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Research Article

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A Scale Development Study: Validity and Reliability of the Educational Skills Scale

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Abstract

The purpose of this study is to develop a valid and reliable measurement instrument towards the educational skills of instructors. This is a methodological study. The sample of the study consisted of 380 instructors who were employed at a university. During the scale development process, an item pool was created by reviewing the literature, content and construct validity and item reliability analyses were carried out. The data were collected by using a Personal Information Form and the Educational Skills Scale Draft Form. In the study, the item pool consisting of 86 items was rearranged in line with expert opinions and according to the results of preliminary implementation. For the Educational Skills Draft Scale with 58 items remaining, the Kaiser-Meyer-Olkin coefficient was 0.89 and the adequacy of the sample size was confirmed. According to the Bartlett's test results ($p<0.05$) there was correlation among the items. As a result of the exploratory factor analysis, factors as planning, implementation and assessment were obtained. The three factors of the scale were found to explain 42.32% of the total variance. The first factor explained 28.47%, the second factor explained 7.81%, and the third factor explained 6.02% of the total variance. The Confirmatory Factor Analysis (CFA) showed that the factorial structure revealed by Exploratory Factor Analysis (EFA) was confirmed, and the factor loads varied between 0.44 and 0.79. For the 5-point Likert-type Educational Skills Draft Scale with 38 items after analyses, the Cronbach's Alpha value was found 0.93. The Cronbach's alpha values of three factors were 0.88 for the planning dimension, 0.84 for the implementation dimension and 0.87 for the assessment dimension. It was concluded that the scale that was developed is a valid and reliable measurement instrument in determining educational skills.

Key Words

Educational skills instructor • Reliability • Scale • Validity

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With the programs they offer, universities are autonomous, qualified and free higher education units that provide the society with human capital with international qualities, can conduct research-development and innovation on an international scale, produce scientific knowledge and technology, publish on an international level and provide supervision support (Aktan, 2007; Aslantaş, 2011; Bergan & Damain, 2010; Eurydice, 2017; Telli Yamamoto, 2018). Universities are institutions that take part in scientific research and development work, direct the field of education-instruction, plan, implement and assess instruction, provide profession-related knowledge and skills and offer services towards the needs of the society (Aslantaş, 2011; Chan et al., 2014; Ergün, 2001; Telli Yamamoto, 2018).

For universities to be able to provide the aforementioned services there is a need for instructors who are qualified in their field. Instructors, who have an important place in achievement of making universities functional, constitute quantitatively and qualitatively competent labor force that may provide the university with the quality of being a thinking, researching and producing institution (Aslantaş, 2011; Esen & Esen, 2015). Instructors working at universities have three main duties as education-instruction, research and service (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2009). Among these three important responsibilities, while scientific research is seen as the most important task, the education-instruction duty is usually overlooked. While assessing instructors, the quality and quantity of their scientific research are prioritized, whereas assessment about their education-instruction skills is neglected (Başbuğ & Ünsal, 2012; Ergün, 200; Esen & Esen, 2015; Kalaycı, 2009). Moreover, it is clear that the competent educational skills of instructors, in addition to their scientific capacity, will be effective in improvement of the quality of educational institutes (Ergün, 2003; Sökmen, 2001; Vatansever & Durak, 2007). Additionally, it is also important for the instructor to have a set of skills such as understanding the learners, being able to create interest, effective communication, being able to determine methods based on the level of the learner, impartiality and being patient and democratic. It should be kept in mind that the instructor has the identity of both a scientist and an educator (Aslantaş, 2011; Erginer & Dursun, 2005).

The educator role of an instructor consists of several components (Jackson, 2006; Vatansever & Durak, 2007). Educational skills have an important place among these components. Functions of instructors towards their educational skills are expressed to include sufficient field knowledge, ability to effectively communicate to learners, classroom management, effective planning of instruction activities, utilization of instruction technologies, effective usage of instruction methods and techniques, objective assessment of education and having a democratic approach (Aslantaş, 2011; Davis et al., 2005; Esen & Esen 2015; Ulupınar, 1998; Vatansever & Durak, 2007). New approaches, changes and technological developments that are adopted in the field of education reveal the importance of educational skills for training the labor force that is needed by today's society (Bayık, 2001; Davis et al., 2005). This is why it is important to determine and develop the skills of instructors towards their educational capacities. Through the education in master's and doctoral degrees, it is aimed to train instructors that facilitate production, development and prevalence of knowledge (Ağıralioğlu, 2013; Karadağ & Özdemir, 2017; Matas, 2012).

Capacities that are aimed to be provided in postgraduate trainings may be listed to include field-specific knowledge, scientific research skills, critical thinking, instruction skills and measurement and assessment (Bergan & Domain, 2010; Djelic, 2008; Erdem, 2015). Higher education institutions that have education-

instruction teams that are on an adequate level in terms of quality and quantity may train the labor force that can think, inquire and produce (Aslantaş, 2011). While the literature review revealed measurement instruments that measure the performance of instructors towards education and instruction, no measurement instruments that directly measured educational skills were encountered. The study was carried out with the purpose of developing a valid and reliable measurement tool towards the educational skills of instructors to meet this necessity.

Method

Research Model

This study which aims to develop an educational skills scale is a methodological type (Bayram, 2017; DeVellis, 2014; Özdamar, 2016).

Study Group

The population of the study consisted of all instructors of a university (1823 instructors). In scale validity and reliability studies, it is stated that reaching people 3-10 times as many as the number of items in the scale is sufficient (DeVellis, 2014; Özdamar, 2016). The draft scale on educational skills consists of 58 items. 380 instructors (6.5 times the number of items) who agreed to participate constituted the study group of the study. The the study group size in the study was deemed to be sufficient for factor analysis (Tabachnick & Fidell, 2001).

Table 1 shows the sociodemographic characteristics of the participants. Accordingly, the mean age of the participants was 36.8, 50.5% were female, 69% had doctoral degrees and 31.3% had the title of assistant professor. The mean amount of professional experience for the instructors was 9.21 years (Table 1).

Table 1

Demographic Characteristics of Instructors

Demographic Characteristics	**n**	**%**
Age		
20-29 age	78	20.5
30-39 age	184	48.4
40-49 age	72	18.9
50-59 age	35	9.2
60 and older age	11	2.9
The average age: 36.8±9.4 (23 age-70age)		
Gender		
Female	192	50.5
Male	188	49.5
Level of Education		
Bachelaor's Degree	25	6.6
Master's Degree	93	24.4
Doctorate Degree	262	69.0
Academic Title		
Professor	33	8.7
Associate Professor	37	9.7
Assistant Professor	119	31.3
Lecturer	63	16.6
Research Assistant	128	33.7

Academic Experience		
1-3 years	98	25.78
4-10 years	167	43.94
11 years and more	115	30.28
Average experience: 9.21±8.35 (min:1year – max:42 year)		

Measurement Tools

The data were collected by the researchers with a Personal Information Form consisting of nine questions and the Educational Skills Draft Scale between January and May 2018 by making appointments with the instructors. The data of the study were collected by using the Personal Information Form and the Educational Skills Draft Scale.

Information Form

It consisted of five questions (age, gender, level of education, academic title and academic experience) on the demographic characteristics of the participants. The information form was used to show the suitability of the characteristics of the study group for the scale.

Educational Skills Scale

The first form of the prepared draft scale consisted of 80 items. After collecting expert opinions, the number of items was reduced to 58. As a result of completion of validity and reliability analyses, the Educational Skills Scale took its final form consisting of 38 items and 3 factors. The Educational Skills scale contains activities related to the planning, implementation and assessment stages of the education-instruction process. Each item in the 5-point Likert-type scale is scored as 1-5 points: 1- Never, 2- Rarely, 3- Sometimes, 4- Often, 5- Always. As the score of the scale increases, it is concluded that the frequency of realization of educational skills also increases.

Data Analysis

The data were analyzed by an expert in statistics by using the AMOS and SPSS software. The content validity of the scale was determined by testing the expert opinions content validity index. Kaiser-Meyer-Olkin (KMO) test and Bartlett's Sphericity test were used to determine the suitability of the data and the adequacy of the sample size, Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were used to determine the validity, and Cronbach's alpha reliability coefficient, Spearman-Brown and Guttmann Split-Half analyses were used to test the reliability of the scale.

Findings

Content Validty

At the first stage, a detailed literature review was carried out to determine the educational skills of the instructors. In this context, studies in this field that were carried out domestically and internationally were examined, and the statements that could be used in the scale were determined. In line with the literature, an item pool towards the educational skills of instructors with 86 statements and 3 factors was created. The draft scale was submitted for expert opinion (20 instructors) for testing scale, language and content validity. The experts were asked to assess each item in terms of language, content and suitability for the factor that is relevant. 4-point

Likert-type scoring (1=not suitable, 2=somewhat suitable, 3=suitable, 4=very suitable) was used in the assessment. Based on the opinions of the experts, the content validity score of each of the 86 statements was determined. The scoring was made by dividing the total number of experts who provided positive responses for each item by the total number of experts minus one. Items with coefficients of 0.80 were removed from the scale, and a 58- item trial form was obtained.

Factor Analysis

Assessment of the suitability of the data for factor analysis: Before conducting factor analysis, to determine the suitability of the data, Measure of Sampling Adequacy (Kaiser-Meyer-Olkin, KMO) and Bartlett's Sphericity test, which shows the correlation of items to each other, were carried out. The KMO value was found as 0.891. KMO showed that the sample size was "good" for factor analysis (Özdamar, 2016). The result of the Bartlett's test was found significant (x^2=6864.251, p=0.000) (Tabachnick & Fidell, 2001).

Determining factorial design: Factor analysis was carried out with the purpose of revealing the construct validity of the scale and being able to determine the factor loads of the items and present dimensions. To determine the factors of the scale, an Exploratory Factor Analysis (EFA) was carried out by conducting principal components analysis with varimax rotation. The factor load in the analysis was set as 0.40 as the minimum (Büyüköztürk, 2006).

As a result of the EFA, the scale was found to have 8 factors with eigenvalues of larger than 1. These 8 factors explained 60.69% of the total variance. 20 items which were not loaded on any factor and had factor loads of under 0.40 were removed from the analyses. The EFA was repeated by limiting the number of factors to the three dimensions that were determined at the design stage and by considering the literature. The three factors of the scale were found to explain 42.32% of the total variance. The first factor explained 28.47%, the second factor explained 7.81%, and the third factor explained 6.02% of the total variance. According to the results of the analysis, all items were in the planned dimensions (Table 2).

Confirmatory Factor Analysis: It was determined that the item-dimension relationship obtained with EFA and the distribution of the items that were formed at the draft stage of the scale were consistent. The dimensions that were obtained as a result of the analysis were named as "planning", "implementation" and "assessment" in suitability with the planning stage of the study. At this stage of the study, the suitability of the 3-factor structure that emerged as a result of EFA was tested. The Confirmatory Factor Analysis (CFA) showed that the factorial structure revealed by EFA was confirmed, and the factor loads varied between 0.44 and 0.79 (Table 3). Since our aim was to determine the frequency of displaying educational skills, no reverse item was used in the scale (DeVellis, 2014; Özdamar, 2016).

Table 2

Item Size Relationship EFA Analysis Results and Factor Loads Obtained as a Result of CFA

Lower Dimensions	Scale Items	EFA Analysis Results		Factor Loads Obtained by CFA	
		Factor Load	Explained Variance	Factor Load	t Value
Planning	Item 1	.587	%28.47	.553	7.898
	Item 2	.694		.627	8.529
	Item 3	.487		.509	7.550
	Item 4	.742		.781	9.094
	Item 5	.759		.797	9.176
	Item 6	.640		.634	8.340
	Item 7	.607		.609	8.394
	Item 8	.451		.536	7.820
	Item 9	.566		.602	8.535
	Item 10	.536		.564	8.266
	Item 11	.498		.518	10.475
	Item 12	.513		.502	10.151
Implementation	Item 13	.616	%7.81	.504	7.498
	Item 14	.510		.482	7.171
	Item 15	.682		.595	8.195
	Item 16	.737		.676	8.917
	Item 17	.700		.721	9.091
	Item 18	.661		.675	8.738
	Item 19	.447		.525	7.480
	Item 20	.451		.465	6.882
	Item 21	.475		.596	7.945
	Item 22	.483		.541	7.612
	Item 23	.486		.528	7.467
Assessment	Item 24	.439	%6.02	.644	13.093
	Item 25	.493		.668	13.581
	Item 26	.503		.627	10.717
	Item 27	.531		.492	8.331
	Item 28	.479		.579	9.453
	Item 29	.450		.571	9.409
	Item 30	.548		.472	7.911
	Item 31	.443		.590	9.897
	Item 32	.544		.620	10.175
	Item 33	.509		.465	7.892
	Item 34	.525		.557	9.147
	Item 35	.647		.528	8.737
	Item 36	.573		.442	7.357
	Item 37	.641		.509	8.423
	Item 38	.698		.589	9.535

Figure 1

Confirmatory Factor Analysis Model

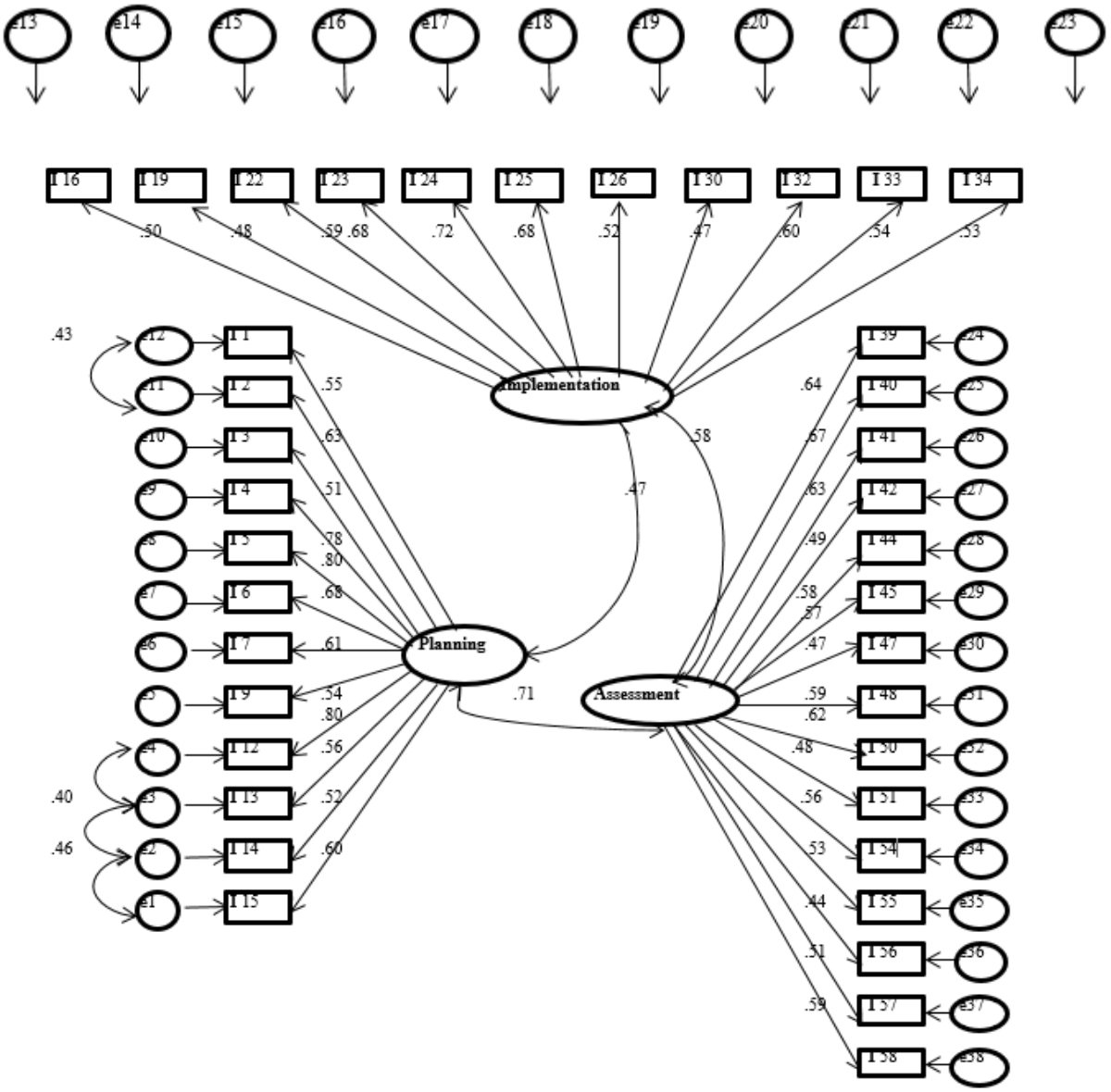

Figure 1 shows the model that was obtained by CFA. Considering the goodness of fit values for Figure 1, the result of $x^2/sd = 2.83$ ($3 \leq$ acceptable ≤ 5, good fit ≤ 3) was obtained. The Root Mean Square Error of Approximation (RMSEA) value was 0.07, while the Root Mean Square Residual (RMR) was found as 0.06 ($0.05\leq$ acceptable ≤ 0.08, good fit ≥ 0.08). It is understood that the model adapts to the desired level (Özdamar, 2016). The model has not been modified.

Reliability

Table 4 shows the correlation coefficients regarding the total scale and its dimensions based on their reliability analyses and those among the factors. The Cronbach's alpha coefficients were 0.88 for the planning dimension, 0.84 for the implementation dimension and 0.87 for the assessment dimension. For the total scale, the Cronbach's alpha internal consistency coefficient was 0.93, Spearman-Brown coefficient was 0.81, and

Guttmann Split-Half coefficient was 0.80. The relationship between the scale and dimensions also examined in the analyses that were carried out. As a result of the analysis, the factors were found to have a positive and significant relationship with each other. Additionally, the item-total correlation value of each item was 0.30 or higher (Table 4).

Table 4

Alpha Coefficients and Correlations of the Scales

	Planning	Implementation	Assessment
Planning (.879)	-	.493**	.611**
Implementation (.840)	.493**	-	.528**
Assessment (.874)	.611**	.528**	-
Educational Skills Scale (.927)	.840**	.734**	.908**

Discussion

In this study, it was aimed to develop a measurement instrument whose validity and reliability in measuring the educational skills that are used by instructions at universities while they are conducting their instruction activities. It is believed that the educational skills scale that was developed will help instructions gain awareness on their educational skills and know about their shortcomings or aspects that could be improved. While the scale provides instructions with the opportunity to decide upon what type of development and transformation they could achieve in line with their needs on an individual level, it will also provide opportunities towards organizing activities towards educational skills on an institutional level.

Among the characteristics of an instructor related to education-instruction, it is stated that personality structure, professional qualification, skills of effective communication with learners, classroom management, measurement, assessment, field-specific competency, effective presentation skills and being accessible and reliable are important issues (Brechelmacheret al., 2015; Helterbran, 2008; Özdemir & Üzel, 2010; Ulupınar, 1998; Wood & Su, 2017). Studies that were carried out with students (Aslantaş, 2011; Özçakır & Sümen Kesten, 2014) reported that instructors did not use instruction strategies and methods to a sufficient extent, and they were not competent in measurement and assessment. Considering the expectations of students, in terms of self-awareness of instructions and their acts accordingly, it is believed that the scale could be a suitable assessment instrument. Studies have stated that one of the most important performance dimensions perceived by instructors is facilitation of education-instruction activities (Esen & Esen, 2015), and education-instruction activities should be considered among the performance criteria of instructors (Başbuğ & Ünsal, 2010; Demir & Acar, 2011). Our study is important in terms of providing criteria regarding determination and proof of the aforementioned performance criteria.

While developing the scale, firstly, an item pool consisting of 86 items was created by reviewing the relevant literature (Aslantaş, 2011; Brown, 2018; Doğramacı, 2007; Eurydice, 2010; Eurydice, 2017; Kashkan & Egorova, 2015; Marginson, 2016; Telli Yamamoto, 2018; UNESCO, 1998; World Health Organization [WHO], 2016; Higher Education Academic Evaluation and Quality Improvement Commission [YÖDEK], 2007). For content validity, the form was submitted for expert opinion, and the content validity score of each item was calculated. The items that had content validity scores of less than 0.80 were removed. Based on the literature

(DeVellis, 2014; Özdamar, 2016; Tabachnick & Fidell, 2001), it may be stated that the draft scale consisting of the remaining 58 items had content validity.

The results of the Kaiser-Meyer-Olkin (KMO) and Bartlett's Sphericity tests that were conducted to reveal the construct validity of the scale demonstrated that the sample size was "good" in terms of suitability for factor analysis (DeVellis, 2014; Tabachnick & Fidell, 2001). According to the Bartlett's test results, the scale was found to be effective in measuring the planned dimensions of it (George & Mallery, 2001; Özdamar, 2016).

To determine the factors of the scale, an Exploratory Factor Analysis (EFA) was carried out by conducting principal components analysis with varimax rotation. The factor load in the analysis was set as 0.40 as the minimum (Büyüköztürk, 2006; DeVellis, 2014). The number of factors was limited to three by considering the information on the literature and based on the objective of the study, while three factors of the scale were found to explain 42.32% of the total variance. In multi-dimensional scales, the acceptable rate of explained variance is expected to be in the range of 40-60% (Tavşancıl, 2002). The result that was obtained showed that the ratio of explained variance was sufficient.

To test the suitability of the three-factor structure that was revealed as a result of the EFA, Confirmatory Factor Analysis (CFA) was carried out. The CFA showed that the factor loads varied between 0.44 and 0.79. This result showed that the dimensions constructed based on the literature were also confirmed statistically (Bayram, 2017; DeVellis, 2014; Özdamar, 2016). The dimensions that were obtained were named as planning, implementation and assessment in suitability with the first form of the study that was designed. As a result of the analyses, it was determined that the Educational Skills Scale and its dimensions had validity and reliability.

Reliability analysis and item analysis are methods that allow assessment of a scale in terms of its construct, content, structure and its power and capacity in questioning the phenomenonit aims to measure (DeVellis, 2014; Özdamar, 2016). According to the results of the analyses that were carried out to test the reliability of the Educational Skills Scale, the Cronbach's alpha internal consistency coefficient for the total scale was 0.93, while this coefficient was 0.88 for the planning dimension, 0.84 f or the implementation dimension and 0.87 for the assessment dimension. Bayram (2017) stated that it is sufficient to have a reliability coefficient of higher than 0.70. These results showed that the reliability coefficients of the scale and its dimension were high, and the scale is a reliable measurement instrument for educational skills.

Previous studies (Bergan & Domain, 2010; Djelic, 2008) listed the capacities that an instructor should gain while being trained in postgraduate programs as basic field-specific theory-concept knowledge, field-specific implementation, putting theoretical knowledge into practice, scientific research skills, critical thinking and skills related to education-instruction activities. It was emphasized that, in training instructors that are capable in terms of quality and quantity, educational capacities should be provided to instructors by considering current necessities and requirements (Erdem, 2015). It is believed that the scale that was developed here will be beneficial in terms of training education-instruction teams that are capable in terms of quality.

Consequently, as a result of the analyses, the Educational Skills Scale was found to be a valid and reliable measurement instrument. This scale may be used to determine the frequency of instructors to use their educational skills. Self-assessment of instructors regarding their educational skills and their increased awareness will contribute to their self development. In addition to the Educational Skills Scale, it is believed that

development of scales that cover the views of learners and administrator and usage of sources such as portfolios and career plans will contribute to multidimensional assessment of education and instruction activities and increasing the quality of education.

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