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UNIVERSITY STUDENTS' APPROACH TO DISTANCE EDUCATION: SCALE DEVELOPMENT AND VALIDATION[1]

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ABSTRACT

This study aims to develop a valid and reliable measurement tool that can be used to determine university students' approaches to distance education during the Covid-19 pandemic process. For this purpose, a questionnaire study was applied to 1636 students studying at Sivas Cumhuriyet University. Explanatory factor analysis was applied to 1285 of the students and confirmatory factor analysis was applied to 351 of them. According to the results of the analysis, a 17-item, 3-factor structure with factor loading values between 0.653 and 0.842 was determined. The reliability coefficient of the scale was found as 0.941 and the subscales were also found 0.927, 0.864, 0.839 respectively. According to the Confirmatory Factor Analysis results, all fit indices were found to have valid values. As a result, it has been determined that the proposed Distance Education scale is a valid and reliable scale to determine the approaches of university students to distance education.

Keywords: *Scale Development, Distance Education, CFA, Covid-19.*
JEL Codes: *C10, I21, I23.*

1. INTRODUCTION

The novel coronavirus disease (Covid-19) first appeared in the Chinese province of Wuhan in late December 2019. As a result of research on a group of patients who developed respiratory symptoms, a full diagnosis of this virus was made on January 13, 2020. The disease spread from the city of Wuhan to other provinces of the People's Republic of China, and from there it quickly turned into a global epidemic all over the world. The World Health Organization (WHO) designated the outbreak as a public health emergency of international concern on January 30, 2020, and finally declared it a Pandemic on

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March 11, 2020 (WHO, 2021). As of July 2022, there were more than 580 million cases and 6.4 million deaths worldwide due to this disease.

The Covid-19 pandemic can be described as a global disaster that has caused a crisis in many issues due to its potential for widespread transmission, high mortality rate, unpredictability, and unconventional ways of protection. After the declaration of the pandemic by the World Health Organization, it has become necessary to take various measures in many areas around the world. One of these measures is to suspend face-to-face education and to switch to a distance education system at all levels of education and universities. The Covid-19 pandemic has disrupted education worldwide, directly affecting more than 90% of the total student population (UNESCO, 2020). Thus, the distance education system, which is an alternative, has become compulsory. Since such a change has not been experienced so widely in the education system before, it has gained importance to examine students' approaches to distance education.

It is very important to determine alternative ways so that education can continue without interruption in situations that may develop suddenly. In this context, technological developments in the field of information and communication cause significant changes in the field of education as well as in all areas of life. Thus, with computer and internet technologies, systems that can be an alternative to the education system connected to physical space such as school and classroom have been made possible. One of these systems is the distance education system (Tuncer and Taşpınar, 2008).

Distance education can be defined as acquiring knowledge and skills through mediated knowledge and teaching, including technology and infrastructures, and other forms of learning that can be done remotely (Roblyer and Edwards, 2000: 192). It is an organized instructional program in which teachers and learners are physically separated (Newby et al., 2000: 210). While the distance education process provides time and space flexibility for the student in learning, it also provides the teacher with the opportunity to evaluate new materials and use technology actively. In general, distance education is preferred because it allows flexibility according to different bits of intelligence, learning abilities, and behaviors, has high mobility in terms of instructor and learner, provides cost advantage, and can meet the needs of large groups for the product (Sherry, 1996). Although distance education was planned as an education system designed for those who do not have time or financial means to receive formal education, it has been determined that it can also be used for unexpected situations today. Distance education materials and opportunities designed for every stage of education can be counted as the most important contribution of the Covid-19 pandemic process to the whole world. Many companies or institutions have designed different programs or internet interfaces to make distance education courses more efficient and effective. While educators were working on different presentation techniques that could be done on the computer, programmers tried to increase the calibration of the programs used. As a result of all these, an education system that constantly renews itself has emerged. With this process,

distance education, which was thought to be an alternative before, started to be defined as a system that was thought to be sufficient for the future with the help of necessary infrastructure supports.

In this study, it was aimed to develop a valid and reliable scale in this regard by determining the perspectives of university students on the distance education system, their suitability for this system, and their views on the courses conducted with distance education during the Covid-19 pandemic period. The emergency caused by the Covid-19 pandemic required the implementation of alternative teaching strategies to traditional face-to-face lessons in Turkey as well as in the whole world. The Council of Higher Education of Turkey (YÖK) has decided that universities will continue their education with distance education systems as of March 23, 2020 (YÖK, 2020). One and a half years after this decision was taken, it was possible to return to face-to-face education at universities as of September 13, 2021. In this process, the attitudes of university students towards distance education were evaluated in Turkey as in the whole world, and the pros and cons of the system were tried to be determined.

2. SHORT LITERATURE REVIEW

During the Covid-19 pandemic, studies on distance education have been carried out in many countries. The aim here is to determine the perspectives of each country on the distance education system, to monitor the adaptation processes to the system and to determine whether the outputs are successful or not. In China, where the epidemic occurred, necessary variables were investigated to ensure the continuity of education and to combat mental stress caused by quarantine. Researchers concluded that there is a greater need to improve self-discipline and concentration amid distractions such as network speed, noisy environment, and lack of professional equipment during distance education (Sun et al., 2020). Handel et al. (2020) stated in their study that during the pandemic process, two student groups emerged in Germany that differed significantly according to their readiness for digital learning. Significant differences were observed regarding the socio-emotional perceptions of the student groups. Ismaili (2021), investigating the effects of Hungarian students on their satisfaction with distance education and their attitudes towards their education, shows that distance education is still under development and although traditional classrooms seem indispensable, post-Covid-19 pandemic the majority of students have a positive attitude and willingness to attend distance education courses. Giusti et al. (2021) identified the impact of distance education on mental health, social cognition, and memory abilities and predictors of academic performance in university students during the national Covid-19 quarantine in Italy. Di Martino and Strongoli (2021), again in Italy, stated that the technical problems of the students related to the platform used (Microsoft Teams) and connection to the internet network; it was determined that sometimes other family members also face difficulties such as difficulty concentrating, interacting with friends and teachers related to situations where they are involved in smart work or distance learning. Rotas and Cahapay (2020) investigated the difficulties of university students in the Philippines in distance learning and found that many factors were effective. These factors have

been defined as unstable internet connection, insufficient learning resources, power cuts, uncertain learning content, overloaded course activities, limited access to a teacher, poor peer communication, conflict with household responsibilities, poor learning environment, financial problems, physical health problems, and mental health struggles. Hamdan et al. (2021) investigated Jordanian university students' interactions, Internet self-efficacy, self-regulation, and satisfaction with online education during the Covid-19 pandemic. According to the results, they found significant differences in the satisfaction of the students according to the education level, university type, and marital status. Alomyan (2021) emphasized the impact of the sudden transition from face-to-face learning to distance learning on students' psychology and learning in Jordan. More than half of those surveyed by Chung et al. (2020) stated that they do not want to continue online learning in the future if they make a choice and that they have difficulty in understanding the content of the subject and internet connection. Bakhov et al. (2021) conducted a study on the fact that distance education takes place differently in Ukraine. They found that there were several technical problems on the network, such as internet connection, lack of computers or educational materials, and most importantly, the teachers were not prepared for distance learning. Alkan (2020) evaluated the results of 17 different scientific studies on distance education in Turkey. Accordingly, it has been observed that the social lives of the students are negatively affected in the distance education process, and the proportion of participants who want to follow their lessons with distance education and those who do not are equal. The other results emphasized are that the exams made with the distance education system do not increase the competencies and that distance education is not desired under normal conditions.

3. MATHERIALS AND METHOD

Due to the Covid-19 pandemic, all universities in Turkey have conducted a part of the 2019-2020 academic year and the entire 2020-2021 academic year with distance education. In this study, it is aimed to investigate the perspectives and attitudes of university students towards distance education in this process. A survey was conducted on the students, including their preferences between distance education and face-to-face education, and the results were compiled, interpreted, and a scale was developed that can be used to determine the approaches of university students to distance education during the Covid-19 pandemic process.

A distance education survey which has Ethics Committee Approval (and numbered 2021/104-68) consisting of 34 questions was prepared with a 5-point Likert type scale (“I strongly agree” to “I strongly disagree”). The pilot study was applied to 122 students from 3 randomly selected faculties with a simple random sampling method. As a result of the pilot application, 4 questions with low Item-total correlation values were removed from the scale and the main field study was conducted with the remaining 30 questions. 1636 students from all faculties of the university participated in the survey. Explanatory factor analysis was applied to 1285 of the questionnaire data applied to these students, and confirmatory factor

analysis was applied to 351 of them. SPSS.22 and R package programs were used in the analyses, and the confidence level was taken as 0.05 in all statistical analyses.

As of 2021, there are 45,227 students registered at Sivas Cumhuriyet University. 27,597 of them have undergraduate education and study in 17 different faculties. In this study, a questionnaire study was applied to 1,636 students from faculties with a stratified sampling method. 56.2% of the respondents are female students (55.44% in the whole university), 43.8% are male students. 60.5% of the respondents stated that they live in the city center, 23.8% in the district center, and 15.7% in the villages.

First, explanatory factor analysis was applied to the survey data. The varimax method was used as factor rotation in factor analysis. The KMO value used to determine the suitability of the data for factor analysis was 0.957 and the Bartlett sphericity test value was 0.000. An item was retained only when it loaded greater than ± 0.40 on the relevant factor and less than ± 0.40 on the non-relevant factor. Thus, the initial 30 items were reduced to 17 items. As a result of the factor analysis made with 17 questions, 3 factors were determined. The factors obtained and their brief explanations can be given as follows:

1. Tutorialness and effectiveness: Contains items in which students compare the instructional and effectiveness of distance education with face-to-face education.

2. Personal suitability: It includes items that evaluate the student's self-efficacy and personality in distance education.

3. Institutional competence: Contains items that enable the student to evaluate the university's competence in teaching staff, materials, and communication in distance education. (The items of the scale formed by these three factors are given in the appendix).

The variance explanation rate of these 3 factors was found to be 67.169%. The Cronbach's Alpha values obtained from the whole study were calculated as 0.941 and the Cronbach's Alpha values of the sub-factors were calculated as 0.927, 0.864, and 0.839, respectively. Explanatory factor analysis results of the survey questions are given in Table 1. In Table 1, it is seen that the questions have factor loads of at least 0.653 on the appropriate factors.

Tablo 1. Factor Loadings

Item	Tutorialness and effectiveness	Personal suitability	Institutional competence
Factor 1: Tutorialness and effectiveness			
Q 5	0,842		
Q 12	0,789		
Q 10	0,775		
Q 34	0,76		
Q 16	0,72		
Q 3	0,691		
Q 6	0,663		

Factor 2: Personal suitability			
Q 19		0,725	
Q 11		0,674	
Q 17		0,671	
Q 9		0,666	
Q 15		0,653	
Factor 3: Institutional competence			
Q 33			0,745
Q 18			0,728
Q 13			0,716
Q 23			0,685
Q 4			0,683
Eigen Value	8,766	1,588	1,065
% of Variance	51,567	9,34	6,263
Cronbach α	0,927	0,864	0,839
		0,941	

Table 2 gives the inter-correlation matrix of three factors. All factors' correlation results are significant under 0.01 significance level.

Table 2. Inter-Correlation Matrix of Determining Factors

	Tutorialness and effectiveness	**Personal suitability**	**Institutional competence**
Tutorialness and effectiveness	-		
Personal suitability	0,744**	-	
Institutional competence	0,590**	0,635**	-

**p<0.01

In Table 3, the average total scores and standard deviation values given by the students for the entire questionnaire and the three subscales are given.

Table 3. Descriptive Statistics of Determining Factors

Subscale	**Items**	**Possible / Actual Range**	**Mean**	**s.d.**
Tutorialness and effectiveness	7	7-35 / 7-35	23,9227	8,193
Personal suitability	5	5-25 / 5-25	13,7886	5,447
Institutional competence	5	5-25 / 5-25	14,6105	4,803
Scale	17	17-85 / 17-85	52,3217	16,308

It is seen that the students got the highest scores on the Tutorialness and effectiveness scale (average 3,417 per item). This is followed by Institutional competence (average 2,922 per item) and Personal suitability (average 2,757 per item). We can conclude that students care more about the similarities/differences of distance education with face-to-face education within the scope of instructional and effectiveness than the suitability of this system for their personal characteristics.

The mean differences and standard deviation values between the three subscales are given in Table 4. Looking at the differences obtained from the three factors, it is seen that the difference between Institutional competence-Personal suitability is the least. It can be said that there are similarities between

the expectations of the students from themselves and their expectations from the educational institution/teachers. When we look at the paired t-test results of the three factors, it is seen that there is a difference between them in terms of the answers given to these three factors.

Table 4. Paired T-Test Results between Factors

Factors	Mean Difference	s.d.	d.f.	t-value
Tutorial and Activity-Personal suitability	0.659	0.811	1284	38.003**
Tutorial and Activity-Institutional competence	0.495	0.983	1284	23.548**
Institutional competence-Personal suitability	0.164	0.883	1284	8.696**

** p<0.01

4. STATISTICAL COMPARISONS

In this subsection, statistical differences between scales and subscales according to some variables were investigated. In Table 5, the scale and subscales were compared according to gender. Accordingly, while there was a statistical difference between male and female students in terms of Tutorialness and effectiveness and Personal suitability factors, there was no statistical difference in terms of Institutional competence factor. In addition, a statistical difference was found according to the whole scale. It can be said that male students have a more positive view of distance education than female students in terms of Tutorialness and effectiveness and Personal suitability factors. Also, it is seen that the students have similar thoughts about the university's adequacy in teaching staff, materials, and communication in distance education.

Table 5. Comparison of Factors by Gender

Subscale	Gender	Mean	s.d.	t-value	Probability
Tutorialness and effectiveness	Female	24,7443	8,084	5,343	0.000
	Male	22,8683	8,217		
Personal suitability	Female	14,0668	5,472	2,708	0,007
	Male	13,4316	5,396		
Institutional competence	Female	14,5888	4,765	0,24	0,811
	Male	14,6385	4,853		
Scale	Female	53,399	16,15	3,51	0.000
	Male	50,938	16,4		

The scale and subscales were compared in terms of monthly income ranges of the students' families (26.8% 0-2000 Turkish Lira (TL), 41.1% 2001-4000 TL, 19.7% 4001-6000 TL, 7.1% 6001-8000 TL, 5%, 4 8001 TL and above), and a statistical difference was found between all of them (p=0.000). ANOVA results and Scheffe test results showing the differences between groups are given in Table 6. It has been observed that students with an income range of 0-2000 TL have a statistically more negative approach to distance education in the distance education scale and its subscales. Similarly,

it can be said that students with families in the 2001-4000 TL income range approach distance education more negatively than the 4001-6000 TL income range.

Table 6. Comparison of Factors by Monthly İncome

	Tutorialness and effectiveness (Mean, s.d.)	Personal suitability (Mean, s.d.)	Institutional competence (Mean, s.d.)	Scale (Mean, s.d.)
(1) 0-2000 TL	24.94 (7.8)	14.63 (5.69)	15.36 (4.89)	54.93 (16.29)
(2) 2001-4000 TL	24.22 (8.27)	14.03 (5.38)	14.71 (4.79)	52.97 (16.2)
(3) 4001-6000 TL	22.67 (8.3)	13.02 (5.08)	13.83 (4.61)	49.54 (15.89)
(4) 6001-8000 TL	23.39 (8.09)	12.29 (5.08)	13.87 (4.66)	49.56 (16.01)
(5) 8001 TL and above	21.77 (8.35)	12.45 (5.49)	13.86 (4.73)	48.09 (16.48)
F (ANOVA)	7.277*	10.962*	8.202*	10,49*
Scheffe	(1)>(3)	(1)>(3)	(1)>(3)	(1)>(3)
	(1)>(5)	(1)>(4)	(1)>(4)	(1)>(4)
	(2)>(3)	(1)>(5)	(1)>(5)	(1)>(5)
		(2)>(3)	(2)>(3)	(2)>(3)
		(2)>(4)		

* p<0.01

The scale and subscales were compared in terms of the places of residence of the students (60.5% city center, 23.8% town center, and 15.7% village/town) and a statistical difference was found between all of the groups (p=0.000). ANOVA results and Scheffe test results showing the differences between groups are given in Table 7. It has been seen that the students living in the city and district centers have statistically lower scores in the distance education scale and sub-scales than the students living in the Village/Town, that is, their view of distance education is more positive. As a result, it can be said that the income status of the families of the students and the place of residence of the students have an impact on their approach to distance education.

Table 7. Comparison of the Factors by the Place of Residence of the Students

	Tutorialness and effectiveness (Mean, s.d.)	Personal suitability (Mean, s.d.)	Institutional competence (Mean, s.d.)	Scale (Mean, s.d.)
(1) City center	23,16 (8,32)	13,25 (5,32)	14,28 (4,75)	50,71 (16,35)
(2) Town center	24,37 (8,07)	14,08 (5,54)	14,54 (4,71)	53,01 (16,03)
(3) Village/town	26,13 (7,41)	15,38 (5,44)	15,93 (4,90)	57,45 (15,41)
F (ANOVA)	19,204*	22,197*	16,311*	24,386*
Scheffe	(3)>(2)>(1)	(3)>(2)>(1)	(3)>(1)	(3)>(2)>(1)
			(3)>(2)	

* p<0.01

5. CONFIRMATORY FACTOR ANALYSIS

To determine the validity of the explanatory factor analysis results, confirmatory factor analysis was applied to the data obtained from 351 students. The confirmatory factor analysis results were evaluated using various fit indices such as the Chi-Square Goodness Test, CFI (Comparative Fit Index), TLI (Tucker-Lewis Index), IFI (Incremental Fit Index) RMSEA (Root Mean Square Error of Approximation), and SRMR (Standardized Root Mean Square Residual). The acceptable fit index for the CFI, IFI, and TLI indices was 0.90, and the perfect fit index was accepted to be 0.95 (Kline 2014; Bentler and Bonett, 1980). 0.08 was the acceptable fit value and 0.05 was the perfect fit value for RMSEA and SRMR (Browne and Cudeck 1993).

The confirmatory factor analysis index values obtained from the study are given in Table 8. IFI, CFI, and TLI were found as perfect fit indices. RMSEA is in acceptable fit and SRMR is in perfect value interval as well. Finally, chi-square has a significant value for confirmatory factor analysis.

Table 8. DFA Goodness of Fit Index Values

Chi-Square	RMSEA	SRMR	CFI	TLI	IFI
0.000	0.054	0.045	0.976	0.971	0.975

6. DISCUSSION

In this study, a valid and reliable measurement tool consisting of 17 items and 3 factors that can be used to determine university students' approaches to distance education during the Covid-19 pandemic was developed. While the highest score that can be obtained from the scale is 85, the lowest score is 17. A low score indicates that the individual to whom the scale is applied has a more positive approach towards distance education.

The Cronbach alpha value of the scale is 0.941, that is, it is seen that the items are consistent with each other. EFA and CFA results also show that the scale is valid and reliable. All fit indices of the model also got excellent values. As a result, it has been determined that the Distance Education scale is a valid and reliable scale to determine the approaches of university students to distance education.

It is thought that there will be important and radical changes in many areas after the pandemic process. In situations that may develop suddenly, such as the Covid-19 pandemic, alternative ways such as distance education should be determined so that education can continue without interruption. The implementation of a hybrid system in the field of education can ensure that the adaptation process takes place quickly in case of future adversities. In this context, it is very important to know the approaches to distance education so that students can easily adapt to different education systems. It will be possible to focus on this issue all over the world and thus, it will be possible to see the deficiencies, inaccuracies,

and differences of the system from the eyes of the students. For this reason, it is recommended that the scale be used to determine the approaches of university students to distance education.

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DISCLOSURE STATEMENT

For this study, "Ethics Committee Approval" was obtained with the decision of Sivas Cumhuriyet University Social and Human Sciences Research and Publication Ethics Committee, dated 01.04.2021 and numbered 2021/104-68.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author, Necati Alp Erilli, upon reasonable request.

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APPENDIX

"University Students' Approach to Distance Education in the Covid-19 Pandemic Process" Scale Questions

Subscale	Question
Tutorialness and effectiveness	I understand and learn the lessons given in distance education more easily than face-to-face education.
	Distance education makes me more active in class
	I prefer distance education to face-to-face education
	I think that the courses in distance education are equivalent to face-to-face education.
	Distance education ensures that learning lessons is permanent.
	I feel more comfortable in distance education classes than in face-to-face education classes.
	Distance education allows me to use my time more efficiently.
Personal suitability	I need the flexibility to attend class whenever and wherever I want.
	I think distance education provides space flexibility and time savings.
	One of the advantages of Distance Education is that it gives the opportunity to repeat continuously.
	I feel more comfortable in distance education exams than in face-to-face education exams.
	The flexible structure of distance education suits my lifestyle
Institutional competence	I think that the course material sharing of the lecturers is sufficient.
	I think that the dominance of the instructors in distance education courses is sufficient.
	During the distance education process, I can easily communicate with our department teachers and assistants.
	I find the information / announcements made by our university during the distance education process sufficient
	In our distance education courses, instructors use new and different materials.

KATKI ORANI / *CONTRIBUTION RATE*	**AÇIKLAMA / *EXPLANATION***	**KATKIDA BULUNANLAR / *CONTRIBUTORS***
Fikir veya Kavram / *Idea or Notion*	Araştırma hipotezini veya fikrini oluşturmak / *Form the research hypothesis or idea*	Prof. (Ph.D.) Necati Alp ERİLLİ
Tasarım / *Design*	Yöntemi, ölçeği ve deseni tasarlamak / *Designing method, scale and pattern*	Asst. Prof. (Ph.D.) Şebnem ZORLUTUNA
Veri Toplama ve İşleme / *Data Collecting and Processing*	Verileri toplamak, düzenlenmek ve raporlamak / *Collecting, organizing and reporting data*	Asst. Prof. (Ph.D.) Şebnem ZORLUTUNA Prof. (Ph.D.) Necati Alp ERİLLİ
Tartışma ve Yorum / *Discussion and Interpretation*	Bulguların değerlendirilmesinde ve sonuçlandırılmasında sorumluluk almak / *Taking responsibility in evaluating and finalizing the findings*	Asst. Prof. (Ph.D.) Şebnem ZORLUTUNA Prof. (Ph.D.) Necati Alp ERİLLİ
Literatür Taraması / *Literature Review*	Çalışma için gerekli literatürü taramak / *Review the literature required for the study*	Asst. Prof. (Ph.D.) Şebnem ZORLUTUNA Prof. (Ph.D.) Necati Alp ERİLLİ

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