Sd	2016
	Sig	.000
Cronbach's Alpha		.94

Determination of Factor Pattern

The basic component analysis as a factorization method in order to reveal the factor design of the Self-Regulated Learning Scale; Direct Obliqim rotation method is used as the rotation method.

Determination of Factor Number

In order to determine the number of factors that can reveal the relationship between the items, slope deposition graph, eigenvalue and variance percentages were used (Çokluk, Şekercioğlu, Büyüköztürk, 2012). The table for the percentages of eigenvalues and variances and the slope deposition graph are given below .

Table 3.2. Values of Factor and Percentages of Variance for Self-Regulated Learning Scale

Factors	Values of the Factor	Revealed Variance	Cumulative Variance
		(%)	(%)
F1. Studying Method	11.628	29.070	29.070
F2. Self-Evaluation	2.011	5.028	34.098
F3. Receiving Support	1.676	4.190	38.288
F4. Time Management and Planning	1.428	3.570	41.858
F5. Seeking Information	1.238	3.096	44.954

In the process of factor analysis, principle component analysis was carried out in order that the factors could be revealed and another conversion method was not used. As is seen in Table 3.2, it has been observed that the scale presents a structure with five factors, according to the analysis performed. Within this five-factor-structure, the screeplot for each factor is over 1.00. Considering the structure mentioned, it is realized that these five factors revealed out can explain the 44,95% of the variance in total. It is asserted that the overall value of variance at 40% to 60% is well enough in the field of social sciences (Çokluk et al., 2010; Tavşancıl, 2010). Therefore, the case that revealed total variance present in this study is 44,95% is regarded as an acceptable value.

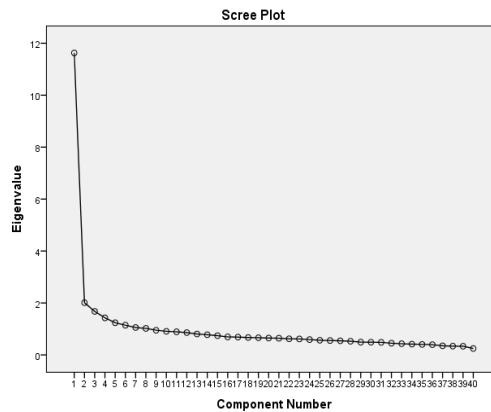


Figure 3.1. Screeplot Diagram

The screeplot graph as a result of the exploratory factor analysis indicates that the scale has a five-factor structure. When the breakpoints in the eigen value graph in Figure 3.1 are examined, it is seen that there are five factors with one and more eigen values in the scale, and the high acceleration decrease is seen after the fifth point. The downward trend seen from the first point is indicated by points of contribution to the variance and each interval between the two points means a factor (Çokluk et al., 2012). Hutcheson and Sofroniou (1999) stated that factors with eigenvalues greater than 1 or 1 should be considered as important factors. Therefore, the eigenvalue criteria should be used to determine the number of factors that can reveal the relationships between the articles in a small number and most effectively (Büyüköztürk, 2007). The fact that the self-evaluative learning process, which the scale tries to determine, has different dimensions and explains the factors on the scale.

Determination of Factor Materials

After the factor number of the scale was determined as five, the distribution of the substances to the factors was examined. In order to determine which factor is strongly correlated with the factors, rotated component t matrix is formed to determine whether the substances meet the acceptance level of overlap and factor loadings (Table 3.3). In order for a substance to be overlapped, two conditions must occur. The first one is that the level of acceptance of a substance in more than one factor gives a high load value. Secondly, the difference between the load values of two or more factors is smaller than .1 (Çokluk et al., 2012). The factor load value of each item is .30 in the exploratory factor analysis to reveal the factor pattern of the Self Regulation Learning Questionnaire.

As a result of exploratory factor analysis, 19 items (items 3, 4, 13, 16, 29, 30, 31, 32, 33, 36, 47, 48, 50, 52, 54, 55, 56, 60, 64) and then 5 items (items 9, 22, 34, 44, 51) were excluded from the scale because they did not meet the reliability criteria because they received a load value under the factor and there was no difference between these factor loadings.

The factor load values of the items in the scale are presented in Table 3.3.

Table 3.3. Values of Factor Loadings of the Items

Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Item-total Correlation Coefficients
14	.515					.516
15	.558					.460
42	.491					.507
43	.412					.539
45	.515					.539
46	.440					.416
49	.352					.407
53	.311					.440
1		.579				.389
2		.618				.418
5		.352				.392
6		.680				.455
7	.344	.455				.377
8		.539				.371
10		.480				.336
11		.625				.480
12		.385				.370
17		.518				.474
26		.317				.321
28		.426				.337
58		.517				.500
35			.541			.480
57			.797			.543
59			.468			.406
61	.395		.530			.450
62			.676			.468
63			.623			.512
18		.304		.560		.532
19				.586		.425
20				.559		.512
21	.377			.554		.542
23				.374		.335
24				.573		.555
25				.490		.479
27				.626		.388
37					-.617	.544
38					-.687	.541
39					-.628	.583
40					-.569	.362
41					-.479	.280

As is seen in Table 3.3, Factor loads of the items in the scale vary between $-.687$ and $.797$. Factor load values pertaining to the first factor are between $.558$ and $.311$ and the load values of the second factor consisting of thirteen items vary between $.680$ and $.317$; and in the third factor, it is between $.797$ and $.468$. The load values in the fourth factor vary between $.626$ and $.374$ and in the fifth factor between $-.479$ and $-.687$.

Findings for Confirmatory Factor Analysis

Confirmatory factor analysis (CFA) is to test whether the data available to the researcher is compatible with the previously constructed factor structure (Meydan and Şeşen, 2011). Confirmatory factor analysis (CFA) was used to test whether the five-factor structure of the scale was compatible with the previously constructed factor. In confirmatory factor analysis, for the structural fit of the model, Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Square Residual (SRMR), Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Comparative Fit Index (CFI), Normed Fit Index (NFI) values, which are of model fit measures, were taken into consideration. In the validated fluid factor analysis, the fit index of the five-factor model of the self regulated learning questionnaire was examined.

Also for confirmatory factor analysis, 400 students were studied at the middle school level with different sample groups. Data on first level confirmatory factor analysis are presented below.

In the first level confirmatory factor analysis, the t value of the 40th item was excluded from the scale because it was meaningless at $.05$ level ($t_{40}=47.256$). The scope of validity is maintained by removal of the substance has been identified and replaced by the second level confirmatory factor analysis. The results of second-order confirmatory factor analysis for the five-factor model are shown in Figure 3.2.

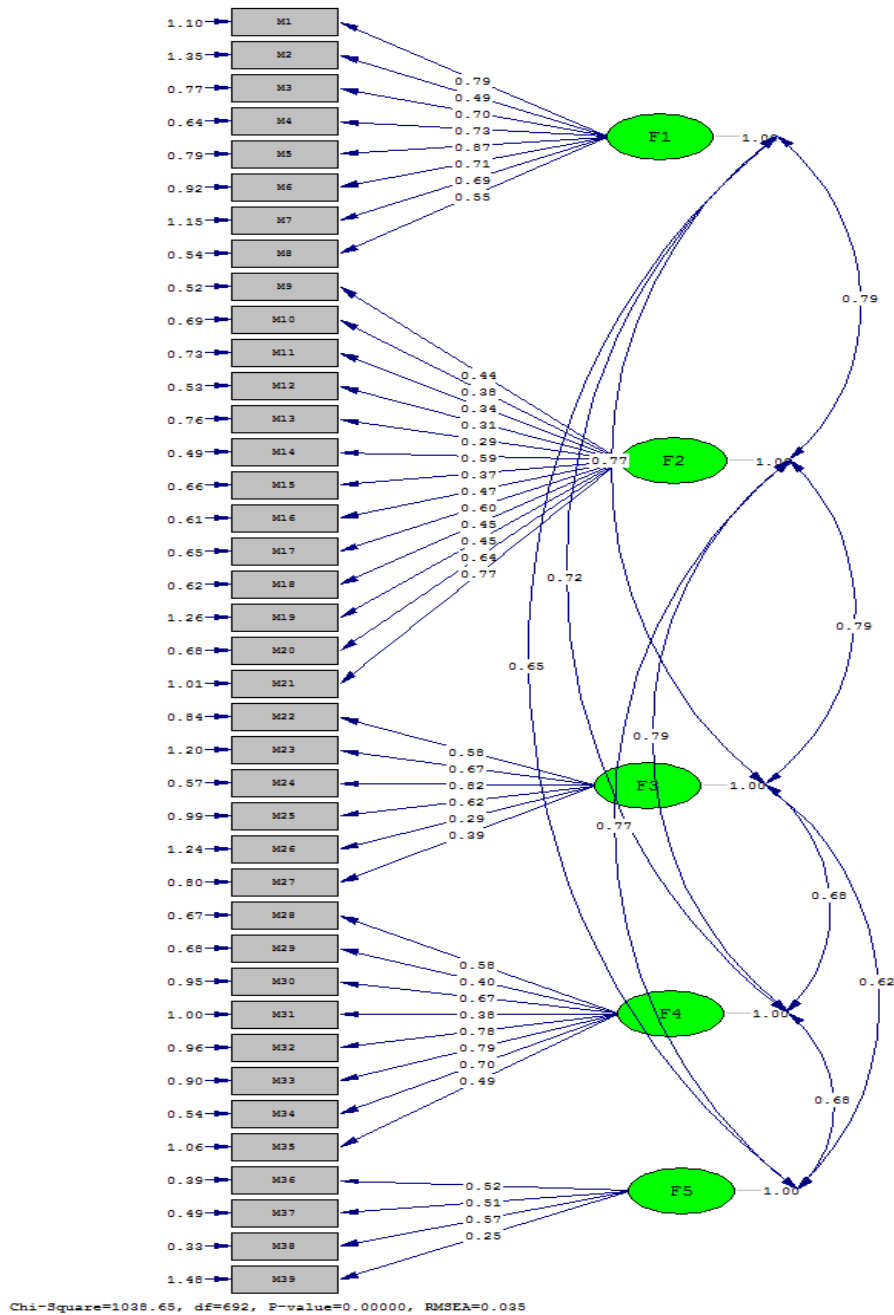


Figure 3.2. Second-order Confirmatory Factor Analysis

The subdimension studying method for factor loadings ranges from .49 to .87; the self-evaluation ranges from .29 to .77; the receiving support ranges from .29 to .82; time management and planning ranges from .38 to .78 and seeking information ranges from .25 to .57.

Jöreskog and Sörbom (1996) stated that the lack of red arrow in the analysis regarding t values indicated that all items were significant at .05 level. In this study, it was found that all items were significant at .05 level as no red arrow was found in terms of t values. The t values obtained as a result of confirmatory factor analysis are presented in Table 3.4.

Table 3.4. First-Level Confirmatory Factor Analysis t-Test Values

Items	t Values	Items	t Values	Items	t Values	Items	t Values	Items	t Values
1	55.28	9	106.56	22	76.11	28	88.85	36	111.80
2	58.24	10	97.19	23	60.72	29	96.10	37	103.46
3	71.29	11	91.572	24	75.33	30	67.50	38	113.16
4	77.87	12	114.48	25	68.56	31	77.66	39	60.28
5	65.21	13	94.70	26	66.35	32	64.54		
6	66.84	14	97.63	27	86.18	33	65.77		
7	61.45	15	99.07			34	85.89		
8	94.96	16	97.09			35	76.02		
		17	85.51						
		18	97.31						
		19	65.03						
		20	81.03						
		21	64.64						

According to the findings in Table 3.4, it was determined that the t value for the items in the Self Regulated Learning Questionnaire changed between 55.28 and 114.48. According to this, all t values obtained in the first level confirmatory factor analysis were found to be significant at .05 level. The excellent and acceptable compliance measures for the fit indices examined in the study and the fit indices obtained from the first and second confirmatory factor analyzes are presented in Table 3.5.

Table 3.5. Fit Indices and Fit Indices Values Obtained from First-level Confirmatory Factor Analysis

Fit indices	Excellent fit	Acceptable fit	First-level Confirmatory Factor Analysis Fit Indices	Second-level Confirmatory Factor Analysis Fit Indices
RMSEA	.00 ≤ RMSEA < .05	.05 ≤ RMSEA ≤ .08	0.035	0.035
CFI	.95 ≤ CFI ≤ 1.00	.90 ≤ CFI < .95	0.98	0.98
GFI	.95 ≤ GFI ≤ 1.00	.90 ≤ GFI < .95	0.88	0.88
AGFI	.90 ≤ AGFI < 1.00	.85 ≤ AGFI < .90	0.86	0.87
SRMR	.00 ≤ SRMR ≤ .05	.05 < SRMR ≤ .10	0.048	0.047
NFI	.95 ≤ NFI ≤ 1.00	.90 ≤ NFI < .95	0.93	0.94
TLI/NNFI	.97 ≤ NNFI ≤ 1.00	.95 ≤ NNFI < .97	0.98	0.98
χ^2 /sd	0 ≤ χ^2 /sd ≤ 2	χ^2 /sd ≤ 8df	1.50	1.50

According to the results attained, in second level confirmatory factor analysis, it was determined that RMSEA value was 0.035 and SRMR value was 0.047, which are required to be below 0,05 in case that the model fit is ensured. Additionally, it was observed that GFI value was 0,88; AGFI value was 0.87; CFI value was 0.98 and NFI value was 0.94. The acceptable fit value for these indexes is .90 (Seçer, 2013). According to the findings in Table 3.5, it can be seen that the values obtained as a

result of explanatory and confirmatory factor analysis are consistent. This indicates that the construct validity of the Self Regulated Learning Questionnaire is confirmed.

Conclusion and Suggestion

Self regulated learning is a skill that is necessary to be acquired as of early ages (Biemiller, Shany, Inglis, and Meichenbaum, 1998; Bronson, 2000; Perry et al., 2004; Perry, Vande Kamp, Mercer, and Nordby, 2002; Whitebread, 1999). However, when literature is reviewed, it is observed that the researches concerning this skill have been mostly carried out at the level of higher education. Within the scope of this research, in order that students' self-regulated learning skill can be investigated as from the ages of secondary school, developing a scale has been aimed. In this context, the validity and reliability study of Self-Regulated Learning Questionnaire, which was developed with the aim of ensuring that relational and experimental studies could be carried out and the related shortage in the literature could be made up, has been performed. The number of items that were first formed as 84 items was reduced to 81 according to the opinions of experts and students. For the scope validity of the draft scale, the findings of the experts were taken and the scale items were revised accordingly. As a result of the pilot application, 17 items were eliminated and the scale was prepared as 64 items. As a result of the AFA, 19 items received load values under multiple factors and there was no difference between these factor loadings at .10 level; five items were excluded from the scale because they did not meet the reliability criteria. In the first level confirmatory factor analysis, the t value of the 40th item was excluded from the scale because it was meaningless at .05 level ($t_{40}=47.256$). Thus, this Self-Regulated Learning Questionnaire is a 39-item, five-point Likert-type scale. The items were graded from 1 to 5 in terms of "totally disagree". As a result of exploratory factor analysis, the scale has 39 items and five factors. These factors are named as "studying method, self-evaluation, receiving support, time management and planning, seeking information". These mentioned five factors clarify the 44,95% of the variance in all scale scores. In terms of the reliability of the scale, Cronbach's Alpha value was estimated. The internal consistency reliability of the whole of Self-Regulated Learning Questionnaire (the Cronbach's Alpha) was estimated as .94.

In order that the accuracy of the established structure could be tested, confirmatory factor analysis was performed for the questionnaire obtained. The results obtained from the confirmatory factor analysis also confirm that the questionnaire has a five-dimensional structure (RMSEA=.035; SRMR=.047; CFI=.98; NFI=.94).

In the light of all these explanations, it can be stated that Self-Regulated Learning Questionnaire is appropriate to secondary school students. Pursuant to the findings obtained from the validity and reliability study for Self-Regulated Learning Questionnaire, it is possible to make some

suggestions. The validity and reliability study of the scale developed within the scope of this research can be tested on different sample groups. Longitudinal and cross-sectional researches can be carried out in order to determine the students' self-regulated learning levels in a more comprehensive manner. Moreover, action researches for enhancing students' self-regulated learning skills can also be designed.

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