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DEVELOPING A "SELF-DIRECTED LEARNING IMPLEMENTATION SKILLS SCALE FOR PRIMARY SCHOOL STUDENTS": VALIDITY AND RELIABILITY ANALYSIS

GÜLTEN FERYAL GÜNDÜZ AND KIYMET SELVİ*

Abstract: The purpose of this study was to develop "The Scale of Determining Self-Directed Learning Implementing Skills" for primary school students. Data were gathered by a survey method. In order to develop this scale, draft items was developed through a literature survey (tarama), observations and interviews done with teachers, parents and students, and presented to experts for evaluation. After alterations based on experts' suggestions, a pilot study with 16 primary students was held to revise the items. After the revision the scale was administered to a sample of 500 3rd and 4th primary school students. In order to determine the validity, exploratory and confirmatory factor analysis was performed. As result of the analyzing data, The Self-Directed Learning Implementation Skills Scale which had 45 items contained five factors and these factors explained % 48.01 of total variance. The five factors were named as "Inquiry Skills" (α=.90), "Thinking Skills" (α=.86), "Using Strategies Skills" (α=.79), "Evaluation Skills" (α=.81) and "Collaborative Learning with Peers Skills" (α=.73). The overall internal reliability coefficient (Cronbach Alpha) of the scale was found as .95.

Keywords: implementing self-directed learning, primary school students, developing scale

INTRODUCTION

The main purpose of modern education is training people who are self-realized and develop themselves physically, mentally, psychologically and socially. In today's information age, information accumulates continually, already existing information lose its currency and information being learned become varied every new day. These changes and evolutions preclude realizing education's main purpose

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only in schools where information is obliged to be given students in crowded classes and time-limited lessons. Due to these problems, *learn to learn* become more important day by day for students in order to be effective and active learners in school and out-of-school learning. Cognitive strategies, metacognitive strategies, learning styles and self-regulated learning are important issues which have been investigated depending on researches about learning to learn. The most general aim of these researches is providing students to become lifelong learners.

The key concept of lifelong learning as a concept which also involves the concepts mentioned above is self-directed learning (SDL). In literature, the concepts named as autodidactic, self-regulated learning, self-planned learning, autonomous learning and independent learning can also be used in the meaning of SDL (Owen 2002; Hiemstra 2004).

According to Dave (1975) SDL is one's using appropriate learning methods and sources to meet his learning needs, planning and managing his learning in order to have success in personal, social and professional development (cited in Gerstner 1992). Tough (1979) described SDL similarly with Dave's definition and he defined SDL as one's taking responsibility in planning and managing the learning process. Guglielmino (1978), by scale development studies related to SDL, made a description of self-direction in learning that addresses context, activation, and universality. In context dimension, she stated that SDL can occur in a wide variety of situations, ranging from a teacher-directed classroom to self-planned and self-conducted learning projects developed in response to personal or workplace interests or needs and conducted independently or collaboratively. In activation dimension, Guglielmino stated that although certain learning situations are more conducive to self-direction in learning than are others, the personal characteristics of the learner—including his or her attitudes, values, and abilities—ultimately determine whether self-directed learning will take place in a given learning situation. In universality dimension, the author stated that SDL exists along a continuum; it is present in each person to some degree (cited in Guglielmino 2008: 1-2; adapted from Guglielmino 1978:34). Finally, in accordance with these definitions, Küçüker (2014) defines SDL as learning preferences that require students to take responsibility for their own learning in different learning environments, to manage their learning processes, to be equipped with affective and cognitive skills needed for realizing this learning process and to aim continuity in learning.

As it can be understood from the descriptions mentioned above, because of SDL is an extensive concept, students also have to be equipped with more skills in SDL. In literature review about SDL (descriptions, researches and scale studies), it was seen that SDL skills that students have to be equipped with are related to students being ready to SDL cognitively and affectively and realizing this learning process effectively. According to Raemdonck (2006), SDL consists of personal characteristics effecting one's personal learning process and determining goals, planning learning process, making strategies and reflecting on his learning to realize SDL (cited in Cornelissen 2012). In accordance to data gathered from literature, it was seen that students' SDL skills can be categorized as self-directed learning preparation skills and self-directed learning implementation skills.

SDL preparation skills can be considered as the learning activities and plans carried out by learners before implementing learning process. In order to realizing SDL, students have to be teachers of themselves, choose and use suitable teaching strategies, methods and techniques fit with learning task after planning the learning process. These skills are defined as self-directed learning implementation skills. According to literature review, these skills can be indicated as follows:

Table 1. *Self-Directed Learning Implementation Skills*

Skills	**References**
Problem solving	LeJeune 2002; Vander Stoep & Pintrich 2003
Doing research	Bagheri, Ali, Abdullah & Daud 2013; Patterson, Crooks & Lunky-Child 2002; Long 2005; Costa & Kallick 2004; Arnoldson 2013
Collaborative learning	Patterson et al. 2002; Costa & Kallick 2004; Williamson 2007; Liang, Wang & Tung 2011
Effective reading	Vander Stoep & Pintrich 2003
Using learning strategies	Liang, Wang & Tung 2011; Long 2005; Costa & Kallick 2004, Vander Stoep & Pintrich 2003
Thinking	Carr 1999; Fisher, King & Tague 2001; Patterson et al. 2003; Costa & Kallick 2004; Williamson 2007
Evaluation	Patterson et al. 2003; Long 2005; Willamson 2007; Garrison 1997; cited in Liang, Wang & Tung 2011

As it is seen in table 1, SDL implementation skills consist of problem solving, researching, collaborative learning, effective reading, using learning strategies, thinking and evaluating skills. SDL is being important in students managing their learning, being independent and life-long learner and specializing in an area that they choose according

to their interests and abilities. The effective realization of self-directed learning with the help of such skills requires the accurate determination of to what extent these skills are acquired by learners. Knowing students' using level of SDL implementation skills will be useful for both students and teachers. With using self-directed learning implementation skills scale, students will not only learn to what extent they use these skills but also they will have opportunities for understanding deeply what SDL is and why it is important for them. Teachers can determine their students' using levels of SDL implementation skills and their inadequacies in using these skills. They can also lead their students to use suitable learning strategies in order to be independent learners through determining their personal learning needs.

Literature review reveals that most of the SDL scales focus on planning learning skills and affective traits. It is seen that scale development or adaptation studies in the related SDL literature focusing on how to determine self-directed learning implementation skills learners have and to what extent they use them are few and inadequate. One of the scales that focus on determining students' using level of SDL implementation skills more than their SDL planning and affective skills was developed by Williamson (2007). The scale named as "Self-Directed Learning Self-Assessment Scale" consists of 60 items and five subscales. All subscales consist of 12 items. Subscales are named Awareness, Learning Strategies, Learning Activities, Evaluation and Interpersonal Relations. Another scale focusing on determining students' SDL implementation skills has been developed by Teo, Tan, Lee, Chai and Koh (2010) and adapted to Turkish language by Demir and Yurdagül (2013); it is named "Self-Directed Learning with Technology Scale". According to the results of explanatory and confirmatory factor analysis, the scale has seven items. First factor named self-management consists of two items; second factor named goal-oriented learning consists of five items.

There are some scale development or adaptation studies related to research, thinking, problem solving, collaborative learning and learning strategies which are also one of the SDL implementing subskills. In this context, analyzing scales developed for determining students' using level of research skills, it was seen that these scale development studies are mostly focused on affective domain (e.g. attitude scales, anxiety scales and proficiency scales). It can be said that research skills test developed by Dilbaz, Özgelen and Yelken

(2012) and research skills scale developed by Yılmaz (2007) for primary school students are partially related to this scale development study in terms of these skills.

When the scales developed for determining students' using level of questioning skills were analyzed, it was seen that Balım and Taşkoyan (2007) developed a scale named "Inquiry Learning Skills Perception in Science" for determining primary school students' research and inquiry skills perceptions. When the scales which were developed or were adapted to aim at determining students' problem solving skills are analyzed, it can be seen that most of these scales developed for high school students, teacher candidates and adults or a specific subject. Serin, Serin and Saygılı (2010) stated that there wasn't a scale development study for determining primary school students' problem solving skills and due to this problem they developed a scale named "Problem Solving Inventory".

There are also scale development studies about thinking skills in literature. These scales mostly focused on one type of thinking: critical, creative or reflective thinking. Scales and tests developed for determining primary school students' thinking skills are New Jersey Reasoning Skills Test, Watson-Glaser Reasoning Skills Test, Cornell Critical Thinking Test, California Critical Thinking Disposition Inventory (Udall & Daniels 1991). Some of these scales were adapted to Turkish. In literature review, however most of thinking skills tests and scales were developed for determining critical thinking; there are also found creative and reflective thinking skills scales developed or adapted. Doğanay and Sarı (2012) stated that most of these scales can be used in high grades class (e.g. secondary school, high school, university) and they believe that teaching of thinking skills to students have to begin in more early age. Due to this, they developed a scale named "Thinking-Friendly Classroom Scale (TFCS)" for 5th year primary school students.

In addition to importance of independent learning, collaborative learning is also important in self-directed learning. The scales developed to determine collaborative learning are mostly according to adults. Students choosing and using suitable learning strategies are also important in self-directed learning. In literature review, we find many scales for determining cognitive and metacognitive strategies. There are also scales developed or adapted for determining adults' or high school students' learning strategies.

One of the learning strategies skills scales is Motivated Strategies for Learning Questionnaire (MSLQ) developed by Pintrich and De Groot in 1990. The scale consists of three dimension and 15 factors below these dimensions. Six factors are related to motivation and nine factors are related to learning strategies. There are 81 items in scale. Doğanay and Kayıran (2012) adapted this scale to Turkish for 5th year students. The results show a scale formed by six factors and 60 items. The factors are: cognitive awareness-learning strategies, self-efficacy, management of study time and learning environment, value of task, test anxiety and recourse.

The usual analyzed scales for SDL implementation skills as a whole are just a few. Most of them (especially Turkish scales) consist of one of the SDL implementation subskills, developed for adults or high school students. Considering these problems and needs, researchers aimed to develop a scale to determine self-directed learning implementation skills of primary school students and to apply reliability and validity studies to it.

METHODS

Participants

The schools of students in the sampling were determined by using criteria of sampling and maximum variation methods which are types of purposive sampling method; and the classrooms were selected by using random sampling method. Criterion sampling method refers to the determination of situations that meets predetermined criteria (Yıldırım & Şimşek 2008). For the purposes of the study, 3rd and 4th year primary school students were chosen as the subjects of the study. In maximum variation sampling method, the aim is to reflect the population of the study in a maximum way (Yıldırım & Şimşek 2008). In this study, schools were determined on the basis of socioeconomic differences and general academic achievements (high, medium and low levels). Accordingly, a total of three primary schools located in Eskişehir were chosen as the sampling of the study. The 3rd and 4th year classes where the scale was administered have been chosen by using random sampling method; and the students in these classrooms became the group of the current study. Table 2 displays demographic information of the students in the study group such as the class level they attend and their gender.

Table 2. *Demographic Information of the students participated in the study*

Type of Analysis	Demographic Information	Predicted value		Evaluated value	
		F	%	F	%
EFA (Explanatory Factor Analysis)	Gender				
	Female	140	46,6	120	48
	Male	160	53,4	130	52
	Total	300	100	250	100
	Class level				
	3rd year	120	40	105	42
	4th year	180	60	145	58
	Total	300	100	250	100
CFA (Confirmatory Factor Analysis)					
	Female	95	47,5	87	50,6
	Male	105	52,5	85	49,4
	Total	200	100	172	100
	Class level				
	3rd year	80	40	69	40,1
	4th year	120	60	103	59,9
	Total	200	100	172	100

According to literature, sample size is an important issue to gain valid results from EFA. There are different suggestions in the related literature regarding the number of people in sampling required for factor analysis. Kline (1994) claims that a total of 200 people in a sampling would suffice to identifying reliable factors in such an analysis. Similarly, Kim-Yin suggests a certain sampling size to keep an item in the scale. Accordingly, sampling size should be 200 for an item with a factor load of 0.40 (cited in Çokluk, Şekercioğlu & Büyüköztürk 2012). Factor load was determined as 0.40 for the explanatory factor analyses done in this study.

As it is shown in Table 2, sampling sizes in the current study were planned to be between 200 and 300 for the purposes of explanatory factor analysis. Self-directed Learning Implementation Skills Scale was applied to 120 3rd year and 180 4th year, total being 300 students. One classroom (a total of 30 students) did not return the scales and another 20 students replied the scale incorrectly or left some items unanswered. Therefore these 50 scales were not included in the analysis. Explanatory factor analysis was applied to the data obtained from 250 students. According to Table 2, 120 of these students are females, 130 males; 105 are 3rd year and 145 are 4th year students.

It is necessary to have adequate sampling size in order to apply confirmatory factor analysis. As a suggestion, Marsh and Hau (1999);

Sapnas and Zeller (2002) and Brown (2006) state that sampling size should be at least 100 for confirmatory factor analysis. As displayed in Table 1, the confirmatory factor analysis of the scale, which was revised after explanatory factor analysis, was planned to be applied to the data to be obtained from 200 students. However, since 28 students filled out the scale incorrectly or did not reply to some items, the analysis was applied to the data obtained from a total of 172 students. As shown in Table 2, 87 of these students are females and 85 males, 69 third year and 103 fourth year students. The students which are the subjects of confirmatory analysis are different from those of exploratory analysis.

Implementation Process

The first phase in the development of the scale was literature review. The previously developed or adapted scales were examined. In addition, the self-directed learning implementation skills that students should have were determined and "Self-Directed Learning Implementation Skills Scale" was developed. Following a thorough literature review, a total of 55 items related to self-directed learning preparatory skills were prepared. The items of the scale were revised after document analysis and expert opinions. The details of this process are given below:

- Following the literature review, a survey was administered to primary school teachers and students (from first year to fifth year) in February 2012 to obtain their opinions regarding self-directed learning skills. Self-directed learning implementation skills were revised according to the results obtained from this questionnaire. After the revisions, self-directed implementation skills included a total of 32 items in three groups; namely learning skills, thinking skills and research skills.
- Common basic skills and learning outcomes of the following subjects, which were the main courses of primary school education (from 1st year to 4th year) were examined: Turkish, Mathematics, Life Sciences, Social Sciences, and Science and Technology. The first two phases included the revision of self-directed learning implementation skills based on the framework of skills covered in curricula and literature review. This new version consisted of the following self-directed learning implementation skills: using learning strategies, collaborative learning, critical thinking, creative thinking, problem solving, self-evaluation and peer evaluation. At the end of this phase,

self-directed learning implementation skills consisted of 60 items in total.

- "Self-Directed Learning Implementation Skills" draft scale was presented to a total of 7 experts for feedback and evaluation: three experts in Educational Programs and Teaching (the main field); two language experts and two primary school teachers. The experts were asked to evaluate the items in the scale in terms of language use (Turkish), the characteristics of the group that the scale is planned to be administered, and the theme. The feedback received from the experts was evaluated by the researcher taking similarities and differences mentioned into consideration. As a result, 4 items were excluded from the survey; 9 were revised and 5 items were rewritten as separate items due to overlapping. At the end of this phase, self-directed learning implementation skills consisted of 67 items in total.

The finalized version after the feedback received from the experts was piloted with 10 students attending İbrahim Karaoğlanoğlu Primary School and having similar characteristics with the subjects of the study; 5 third year students and 5 fourth year students. The aim of this pilot study was to test the items in terms of comprehension. Since item 6 and item 15 were not clearly understood by the students, they were reevaluated in terms of language and clarity and corrected accordingly. After these revisions, the scale was given to 6 more students; 3 fourth year and 3 third year students. The final version was observed to create no problems in terms of comprehension.

RESULTS

This section presents findings regarding the reliability and validity studies of the "Self-Directed Learning Implementation Skills" draft scale. Construct validity was examined within the framework of validity issues, and Cronbach Alpha for reliability.

Construct validity

It is a desire to test scale model developed with confirmatory techniques after analyzed scale with explanatory factor analyses to reveal the factor design of scale (Çokluk, Şekercioğlu and Büyüköztürk 2012). Firstly, explanatory factor analysis was applied to the data obtained and later confirmatory factor analysis. Finally, the relationship between predetermined latent and observed variables was tested in order to validate factor structure.

Explanatory Factor Analysis

Explanatory factor analysis was used to examine the structure of the data obtained and to eliminate the problematic items during the scale development process. For the purposes of this analysis, Principal Components Analysis is a practical solution for researchers who want to categorize a large number of variables into relatively low number of variables (Çokluk et.al 2012).

Kaiser-Meyer-Olkin coefficient and Bartlett's sphericity test are also very important for the calculation of adequate sample size for explanatory factor analysis - that is the applicability of the collected data for explanatory factor analysis. Kaiser–Meyer-Olkin coefficient must be at least .60 for a sound factor analysis. In addition, p value calculated in Bartlett test must be meaningful (Pallant 2005:174).

"Self-Directed Learning Implementation Skills Scale" Explanatory Factor Analysis

The suitability of the data collected from the students for principal components analysis was evaluated with Kaiser–Meyer-Olkin coefficient and Bartlett's test of sphericity, displayed in Table 3.

Table 3. *Kaiser-Meyer-Olkin and Bartlett test results*

Kaiser-Meyer-Olkin Statistics		,899
Bartlett's test of sphericity	Chi Square Approximately	8607,444
	Degree of Freedom	2211
	Level of Significance	,000

Kaiser–Meyer–Olkin coefficient was calculated as 0.899, which shows that data set is suitable for factorization. Also, meaningful p value ($p<.05$) implies high correlation between the variables. In other words, sampling size is suitable for Principal Component Analysis. According to this analysis, 67 items were categorized under 16 factors, of an eigenvalue that is higher than 1. After Varimax rotation, the distribution of these items according to the factors and scree plot results were examined. According to the results, this 16-factor structure does not have a meaningful structure for self-directed learning readiness (preparatory) skills. The factor showing sharp and fast decreases gives the number of important factor numbers (Büyüköztürk 2010:126). Accordingly, it was thought that five-factor

or six-factor structure could be appropriate. Examined five-factor scale structure, it was seen that the distribution of scale items to factors didn't fit with the literature, then the six-factor scale structure was examined. While deciding which items will be included in the scale, the following criterion was followed: item factor load is higher than 0.40 (Coombs and Schroeder 1988:84) and the difference between the item loads of two factors is at least 0.10 when an item is placed in these two factors at the same time (Büyüköztürk 2010:126). After the validity analysis, 20th, 21st, 22nd, 23rd, 25th, 27th, 31st, 36th, 43rd, 44th, 45th, 48th, 50th, 51st, 54th, 57th and 59th items were excluded from the draft scale, which had totally 67 items.

When six-factor scale structure was examined, it was seen that the items in the sixth factor couldn't be under the same factor because of not fitting with the literature. Due to this problem, the items in the sixth factor not being wholeness with each other (item 9, item 10, item 11, item 14 and item 26) were excluded from scale and the scale structure was formed from five factors. In total, 22 items were excluded from the draft scale and the remaining 45 items were renumbered in the new version of the scale. The results of factor analysis for validity and factor loads are shown in Table 4.

Table 4. *Factor Analysis and Factor Loads of Self-Directed Learning Readiness Skills Scale*

	Factor Load				
Item No	**I**	**II**	**III**	**IV**	**V**
1	.61				
2	.58				
3	.55				
4	.54				
5	.54				
6	.53				
7	.52				
8	.52				
9	.51				
10	.49				
11	.49				
12	.46				
13	.46				
14	.44				
15	.44				
16	.41				

17		.69			
18		.60			
19		.57			
20		.55			
21		.54			
22		.54			
23		.53			
24		.50			
25		.45			
26		.42			
27			.74		
28			.71		
29			.60		
30			.51		
31			.50		
32			.49		
33				.71	
34				.61	
35				.51	
36				.50	
37				.46	
38				.45	
39				.43	
40				.41	
41					.71
42					.65
43					.58
44					.50
45					.43
Explained Variance (%)	**12.49**	**10.42**	**9.31**	**8.47**	**7.32**
Explained Total Variance (%)	**48,01**				

The item loads calculated in validity analysis are between 0.74 and 0.41 and the scale has a five-factor structure. The total variance explained by these factors together is 48.01 %. The first factor in the scale is “Research Skills”, which includes 16 items and explains 12.49 % of total variance. Research is described as systematic studying in order to solve a problem, reveal the truth and enhance the data obtained through using scientific methods and techniques. Research is gathering, analyzing, interpreting and evaluating the data and

presenting the results in order to solve the problems which are determined through willingness and curiosity (MEB 2011). Dilbaz, Özgelen and Yelken (2012) also determine research skills according to their literature review done about scale studies. They named these skills as curiosity, determining problems, hypothesizing, gathering data, hypothesis testing, analyzing the data and evaluating the data, presenting results and investigating. In this scale study, research skills consist of curiosity, problem solving, evaluation and investigation. The second factor in the scale is "Thinking Skills", which includes 10 items and explains 10.42 % of total variance. According to Fisher (1995), thinking is a cognitive activity that consists of determining, clarifying and solving problem, decision-making, generating solutions and investigating thoughts. In literature, high order thinking skills are described as problem solving, critical thinking and creative thinking. Critical thinking is an active and systematic cognitive process that aims to understand ourselves and events happening around us by being aware of our thinking process and implementing our learning in considering others' views (Cüceloğlu 1995; cited in Güven & Kürüm 2004). In literature, problem solving is described as thinking around a problem, describing the problem, gathering data about problem and solution, applying the most suitable solution and evaluating the result (Ülgen 2001; LeJeune 2002; Vander Stoep & Pintrich 2003). Creative thinking is original, fluent, flexible and unusual thinking way (Guilford 1967; cited in Doğan 2005). In this scale study, the items in second factor consist of problem solving, creative thinking and critical thinking skills. The third factor in the scale is "Using Strategies Skills", which includes 6 items and explains 9.31 % of total variance. Learning strategies are behaviors and thoughts targeting to effect learners' coding process. The fourth factor in the scale is "Evaluation Skills", which includes 8 items and explains 8.47 % of total variance. Assessment and evaluation are major elements that complete teaching-learning process (Ertürk 1998; Gönen, Kocakaya & Kocakaya 2011). The way of determining if and to what extent education-instruction process answers the learning goals is doing assessment and evaluation. In this factor, items about teacher's assessment, items about self-evaluation and peer-evaluation which are important in SDL are also found. Self-evaluation is students' evaluation about themselves and judging their learning about a subject in learning process, their achievement levels and learning outcomes (MEB 2008; Çepni et.al 2007; Yurdabakan & Uzun 2011). Peer-evaluation is students'

evaluation about their friends' work sheets through some criteria (Çepni et al. 2007; Fer & Çırık 2007). The last factor in the scale is "Collaborative Learning with Peers Skills", which includes 5 items and explains 7.32 % of total variance. Collaborative learning is an instructional process that students work through groups in order to realize common learning goals and they do their learning responsibilities in group.

Following the analysis about the construct validity of the scale, the distinctiveness of scale was also examined. For the purpose of this analysis, the differences between the means of 27 % bottom and top group were examined. In these comparisons, t value was found to be meaningful at p<.001 level. When the dual correlations between factor points are examined, it can be said that there is a positive relationship among each factor, though being at medium level. The highest correlations were between "Research Skills" and "Thinking Skills". The relationship among the factors in the developed scale is shown in Table 5.

Table 5. *The Correlation among the Factors of the Scale*

Correlation Coefficient					
	Research skills	Thinking skills	Using learning strategies skills	Evaluation skills	Collaborative learning with peers
Research skills	1	.71	.65	.73	.58
Thinking skills	.71	1	.59	.66	.58
Using learning strategies skills	.65	.59	1	.56	.43
Evaluation skills	.73	.66	.56	1	.60
Collaborative learning with peers	.58	.58	.42	.60	1
		.87	.77	.84	.71

Confirmatory Factor Analysis Results

Revised according to explanatory factor analysis results, the model was tested through confirmatory factor analysis. The first thing researchers should check is the level of significance of t values. Parameter predictions are meaningful at .05 level if "t" values exceed 1.96, and they are meaningful at .01 level when they exceed 2.56. In the analysis done in structural equality model, t values that are not

meaningful must be excluded from the analysis. However, it can be useful to check error variances as well before making the final decision (Çokluk et al. 2012). All indicators give meaningful t values at .01 and .05 level and error variances are quite low. Another value that should be examined is p value, which provides information about the significance of the difference between predicted covariance matrix and observed (χ^2). Naturally, it is better when p value is not meaningful; however, meaningful p value can be tolerated in many studies. Therefore, it is useful to evaluate alternative fit indexes about the application between two matrices (Çokluk et al. 2012). Fit indexes obtained after the analysis regarding the model are displayed in Table 6.

Table 6. *The ideal fit values for Explanatory Factor Analysis in the related literature and the Uyum values observed in the scale*

Fit Index	Best Fit Value	Observed Fit Value	References
χ^2	$0 \leq \chi^2 \leq 2sd$	1287.76	(Sütütemiz 2005)
p değeri	$.05 \leq p \leq 1.00$	0.000	(Hoyle 1995)
χ^2/sd	$0 \leq \chi^2/sd \leq 2$	1.38	(Sütütemiz 2005; Tabachnick & Fidell, 2001)
RMSEA	$0 \leq RMSEA \leq .05$	0.047	(Schumacker & Lomax, 2004)
SRMR	$0 \leq SRMR \leq .05$	0.060	(Kenny 2010)
RMR	$0 \leq RMR \leq .05$	0.074	(Kenny 2010)
NFI	$.95 \leq NFI \leq 1$	0.92	(Kenny 2010)
NNFI	$.95 \leq NNFI \leq 1$	0.97	(Arbuckle 2007)
CFI	$.95 \leq CFI \leq 1$	0.97	(Hu & Bentler 1999)
GFI	$.95 \leq GFI \leq 1$	0.75	(Blunch 2008)
AGFI	$.95 \leq AGFI \leq 1$ AGFI<GFI	0.72	(MacCallum & Sehee 1997)

χ^2=1287.76; sd=935

Chi-Square statistics is known as lack of fit index (Stapleton 1997). Smaller test statistics shows that the model is appropriate for observational (empirical) structure. However, since Chi-Square is a cumulative statistics, Chi-Square value will increase as the number of variables increases, so it is necessary to evaluate Chi-Square degree of freedom. If this value is smaller than 5, model is said to have well fit. If it is smaller than 3, model is said to have very well fit. (Byrne 1998).

Tabachnick and Fidell (2001) and Sütütemiz (2005) suggest that if the value is smaller than 2, it has very good goodness of fit. According to Table 6, this value is 1.38, which shows that the model has "very good fit" when Chi-Square/SD ratio is examined. Since x^2 / sd ratio of fit level obtained for confirmatory factor analysis and most of the fit indexes without making any modifications were within acceptable limits, the researcher decided not to make any revisions in the items of the scale.

Reliability Analysis

In order to test the presence of normal distribution in the data, Kolmogorov-Smirnov Test was applied. The results of the test are displayed in Table 7.

Table 7. *The Results of Kolmogorov-Smirnov Z Test*

		TOPLAM
N		250
Normal Parameters (a,b)	Mean	188,36
	Standard Deviation	26,790
Most Extreme Differences	Absolute	,149
	Positive	,100
	Negative	-,149
Kolmogorov-Smirnov Z		2,349
Asymptotic Significance (2-tailed)		,000

The maximum score to be taken from the 45-item scale is 225 and the minimum score is 45. According to the analysis, the minimum score was calculated as 106 and the highest score was 220; the range was 119. As displayed in Table 7, the mean value for the scale is 188.36, standard deviation 26.790, skewness value -.29 and kurtosis .26. Kolmogorov-Smirnov test result showed a meaningful p value. This result implies that the data do not have normal distribution. Pallant (2005:57) suggests that this result is often observed in studies with high number of subjects and low p value cannot be interpreted as the absence of normal distribution. Similarly, Tabanchnick and Fidel (2001) emphasize that skewness and kurtosis values are more sensitive in big samplings and therefore distribution should be examined by

using histogram. In the current study, the results of normal probability graph, detrended normal probability graph and box plot were examined. The analysis revealed a normal distribution.

In order to calculate internal consistency of the scale, Cronbach Alpha coefficient was used. The value was calculated as 0.95. If Alpha value is between 0.80 and 1 in a scale with one variable, the scale is considered highly reliable (Ural & Kılıç 2006:290). Therefore, the scale used in this study can be told to be highly reliable. As shown in Table 8, internal consistency value for each of these four factors was calculated as 0.90, 0.86, 0.79, 0.81 and 0.73.

Table 8. *Reliability Coefficients of Subscales*

Subskills	**Cronbach's α**
Research skills	.90
Thinking skills	.86
Using learning strategies skills	.79
Evaluation skills	.81
Collaborative learning with peers skills	.73

The results of reliability and validity analysis clearly showed that "Self-Directed Learning Implementation Scale", which consists of 5 subscales and 45 items, can be used to determine SDL implementation skills of primary school students.

CONCLUSION AND FURTHER SUGGESTIONS

In this study, it was aimed to develop a scale for determining primary school students' SDL implementation skills. In the current study, explanatory factor analysis was firstly realized; and later confirmatory factor analysis was done via LISREL. The item-total correlation of the items in the scale was found to be between .74 and .41. The scale consists of five factors which are "Research Skills", "Thinking Skills", "Using Learning Strategies Skills", "Evaluation Skills" and "Collaborative Learning with Peers Skills". The total variance of five factors in the scale is 48,01 %. After the explanatory factor analysis, confirmatory factor analysis was applied to the data obtained. Although the results of the first analysis suggested revisions in some items, these modifications were not made since Chi-Square value was within the acceptable value range and the modifications were not going to change Chi-Square value. In other words, the fit according to the values obtained in the first analysis was quite good. The results of

reliability analysis showed that internal consistency values were found to be within an acceptable range. Cronbach Alpha value, the internal consistency coefficient, was calculated as 0.95. The scale consists of five subscales and 45 items.

In literature review, there is a lot of scale studies to determine students SDL implementation skills, but all of these scales only focused upon one of the implementation skills. There are not scale studies to determine primary school students' SDL implementation skills as a whole in literature. The first factor of the scale is named "Research Skills." In this scale study, research skills consist of curiosity, problem solving, evaluation and investigation. The importance of research skills was emphasized in the studies related to SDL (Van-Deur & Murray-Harvey 2005; Gündoğdu 2006; Faisal & Eng 2009; Birenbaum 2010). But it was seen that the indicators related to research skills were not stated in the most of the SDL scales and analyzed the pre-developed SDL scales, these skills did not exist within the structure of an independent factor. In this scale development study, one of the factors in the scale only consists of research skills and the indicators of these skills are in more detail.

The second factor in the scale is that of "Thinking Skills." The importance of thinking skills was mostly emphasized by the studies related to SDL (Carr 1999; Fisher, King & Tague 2001; Patterson et al. 2003; Costa & Kallick 2004; Williamson 2007). In literature, high order thinking skills are described as problem solving, critical thinking and creative thinking. In this scale study, the items in second factor consist of critical thinking, problem solving and creative thinking skills, similarly.

The third factor in the scale is called "Using Learning Strategies Skills." Learning strategies are behaviors and thoughts targeting to effect learners' coding process (Weinstein and Mayer 1986). Özer (1998) emphasized that learning strategies is an important concept in learning to learn. The importance of using learning strategies in realizing SDL is also emphasized by the studies related to SDL, and many SDL scales contain using learning strategies, similarly (Long 2005; Liang, Wang & Tung 2011; Bradley & Lane 1996; cited in Oladoke, 2003; Candy 1991; cited in Kaufman, 2003).

The fourth factor named "Evaluation Skills" shows the way of determining if and to what extent education-instruction process answer the learning goals - doing assessment and evaluation. In this factor, however items are mostly related to teacher's assessment; items about

self-evaluation and peer-evaluation which are important in SDL are also found. The importance of evaluation skills is emphasized, too, in the studies related to SDL (Patterson et al. 2003; Liang, Wang & Tung 2011, Long 2005, Costa & Kallick 2004). In this scale study, these skills were stated in more detail.

The last factor in the scale is called "Collaborative learning with peers". Its importance in SDL has been emphasized in recent years (Patterson et al. 2002; Costa & Kallick 2004; Williamson 2007; Liang, Wang & Tung 2011). But they were not stated in previous SDL scales in more detail and clearly. The fact makes this current scale study more important, also discriminating this scale from other scales.

In literature review, it was seen that most of the SDL scales were developed for determining students' SDL planning skills, but there was not any SDL scale for determining their implementation skills as a whole and in details. Because of this, it is considered that this research will be useful in literature. According to the results of the study, the scale developed on the ground of the findings obtained in the study is to be a reliable and valid data collection instrument that can be used in the studies to be conducted to determine implementation skills for self-directed learning with primary school students. It is suggested that the studies to be carried out with different subjects might provide valuable data regarding the consistency of the scale. In addition, further studies can be conducted to adapt the scale to various levels of education in order to use it in a wider context.

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