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Developing technology and design course self-efficacy scale: A validity and reliability study

Celalettin Ozden, National Ministry of Education, 06650 Ankara, Turkey
Murat Tezer*, Near East University, Institute of Educational Sciences, Nicosia 99138, Northern Cyprus
Ramazan Atasoy, National Ministry of Education, 06650 Ankara, Turkey

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Abstract

The aim of this study was to develop a valid and reliable assessment and evaluation instrument to specify the efficacy of the students in technology and design courses. The assessment instrument was composed of an item pool, experts' views about the validity scope, pre-application, analysis of structure validity and reliability analysis steps. This study was carried out with the seventh-grade students in State secondary schools in Northern Cyprus. A scale with 38 items and seven factors was determined through an exploratory factor analysis. The scale consisted of synthesis, basic application, evaluation, formal analysis, further analysis, advanced application and comprehension dimensions. The confirmatory factor analysis and the factor structures were tested. At the end of the confirmatory analysis, it was noted that the variables had acceptable goodness of fit values. A valid and reliable technology and design course self-efficacy scale was developed at the end of the study.

Keywords: Technology and design, self-efficacy, secondary school, scale development.

* ADDRESS FOR CORRESPONDENCE: **Murat Tezer*,** Institute of Educational Sciences, Nicosia 99138, Northern Cyprus. *E-mail address*: murat.tezer@gmail.com / Tel.: +90-392-2236464

1. Introduction

Self-efficacy is one of the most important concepts in self-development. An individual can change self-efficacy through different interactions by in and out of school activities. Change of self-efficacy is a socially predominant process. In this respect, the first scientist to remember is Albert Bandura, who advocated the social learning theory. Bandura (1997) explains self-efficacy as an individual's organisation and application performance skill on a specific occasion. Alternatively, it is an individual's belief in exhibiting certain behaviours. Senemeoglu (2012) defines self-efficacy as an individual's self-belief and evaluations in reaching success through using own skills in different situations to different events to accomplish a certain task. Self-efficacy is an individual's belief in self-ability or capacity in succeeding and reaching an aim (Behroozi, 2017; Coklar & Akcay, 2018; Kurt & Goksun, 2016; Ormord, 2006). Ansari & Khan (2015) defines self-efficacy as the beliefs in one's capacity to influence cases around. This concept affects one's power and alternatives preferences in case of facing difficulties (Ansari & Khan, 2015). In the light of these definitions, it can be assumed that self-efficacy influences one's behaviours in every stage of life. Even more, in terms of self-efficacy, beliefs in one's success performance and types of behaviour adapted in such cases are priorities in common grounds, because self-efficacy is a characteristic related to one's psychological condition and can be changed. Bandura (1977, p. 191) strongly argued that, in any case, psychological processes change the power and level of self-efficacy. In the case of intimidating from a handicap or target, self-efficacy expectations explain whether to start to cope with the situation, how much effort is required and how long the try will last. The more perceived self-efficacy is the more effort spent (Basarmak, 2017; Farjami & Kazemi, 2018; Tezer, Yildiz & Uzunboylu, 2018).

Bandura noted a connection between perceived self-efficacy and behavioural changes. A strong perception of self-efficacy brings along with it more active efforts. In case of lack of skill, the perceived self-efficacy expectation will not achieve the required performance by itself. On the other hand, when skills and sufficient wishes are considered, self-efficacy expectations become the determinant for preferences of people in stressful occasions (Bandura, 1977, p. 193). In addition, this clearly indicates the connection between self-efficacy and skills. Bandura (1994) argued that people's self-efficacy beliefs affect their way of thinking, their feelings, how they motivate themselves and the way they behave. The connection between behaviour and motivation mentioned here is expressed differently by cognitivist and behaviourist theoreticians (Durmuscelebi & Kusucuran, 2018; Demirel, 2015; Karacaoglu, 2014; Plotnikova & Strukov, 2019). However, when the basics of both theories are concerned, it can be seen that motivation is a common trigger for motivation.

Motivation is a crucial sub-factor in self-efficacy. Motivation required for active and ongoing behaviour, partly emerges from cognitive activities (Bandura, 1977; Ping-ying, 2017; Soetan & Coker, 2018). An individual lacking basic knowledge and skills cannot exhibit a competitive performance. At this point, the perception of self-efficacy will be helpful in raising rivalry (Schunk, 1995). Self-efficacy can have an impact on every kind of behaviour such as academic, social and physical skills. Self-efficacy and skills can be considered loops complementing each other. Lack or surplus in any of these directly affects one's level of success. Studies done to investigate the connection between self-efficacy and academic success indicated a positive relation between the two variables (Bencze, 2010; Benli Ozdemir & Hamzaoglu, 2016; Hoigaard, Kovac, Qverby & Haugen, 2015; Hartell, Gumaelius & Svardh, 2015; Nas, 2018; Zimmerman, 1999).

Besides several factors in the development of self-efficacy perception, the effect of the environment one lives in has a great role, too. Educational institutions are one of the environments in constant interaction (Ozdemir & Erdogan, 2017; Turan Cimsir & Uzunboylu, 2019). Intelligence, age, stimulants and attention, as well as self-efficacy, are the factors affecting learning processes (Aarabi, Abdi & Heydari, 2018; Cetin, 2007; Ozkal, 2019).

In learning environments, every teaching programme includes particular skills and self-efficacy. Several studies have been done related to mathematics, geometry and IT (Information Technology) related to measuring self-efficacy. These studies showed that individuals with high self-efficacy exhibit more insistent effort for success in their tasks (Bong, 2004; Bhar, 2019; Cilingir & Artut, 2016; Gulten & Soyturk, 2013; Gedik & Aykac, 2017; Phan, 2012; Seker & Erdogan, 2017; Sengul, 2011; Tatar & Buldur, 2013; Zimmerman, 1999). In this respect, it is of great importance that student self-efficacy perceptions are examined. Another important point in assessing self-efficacy in specific disciplines is the lack of scale (Capri & Kan, 2006). It is expected that students develop skills and self-efficacy in Technology and Design Courses. This study aimed to help design students' learning habits through measuring their sufficiency's. The data obtained from this study can be referred to revise and rapidly modernised teaching programmes developed behind times. The aim of this study was to design a tool to assess students' conception levels of self-efficacy in technology and design courses.

2. Method

This research aimed to develop a scale to specify the seventh-grade students' self-efficacy levels in Technology and Design Courses. In this study, a survey model was conducted and the data collected were analysed through statistical methods. A survey type of research deals with the skills, views, knowledge, etc., of the participants (Can, 2014). This research was done in the 2016–2017 academic year.

2.1. Participants and sampling

Around 3,116 seventh grade students from State schools in TRNC participated in this study. The number of the participants was determined in the light of up-to-date information from the Office of Secondary Education of the Ministry of National Education, Northern Cyprus. A 'stratified sampling' and 'simple random sampling' method was used in this study. In a stratified sampling method, every single unit of the population is one stratum and the sample is drawn separately back from every stratum (Buyukozturk, Cakmak, Akgun, Karadeniz and Demirel, 2016).

This research was done with respect to geographical region, number of students, type of school and level of class status. The districts of Northern Cyprus were set as sub-stratum and among this specified stratum; a sampling group was formed through simple random sampling method to develop the scale. According to the sampling size table with a 95% reliability gap, by Cohen, Mnion & Morrison (2007), a sampling size with 285 persons is sufficient for 1,100 participants. Buyukozturk et al. (2016a) stated that 10% of the participants is big enough for the sampling in increasing the size of sampling and dropping the sampling errors. 36.9% (1,152) of the seventh-grade students were in Nicosia, 24.7% (770) of them were in Magosa, 19.7% (614) were in Kyrenia, 10.3% (321) were in İskele and 5.1% (259) were in Guzelyurt. From the sub-stratus, specified through simple stratified sampling method, the number of sampling students picked through 20% simple random sampling was as 230 from Nicosia, 154 from Magosa, 122 from Kyrenia, 64 from İskele and 52 from Güzelyurt.

2.2. Data collection tool

When the literature related to Technology and Design Courses was overviewed, at the beginning of developing the scale, a 78-item pool was formed and then similar items with the same meaning and the items not related to the research question were omitted. The items to be associated and the ones to be separated were rearranged according to expert opinions and a 51-item draft was formed to be implemented in priority. While referring to expert opinions, the same items were assessed twice at 15 days intervals and the agreed items were decided to be put in the first implementation.

The scale was a five-point Likert type scale, with no negative items. The participants' responses were collected in parallel to the values of answers and calculated. As the points went up in the scale, the sufficiency of technology and design courses increased and their self-efficacy decreased as points dropped.

According to Comrey & Lee (1992), a group of 200 individuals is enough to obtain reliable results in a pilot study. With respect to this assumption, from the data collected from 220 participants, a scale with 8 factors and 51 items was formed. Prior to the first application, expert views were referred to as the last step to lessen the number and the amount of the factors of items with similarities in terms of measuring the least number of items and the highest features. For scope validity, exploratory and confirmatory factor analyses were done through structure validity of the scale provided by nine experts in the field.

The validity and reliability calculations of the scale were done through SPSS23 package program. After the first application of the self-efficacy scale prepared in the light of nine experts and three linguists, it was finally applied with 515 seventh grade students in State secondary schools in Northern Cyprus. Over 0.70 value of Cronbach's Alpha coefficient, as pointed out in a study by Reynaldo & Santos (1999), is a valid reliability coefficient. The Cronbach's Alpha value of this scale was found as 0.93, which indicates a high-reliability level.

Five hundred twenty-eight scales out of 650 self-efficacy scales, distributed among the participants, were returned. The distribution of 515 scales subject to evaluation, was as; 197 from Nicosia, 129 from Magosa, 108 from Kyrenia, 42 from İskele and 39 from Güzelyurt. The scale was finalised to be used in the 2016–2017 academic year.

3. Results

3.1. Exploratory factor analysis (EFA)

The EFA results in a factor structure through the free distribution of the relations among variables (Stevens, 2009; Tabachnick & Fidell, 2013). The first aspect of EFA is the number of participants. According to Cattell (1979), 3–6 times of the number of items in the scale is assumed, as sufficient or at least 200 participants are needed. If reached, 500 participants are a better source for the aim. Kline (1994) stated that from the analysis of a study with 200 participants reliable results could be obtained. Comrey & Lee (1992), on the other hand, emphasised that 300 participants would be reasonable and 500 would be the ideal number. In this respect, the 515 participants in this research were sufficient for the application of the Factor Analysis.

In order to measure the validity of the Self-efficacy Scale, the Exploratory Factor Analysis and the Confirmatory Factor Analysis were used. There are several methods to measure the structure validity of a scale. The Factor Analysis is used to measure structure validity. The scale is assumed as valid if it measures some dimensions of a quality (Aslanargun, Kilic & Eris, 2013; Buyukozturk Sekercioglu & Cokluk, 2016).

Table 1. KMO and Bartlett's tests

Kaiser–Meyer–Olkin Measure of Sampling Adequacy.	0.935
Bartlett's Test of Sphericity Approx. Chi-Square	6,401.599
Df	703
Sig.	0.000

In order to apply EFA, the Kaiser–Meyer–Olkin test is one of the measures for the data. Field (2013) stated that in the case when the KMO value is around 1, the correlation values in the scale consisted of high-reliability factors and a KMO value above 0.90 was an ideal level. The result of the analysis in this research was 0.935, which indicates the suitability of the size of sampling for factor analysis. When Bartlett's global test results are examined, the Chi-square value obtained is significant (6,401, 599; $p < 0.01$). Can (2014) states that Bartlett's global p-value below 0.05 is reasonable.

The calculation of the basic components analysis on the scale and factors were excluded and by applying the varimax rotation technique and the results were limited in line with the expected factor numbers. In the varimax rotation technique, in obtaining a simple factor structure and meaningful factor distributions, rotation can be done to provide the least variable and the highest factor variances (Tavsancil, 2014). When developing a Factor Scale, it is stated that in forming factor loads, loads between 0.30 and 0.40 can be used as the sub-cutting points (Gurbuzturk & Sad, 2010; Stevens, 1996).

According to the distribution of items, factor loads and the significance levels in factors, 13 items were excluded from the scale. The seven-dimension scale with 38 items was responding to EFA and its distinguishing features. The basic 38 items in the factor analysis had a 50.65% contribution to the total variance of seven components with self-value over 1. The distribution level of the total variances in terms of factors is as; the first factor 8.422%, the second factor 8.188%, the third factor 7.573%, the fourth factor 7.149%, the fifth factor 7.029%, the sixth factor 7.016% and the seventh factor 5.278%. When these seven variables are considered in terms of their distribution to the total variance, it can be observed that they have a significant contribution to the variance. In this respect, it was decided that the analysis was done in seven factors.

Table 2. The factor analysis results of total variance reached

Component	Initial eigen values			Extraction sum of squared loadings			Rotation sum of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	10.701	28.160	28.160	10.701	28.160	28.160	3.200	8.422	8.422
2	2.129	5.602	33.762	2.129	5.602	33.762	3.111	8.188	16.610
3	1.154	4.054	37.817	1.541	4.054	37.817	2.878	7.573	24.183
4	1.381	3.635	41.451	1.381	3.635	41.451	2.717	7.149	31.332
5	1.222	3.215	44.666	1.222	3.215	44.666	2.671	7.029	38.361
6	1.170	3.079	47.745	1.170	3.079	47.745	2.666	7.016	45.377
7	1.106	2.909	50.655	1.106	2.909	50.655	2.005	5.278	50.655
8	0.958	2.658	53.313						
9	0.953	2.509	55.821						
10	0.908	2.390	58.211						
11	0.871	2.293	60.504						
12	0.860	2.264	62.768						
13	0.808	2.127	64.895						
14	0.777	2.044	66.939						
15	0.753	1.981	68.920						
16	0.731	1.923	70.843						
17	0.691	1.818	72.661						
18	0.670	1.763	74.424						
19	0.651	1.714	76.138						
20	0.639	1.681	77.819						
21	0.627	1.651	79.470						
22	0.599	1.576	81.046						
23	0.587	1.544	82.590						
24	0.550	1.446	84.036						
25	0.518	1.364	85.400						
26	0.510	1.341	86.742						
27	0.505	1.328	88.070						
28	0.498	1.311	89.381						
29	0.477	1.256	90.637						
30	0.463	1.218	91.855						
31	0.451	1.187	93.043						
32	0.434	1.141	94.184						

33	0.419	1.103	95.287
34	0.408	1.073	96.360
35	0.399	1.051	97.411
36	0.347	0.913	98.323
37	0.330	0.867	99.191
38	0.308	0.809	100.000

Table 3. Rotated component matrix

	Rotated factors	**1**	**2**	**3**	**4**	**5**	**6**	**7**
m37	I can develop projects in saving energy	0.623						
m39	I can invent a new product in the workshop	0.591						
m40	I can write instruction for use	0.588						
m41	I can apply the project plans in other lessons	0.580						
m38	I can design products for the handicapped	0.574						
m10	I can develop product by myself independently	0.459						
m36	I can recycle waste material	0.410						
m15	I can implement safety conditions in workshops		0.719					
m16	I can use the apparatus provided in workshops		0.705					
m18	I can search the internet for designing.		0.604					
m14	I can fix a product through instructions		0.591					
m13	I can develop my manual skills		0.503					
m9	I can take responsibilities in Project Development Team		0.471					
m51	I can comment positively on products developed by my friends			0.653				
m50	I can criticize my weakness and strengths in T D Courses			0.603				
m49	I can renew the product in the light of criticisms			0.581				
m47	I find myself sufficient in designing a product			0.578				
m48	I can do self-criticisms about my own designs			0.554				
m45	I can evaluate a product according to its features			0.497				
m21	I can distinguish width–length–depth in figure				0.681			
m20	I can distinguish geometric figures in objects				0.632			
m22	I can distinguish the declination of a geometric figure from others				0.603			
m19	I can distinguish the measurements of objects				0.596			
m23	I can distinguish figure-ground				0.519			
m26	I can analyse problems I face					0.665		
m25	I can do needs analysis for a new project					0.651		
m27	I can design steps in production					0.591		
m24	I can see objects from different angles					0.466		
m34	I can compare different areas to use a product					0.411		
m33	I can relate my learning outcomes to Technology and Design Courses					0.366		
m5	I can design on the computer						0.705	
m6	I can replace an object on the plane coordinate						0.681	
m12	I can do an animated presentation of my project						0.648	
m46	I can do a product according to its ergonomic use features						0.512	
m42	I can design mobile mechanical tools						0.494	
m1	I can explain line element, one of designing elements							0.642
m2	I can explain designing principles in project making							0.630
m3	I can explain the technical drawing of a certain project							0.501

Factor Extracting Method: Analysis of Basic Components
Rotation Method: Varimax

A 0.3 factor load of a variable indicates that the variance explained by the factor is 9%. A variance at this level is notable and in general, regardless to its sign, 0.60 and above high load value; 0.30–0.59 load value can be defined as average sizes and are considered in value extractions (Buyukozturk, 2017). A variance between 40%–60% and factor load not below 0.30 are sufficient in the use of scale items in terms of behavioural sciences (Lau & Woods, 2009; Namlu & Odabasi, 2007; Tavsancil, 2014). In another resource, an item factor load around 0.32 in general was assumed as sufficient (Tabachnick & Fidell, 2013). In general, applications, items remaining between 0.20 and 0.30 can be on the scale if necessary, but items below 0.20 can be excluded from the scale. In this research, the sub-limit point was set as 0.35while doing factor analysis. According to the calculations, some items were excluded from the scale. The reason for excluding 13 items from the scale was as; the factor loads of 4-7-11-17-28-29-31-43 were below 0.35 and they dropped the total reverse variance value. Items 30-44-8-32-35 showed weight in the double factor and because their distinguishing feature in factor distribution was low and they negatively affected the reverse variance they were excluded from the scale. As Buyukozturk (2017) pointed out, in cases when an item related to more than one factor has a high level of relation with any factor, it should be classified under that factor which exhibits a higher level of relation. At the end of the application, a self-efficacy scale with 7 factors and 38 items with a total variance value of 50.65% was developed.

When the distinguishing features of the scale items were examined, the item-total correlation value calculated for 38 items was noted between 0.384 and 0.626. Buyukozturk (2017) emphasises that the items with 0.30 and above item-total correlation have quite a high level of distinguishing feature.

The factors were explained as; the item loads in the first factor differ between 0.410 and 0.623. The items were named as the 'synthesis-dimension' because they are the students' opinion related to the emergence of a new product or an idea. The second factor was named as 'basic application' dimension because item loads differ between 0.471 and 0.719 and are related to the basic application in lessons. In the third factor, the item-loads differ between 0.497 and 0.653 and are named as 'evaluation' dimension because it includes students' opinions about behavioural expressions of themselves, the product and the environment. The fourth factor is named as 'formative analysis' dimension and the item-loads differ between 0.519 and 0.681 and are opinion expressions that include simple formative distinctions. The fifth factor is named as 'further analysis' dimension and the item-loads differ between 0.366 and 0.665 and are opinion expressions that include detailed analysis statements. The sixth factor is named as 'further application' dimension and the item-loads differ between 0.494 and 0.705 are opinion expressions more detailed issues rather than the use of simple tools. The seventh factor is named as 'comprehension' dimension and the item-loads differ between 0.501 and 0.642 and includes opinion expressions of comprehending lesson contents. Figure 1 shows scale factors or dimensions;

As shown in Figure 1, there are seven-point factors because every gap between the two ends refers to one factor. After the seventh factor, the incline becomes an even plateau. In the scale, the least factor and the most variable were tried to be explained. Therefore, the variances up to the seventh factor have a high level of contribution to the explained variances. The contribution of the further factors to the variances is low; therefore, the diagram turns into a plateau. Thus, the number of factors of the scale is 7.

A 'gapped scale' was used in this research and the participants' self-efficacy levels were determined according to the maximum and minimum points scored. The calculation of space values of the Likert-type scale with equally gapped choices (5-1 = 4, 4/5 = 0.80), every gap value was 0.80. Table 4 shows the participants' average gapped points;

Table 4. The score table of gapped-Likert type scale

Gap between points	Choices
1.00–1.79	Strongly disagree
1.80–2.59	Disagree
2.60–3.39	Partly agree
3.40–4.19	Agree
4.20–5.00	Strongly agree

The average points in every sub-dimension, standard deviations, minimum and maximum values in explaining participants' self-efficacy levels are presented in Table 5.

The material-point values of scale factors at the end of the exploratory analysis are as shown in Table 5. The minimum value of every item is 1 and the maximum is 5.

Table 5. The sub-dimensions of technology and design courses self-efficacy scale

	N	Max. score	Min. score	Mean	SD
1. Synthesis	515	7	35	2.96	1.30
2. Basic application	515	6	30	3.18	1.36
3. Evaluation	515	6	30	3.12	1.29
4. Formal analysis	515	5	25	2.78	1.30
5. Further analysis	515	6	30	2.95	1.27
6. Advanced application	515	5	25	2.42	1.24
7. Comprehension	515	3	15	2.68	1.30

The arithmetical average of the sub-dimensions of synthesis, basic application, evaluation, formal analysis, further analysis, advanced application and comprehension in Technology and Design self-efficacy is between 2.60 and 3.39. The further application dimension has a score of 2.42, which is below arithmetical average and average points. This indicates that student self-efficacy level in Technology and Design Courses is at an average level.

3.2. Confirmatory factor analysis

The confirmatory factor analysis of the self-efficacy scale of Technology and Design Courses, done in the AMOS package program, is shown in Figure 2;

Figure 2 presents the dimensions scale items are related to and the connections among these dimensions. In order to explain the values related to CFA more clearly, the values are shown in Table 6.

The Confirmatory Factor Analysis is used to confirm the suitability of the measurement model after EFA (Exploratory Factor Analysis) to the data (Stevens, 2009; Tabachnick & Fidell, 2013). That is to say, the CFA was applied to confirm the factor structure of the self-efficacy scale.

Table 6. The harmony fitness and the complete and acceptable criterion used in confirmatory factor analysis

Suitability index	Complete suitability criterion	Acceptable suitability criterion	Scale values
X^2/sd	$0 \leq X^2/sd \leq 0$	$2 \leq X^2/sd \leq 3$	1.8
AGFI	0.90 ≤ AGFI ≤ 1.00	0.85 ≤ AGFI ≤ 0.90	0.878
GFI	0.95 ≤ GFI ≤ 1.00	0.90 ≤ GFI ≤ 0.95	0.894
CFI	0.95 ≤ CFI ≤ 1.00	0.90 ≤ CFI ≤ 0.95	0.912
NFI	0.95 ≤ NFI ≤ 1.00	0.90 ≤ NFI ≤ 0.95	0.824
(NNFI) TLI	0.95≤(NNFI)TLI ≤ 1.00	0.90≤(NNFI)TLI ≤ 0.95	0.904
RFI	0.95 ≤ RFI ≤ 1.00	0.90 ≤ RFI ≤ 0.95	0.807
IFI	0.95 ≤ IFI ≤ 1.00	0.90 ≤ IFI ≤ 0.95	0.913

RMSEA	0.00 ≤ RMSEA ≤ .05	0.05 ≤ RMSEA ≤ 0.08	0.039
SRMR	0.00 ≤ SRMR ≤ .05	0.05 ≤ SRMR ≤ 0.10	0.077
PNFI	0.95 ≤ PNFI ≤ 1.00	0.50 ≤ PNFI ≤ 0.95	0.754
PGFI	0.95 ≤ PGFI ≤ 1.00	0.50 ≤ PGFI ≤ 0.95	0.777

It is suggested that X^2, RMSEA, CFI, GFI, NFI, SRMR and NNFI values in Scientific researches are reported (Ilhan & Cetin, 2014). It has been noted that in the result of CFA, the variables possess acceptable harmony fitness values. At the end of CFA, the rate of scale to chi-square degree of freedom was found as CMIN/DF = 1.8. In general, this value is expected to be below 3. The fact that RMSEA was smaller than 0.05 is the indication of minimum errors among the produced matrixes and a close perfect harmony (Engel, Moosbrgger & Müller, 2003). The root mean square error was calculated as RMSEA = 0.039, the equivalent of not normed fitness index in Amos program Tucker-Lewis index (TLI) value was calculated as 0.90 and the comparative fitness index was calculated as CFI = 0.912. The goodness of fit index (GFI) is at 0.894 level and it is very close to threshold value 0.90. It can be said that the corrected goodness of fitness index (AGFI) is at 0.878 level. Being very close to zero, the standardized RMR (SRMR) value indicates a perfect fitness. Engel, Moosbrugger and Muller (2003) state that a value between 0.05 and 0.10 is among the acceptable values. At the end of the analysis, the calculated 0.077 SRMR value is an indication of a good fitness.

4. Discussion and conclusion

The data collected from this research were calculated statistically and a valid and reliable Technology and Design Course self-efficacy scale was reached. The scale is composed of seven sub-dimensions. With this scale, the students' self-efficacy, the conceptual basis of the course, applications related to the course, analysing, evaluating and synthesis can be assessed.

As can be observed in the literature, there are not any other studies done to explain students' self-efficacy conceptions of Technology and Design Courses. Therefore, this study has a crucial importance in responding to the lack of studies. When this study is compared with some self-efficacy scales in recent disciplines, the 'material design and self-efficacy scale' developed by Bakac and Ozen (2016) 0.92 is composed of Cronbach alpha reliability coefficient and a three-factor structure with 25 items. As with the CFA values of the scale, the model also fitted well. The 'self-efficacy scale related to educational technology standards' 0.95 developed by Simsek & Yazar (2016) is composed of Cronbach Alpha reliability coefficient, five dimensions and 40 items. The CFA values of the scale are within reasonable limits. The related dimension of self-efficacy with the 'strategical scale related to learning', developed by Pintrich and De Groot (1990) is 0.89 consisting of 9 items and Cronbach Alpha.

The scale developed in this research 0.93 includes Cronbach Alpha coefficient, 7 dimensions and 38 items. It is hoped that it provides students with details on their perception of self-efficacy in Technology and design. While preparing the scales by Bakac and Ozen (2016) to respond to university students, the study by Pintrich & De Groot was applied similarly to our research to the seventh-grade secondary school students. Among the scales mentioned above, only this research dealt with specifying in detail the perceptions of self-efficacy in Technology and Designing Courses. This scale has a mission more than saying, 'I agree'. It will contribute to designing a teaching programme for technology and design courses responding to students' personal characteristics. Cervone (1989) proved that self-efficacy judgements are mediators in behavioural impacts. In this respect, specifications related to skills will present evidence for the self-efficacy in Technology and Designing courses. Nordlof, Hallstrom and Host (2017) stated that self-efficacy emerges from three factors; experience, education and interest. This finding will enable the involved to measure the self-efficacy sufficiency, which will interpret students' self-efficacy experiences.

5. Recommendation

We suggest that researchers carry out studies to develop this scale to be used for sufficiency measurement in the seventh- and eighth-year students. It is also suggested that studies are done in teachers', taking Technology and Designing Courses, effectiveness and specify common sufficiency's among different disciplines to measure them.

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