Factor Structure, Validity and Reliability of The Teacher Satisfaction Scale (TSS) In Distance-Learning During Covid-19 Crisis: Invariance Across Some Teachers' Characteristics

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Abstract

This study aimed to examine the Factor Structure of the teacher satisfaction scale (TSS) with distance education during the Covid-19 pandemic, as well as affirming the (Factorial Invariance) according to gender variable. It also aimed at identifying the degree of satisfaction according to some demographic variables of the sample. The study population consisted of all teachers in public education and faculty members in higher education in the Kingdom of Saudi Arabia. The (TSS) was applied to a random sample representing the study population consisting of (2399) respondents. The results of the study showed that the scale consists of five main factors, with a reliability value of (0.94). The scale also showed a high degree of construct validity through fit indices of the confirmatory factor analysis. The results have shown a gradual consistency of the measure's invariance that reaches the third level (Scalar-invariance) of the Measurement Invariance across the gender variable. The results also showed that the average response of the study sample on the scale reached (3.74) with a degree of satisfaction, as there are no statistically significant differences between the averages of the study sample responses with respect to the gender variable. While there were statistically significant differences in the averages with respect to the variable of the educational level in favor of the middle school and statistically significant differences in the averages attributed to the years of experience variable in favor of those whose experience is less than (5) years.

Key words:
Factor Structure, Measurement Invariance, Teacher's Satisfaction, E-learning, Distance Learning, Covid-19.

1. Introduction

The Covid-19 pandemic has imposed on Saudi society as part of the global community to develop the educational system in a way that enables the education process to continue without endangering the health system. Distance education was the best option available to the Ministry of Education, and though it was present in some aspects of education before the pandemic, the practice of distance education was forced to develop because it became an essential part of the educational process.

Teachers are the active element in the success of any educational program, so their satisfaction with their work and production is one of the basic elements in achieving their goals. Job satisfaction is one of the most important elements of productivity at work and controls the psychological and skill readiness to perform the work properly. It helps to build social relationships between heads and co-workers. Teachers, in their active role, are the criterion by which the quality of the learning process is determined, resulting in the extent of their satisfaction and the smoothness of modern learning methods that the world has been forced to, and have even become a basis on which all educational institutions depend. One of the requirements for the transition to a distance education environment in order to achieve a high quality of the educational process should be to satisfy teachers' satisfaction, which expresses the mechanism by which the efficiency of the educational process is measured from both the administrative and academic sides, and it expresses the scientific standing obtained by the educational institution or educational program in exchange for meeting the quality standards approved by educational evaluation institutions [1]–[6].

Due to the importance of teacher satisfaction, it was necessary to develop a standardized scale to measure it, so that we could have clear indications about the extent of teacher acceptance and satisfaction with distance education, and to know the obstacles that may face teachers, so that educational institutions can work to overcome these obstacles. This is what prompted the current study to be conducted.

Based on the importance of distance education and its important and fundamental role in the success of the educational process, especially in light of the great technological developments and based on the health challenges that the Covid-19 pandemic imposed on the Saudi society as part of the global community, the Ministry of Education decided on (15) August (2020) to transfer the education system to distance education at the beginning of the academic year as a preventive measure, and they have worked to provide educational programs electronically in all stages of education from kindergarten to university. Since the teacher is one of the pillars of the educational system, it is extremely important to pay attention to their

psychological state and to make sure that they are acclimatized and satisfied with the current situation of distance education, because this would positively affect their performance and the other elements of the educational process [7]–[15].

Baptiste [16] and Toropova et al. [17] emphasized the importance of achieving job satisfaction for teachers in their teaching of educational courses by evaluating the effectiveness of e-learning and its ability to meet the needs of students and teachers. To measure teachers' satisfaction with distance education in an accurate manner, we need to develop a scale that measures good psychometric properties. The more the psychometric properties of the scale are good, the level of reassurance of the decisions that can be based on the results of the measurement will increase. A number of important decisions related to the topic of the study are based on the results of the measurement, but the accurate and objective decision-making process requires that the scale used in decision-making be accurate, objective and reliable [16], [18]–[21].

Hence the importance of the factor structure of the Teacher Satisfaction Scale (TSS), especially in relying on distance education in light of the spread of the Covid-19 pandemic to verify the accuracy of the scale's results, and therefore psychometricians must build more in-depth measures to verify the accuracy and validity of the results, especially with the scarcity of previous studies related to developing measures that measure teacher satisfaction with distance education, hence come the idea of the current study in an attempt to answer the following questions:

1. What is the exploratory Factor Structure of the Teacher Satisfaction Scale with Distance Education during the Covid-19 Pandemic?
2. What is the confirmatory Factor Structure of the Teacher Satisfaction Scale with Distance Education during the Covid-19 Pandemic?
3. What is the Level of Measurement Invariance for the Teacher Satisfaction Scale with Distance Education during the Covid-19 Pandemic across the gender variable?
4. What is the degree of teacher satisfaction with distance education during the Covid-19 pandemic?
5. Are there statistically significant differences due to the variable (gender, number of years of experience, school stage) in the degree of teacher satisfaction with distance education during the Covid-19 pandemic?

2. Theoretical Consideration

2.1 Teacher's Job Satisfaction

Job satisfaction is defined as the positive emotional state of an employee as a result of enjoyable work experiences [22]. When job satisfaction decreases, phenomena such as work-related stress and burnout can appear. Work-related stress is considered a temporary condition, while burnout tends to be a more chronic disorder [20], [23]. It has been shown that teachers' job satisfaction is strongly negatively correlated with job burnout, and that teachers often report that they are overworked. Despite this, they are satisfied with the teaching profession and will choose it again and forever [24], [25].

It was found that there is a correlation between teachers' emotions and their satisfaction. Joy and love were positively correlated with teachers' job satisfaction, while love? and fear predicted a statistically significant sign of job satisfaction through a number of intermediate variables [17], [26], [27]. Teachers feel happy when they are able to achieve their goal, that is, success and achievement leads to teacher satisfaction [17], [27], and over time this satisfaction leads to a feeling of pride and achievement on the professional and personal levels [16], [28]. It was also found that teachers feel uncomfortable when they has difficulty performing different roles at the same time [29], [30].

2.2 Institutional Support

Institutional support is defined as the extent to which an organization appreciates its employees and their contributions, concerns about their quality of life, rewards them, and meets their emotional and social needs [19], [31]. Among the sources of job satisfaction are the policies, procedures and support provided by the institution [23], [32]. It has been shown that institutional support has a positive effect on job satisfaction [27], [28].

In countries with different income levels, governments use several forms of distance learning, where the rates of its use vary widely according to the level of the country's income. Low-income countries can only offer some kinds of distance learning through television and radio, in contrast to high-income countries that can provide distance learning opportunities, almost all of which are online [20], [33], [34]. In the period of the Covid-19 pandemic, the report "Education during the Covid-19 Pandemic and Beyond" issued by the United Nations 2020 referred to the essential role that governments and educational institutions have to care for workers in the field of education; by maintaining the share of spending on education as a priority for countries, as it appeared in the report to increase the funding gap and institutional support of governments for education by up to one third. This pandemic has highlighted the weaknesses in institutional support for education in some of the most low-income countries, as the education process was postponed for an unknown period, while some countries used traditional methods of distance education, that is, a combination of educational television, radio and the distribution of printed materials.

Teachers are the most important factor in student

learning, and therefore the support provided by educational institutions to teachers during school closures and its quality will affect student learning. High-income countries that can provide support to their educational institutions have been able to guide and train their teachers on how to deal with the students during this pandemic, as well as preparing them for the transition from traditional classroom education to distance education [22], [35], [36].

During this pandemic, many obstacles appeared that limit the process of distance education, including the shortage and the need for training in using the Internet. Teachers need training to use the Internet in general, in addition to training to use special programs to be used in the creation of Internet pages and the publication of lectures. Likewise, the learner needs training in using the Internet, in addition to training in using programs that help them exchange information with their teacher. Lack of training and institutional support may lead to problems among learners and teachers [29], [32], [37]–[40].

2.3 Educational Environment

The educational environment is an essential component of an effective educational climate, and the availability of educational means that teachers use in performing their work would leave a good effect on the learners and teachers, and this leads to improved performance and job satisfaction. It has also been shown that the employment of modern technology leads to the creation of an atmosphere characterized by open communication, trust, innovation and responsibility, and all this helps to accomplish the work in the least time and with the highest efficiency [41]–[45].

Suwanto et al. [24]; Froiland et al. [30]; and Worth and Van [25] stated that the educational environment has an influential role in all aspects of the educational process especially from the teachers' point of view, and thus this is reflected in their performance, and that the lack of educational aids to help them perform their educational function well is one of the most prominent obstacles and factors affecting their job satisfaction.

Conversely, components of the learning environment such as chalk and blackboards did not affect teachers' satisfaction or their desire to change their workplace. The direct effect of the learning climate on the learners' grades is not statistically significant, indicating that it affects the students' learning outcomes through intermediate variables which are basic psychological needs and motivation, and this was demonstrated through the positive correlation of motivation with satisfaction and negatively with dissatisfaction [28], [30], [42], [46]–[48].

2.4 E-Learning

E-learning is a broad term that covers a wide range of educational subjects that can be provided on CD-ROMs, over a local area network (LAN), or the Internet. It includes computer-based training, web-based training, electronic performance support systems, distance learning, online education, and e-learning [41], [49]. The resulting developments in the field of information and communication technology showed the urgent need to integrate this technology into the field of education with the aim of building a generation capable of dealing with the changing times and keeping up with modernity. E-learning contributed to the development of thinking and the enrichment of the learning process, in addition to increasing the possibility of communication between students among themselves and between learners and teachers [50]–[52]. One of the obstacles of communication during e-learning lies in the lack of fast internet service, and if available, then it is at a high cost, which in turn limits the application of e-learning [51], [52].

In a research aimed at tracking online education in the United States, the results from (2002) to (2021) showed that a small percentage of teachers accepted e-learning, and this percentage ranged from (27.6%) to (33.5%). The percentage is small and unsatisfactory. The researchers considered that teachers' lack of conviction of the importance and value of e-learning is one of the reasons for the failure of e-learning [1], [6], [52]–[55]. Likewise, lack of preparation for distance education can harm the educational process and may lead to problems such as pandemic anxiety, stress and depression [56], [57].

The characteristics of e-learning are the interaction that occurs between the teacher and the learner through electronic learning methods, and the opportunity for the teacher to make an immediate questionnaire to know the extent of the learners' interaction with the educational content. It also provides educational opportunities and services that may overcome the difficulties and limitations involved in traditional education, as well as easy access to the teacher even outside his official working hours [58]–[62]. In addition to the sustainability of development and its dynamism, as the process of development of e-learning is continuous and accelerating, it is characterized by participation and interaction, so the learner in e-learning can only be an active participant in discussions, performing assignments and answering questions raised in the virtual classroom [36], [63], [64].

2.5 Designing the Electronic Instructional

E-curricula and e-learning are among the most important foundations of modern educational institutions in building the future of their pioneers in the age of information and technology. The idea of e-learning courses has emerged to the point that some experts expect that the e-learning will be the most ideal and popular method for education and training in the near future [56], [57], [65], [66].

It has been shown that the use of the human voice in the design of electronic courses, as well as the use of videos, pictures and appropriate graphics explaining the written texts, so that they are integrated with them leads to linking

the parts of the course with each other. This contributes to facilitating the perception and identification of scientific information and thus facilitating its understanding, in addition to the presence of simulation programs, animation, events, interactive exercises, practical applications and modern rich information in a variety of ways consistent with the needs of learners and helping them to learn [6], [49], [56], [57], [67], [68].

It was found that many teachers suffer from obstacles in designing electronic courses, the most prominent of which are: the lack of modern devices, equipped laboratories, the failure to allocate training hours for designing electronic courses within the working hours, as well as the mismatch between training course time and teaching hours [12], [69], [70]. Thus, among the challenges of e-learning: financial and administrative challenges and designing electronic courses [53], [71], [72].

2.6 Interactions within the E-Learning Environment

Effective learning is learning whose outputs are of a high quality, and in order to achieve this, the teaching method followed must require interaction between the student and the teacher, with an appropriate climate for that [70], [73]–[76]. Technology has played an important role in the learning process in general and in increasing the learning space in the classroom [20], [34], [48], [77]. These e-learning environments have provided learners with many opportunities for simultaneous interaction with other learners [8], [27], [32]. These environments enabled them to develop new skills that allow them to self-learn, in addition to developing their abilities to interact and cooperate with their peers [73], [78]. The existence of educational activities that promote this type of electronic interaction between learners is an ideal context for assessment; because it increases the teacher's ability to diagnose their strengths and weaknesses [64], [79].
Teachers expressed their satisfaction with the effective and fruitful interaction between themselves and learners during e-learning. It is an opportunity for creativity, innovation, production of creative ideas and interaction with learners from different cultural backgrounds, and this is what enriches the educational process [3], [71], [80].

2.7 E-Assessment

Education quality is defined as a set of activities carried out by those responsible for education and aims to improve education affairs. It includes several criteria and elements, one of which is assessment that is made for all areas of the educational process. Assessment is an important factor that reflects and affects the quality of learning and teaching. Some research have shown that the quality of education is an important factor for teacher and learner satisfaction with the educational process alike [77], [81]–[83].

Ansley et al. [18] and Toropova et al. [17] explained that there is a significant positive correlation between the

quality of teaching among teachers and learners' satisfaction with learning, between the quality of education for teachers and the academic performance of learners, and between learners' satisfaction with learning and their academic performance. The learners' learning satisfaction has a mediating effect on the relationship between teaching quality and learners' academic performance. Likewise, there is a positive effect of teacher job satisfaction on teaching quality. Further teacher's quality is an important factor affecting learner's performance [16], [19], [22], [24], [31], [32].

The Covid-19 pandemic has contributed to the rapid transition of educational institutions towards e-assessment, which was found to help create opportunities for self-assessment for learners. This increases their independence and thus increases the chance of mastering the learning process. Several researchers argued that e-assessment led to better outcomes for learners than the traditional one, and that teachers are satisfied and prefer it; because it reduces their workload by providing them with the time and effort spent on correction, supervision, and follow-up, and helps them to identify the strengths and weaknesses of learners. It also helps in facilitating communication with them and prepare reports on them, with the necessity of using electronic assessment methods based on standards to inform the learner of how and what will be assessed [29], [46], [57], [66], [84]–[90].

Conversely, some teachers complained about the workload and stress attributable to the diversity in designing appropriate electronic assessment tools to monitor learners' learning [25], [27], [29]. Almaleki [8], [9] indicated that resorting to face-to-face evaluation is useful and helps to achieve educational goals when explaining cognitive concepts related to a topic as well as in practical courses.
Therefore, the diversity of assessment methods and activities would positively affect the learning process [33], [91]–[94]. It has been shown that there are positive results related to the use of self-assessment in the educational process, as learners who participate in self-assessment tend to obtain the highest scores on the tests. This assessment enhances the learning of skills and abilities, thinking, achieving higher results, taking responsibility, and increasing the understanding of problem solving. The accuracy of this type of assessment improves over time, especially when teachers provide feedback on it [48], [89]. This was also shown in the electronic continuous assessment strategy, which was found to have a positive impact on the learning process and on the learners' grades in the final exam. All this applies to good assessment strategies, which should provide information related to the learner's acquisition of the required competencies and skills [23], [24], [90].

Finally, given that online learning has become imperative in this pandemic, education officials will need to reformulate the basic concepts of evaluation in electronic

environments, including; validity and reliability of the e-assessment, the clarity of its standards that serve educational goals. It is also necessary to understand how formative assessment works within online learning and blended learning; due to the emergence of its importance in accelerating the learning process with the presence of valuable educational experiences through formative feedback [36], [64], [95]–[97].

3. Methodology

The current study used the descriptive (survey) approach to obtain realistic data from the field on the degree of satisfaction of teachers who practice distance education during this period, to know the extent of their satisfaction with distance education, as well as to ensure the quality and efficiency of the scale used.

3.1 Population and Sample

The study population consists of all teachers (general education) and faculty members (higher education) in the Kingdom of Saudi Arabia. The study sample consisted of (2399) teachers from different levels of education. Tables 1, 2, and 3 illustrate the distribution of the study sample according to the study variables.

Table 1. sample size specification

Gender	Number	Percentage%
Male	672	28%
Female	1727	72%
Total	2399	100%

Table 2. Sample distribution according to experience in years

Experience in years	Number	Percentage%
Less than 5	218	9.1%
Between (5-10)	664	27.7%
Between (11-20)	864	36%
More than 20	653	27.2%
Total	2399	100%

Table 3. Sample distribution according to educational level

Educational level	Number	Percentage%
Primary	988	41.2%
Middle School	464	19.3%
High School	669	27.9%
University	278	11.6%
Total	2399	100%

3.2 Measure

To achieve the study objectives, a scale was developed to measure teacher satisfaction with distance education during the COVID-19 pandemic, depending on some theoretical frameworks and e-learning standards for general education and university education in the Kingdom of Saudi Arabia (National E-learning center, 2020), and the American National Standards in Learning version 3, to provide a high-quality and efficient scale that has good psychometric properties with different characteristics of the respondent

sample, through which we can effectively measure satisfaction and obtain reliable results.

Five main factors of the scale have been identified through which teacher satisfaction with distance education can be measured during the Covid-19 pandemic: Institutional Support, E-learning Characteristics, Instructional Design, Electronic Interactions (learner with teacher, learner with learner, learner with content), and Measurement and Assessment. The scale consisted of (40) items in its initial form, including (6,10,5,13,6) items that measured the five factors in order.

After that, the scale was presented to (8) specialists in the fields of measurement, assessment, statistics, psychology, and those with experience in the educational field to calculate inter-rater validity. Their opinions regarding the linguistic wording and the appropriateness of the vocabulary for the factors were considered, and then the percentages of agreement were calculated, and the modifications to the scale were as follows: Items that achieved an agreement rate of (75%) or more was retained, while those that achieved less than (75%) were modified and reformulated. The final scale consisted of (27) items, including (5,5,5,8,4) measuring the five factors in order. The response categories for each statement were defined in a five-point scale ranging between (Strongly Agree - Agree - Slightly Agree - Disagree - Strongly Disagree) and scores are given from 1-5 to the items.

After considering the opinions of the specialists, the items of the teacher satisfaction scale for distance education were adopted during the Covid-19 pandemic, and an electronic copy was made identical to the paper version of the scale and sent to the sample. After reaching the required sample, it was organized and arranged to be treated statistically using (SPSS), (Factor) and (AMOS) programs to conduct the statistical processing of the data, extract research results, then discuss and interpret them according to the theoretical framework and the results of previous relevant research. Finally, recommendations and proposals have been developed.

4. Results

Initially, a pilot sample of (300) was taken to conduct an exploratory factor analysis on it, then to explore the factor structure of the scale, and to amend it if necessary, before answering the remaining research questions. Before starting the EFA procedure, it must first be ascertained that the data is valid for analysis. First, by looking at the level of measurement used in the study tool, which is (Ordinal) according to the five-point Likert; the polychoric correlation coefficient was used to find the correlation matrix between the variables.

The data distribution was also validated, as the Kurtosis and Skewness values were within the acceptable range in the factor analysis between (±1). There was no missing data. To justify the EFA, the correlation matrix

should be examined, and the coefficients should be greater than (0.30). When examining the polychoric matrix, it was found that it ranged between (0.30) and (0.70). Finally, the overall reliability of the scale was examined with a value of (0.94) which is higher than the acceptable minimum recommended. As for the reliability values for all items, they ranged between (0.935) and (0.938), according to see Table 4.

Table 4. Detailed reliability of the scale (cronbach's alpha)

Q	α	Q	α	Q	α	Q	α	Q	α
1	0.937	7	0.936	13	0.935	19	0.936	25	0.936
2	0.937	8	0.935	14	0.937	20	0.936	26	0.937
3	0.937	9	0.937	15	0.938	21	0.936	27	0.936
4	0.938	10	0.936	16	0.937	22	0.937		
5	0.937	11	0.937	17	0.936	23	0.935		
6	0.937	12	0.937	18	0.938	24	0.936		

Question 1: What is the exploratory Factor Structure of the Teacher Satisfaction Scale with Distance Education during the Covid-19 Pandemic？

Factor analysis is generally used to find the underlying correlations and the structure of a set of measured variables. An exploratory factor analysis is a method of collecting data and determining its structure in a data-driven manner, that is, it does not restrict the factor structure specifically, and is useful for data reduction as well as for checking relationships between underlying variables. It helps to provide insights that can help researchers achieve better measurement of latent traits. It consists of three steps: (a) Extracting factors to estimate the number of factors using several methods, including: Maximum Likelihood (ML), (b) Rotating factors to obtain a simple structure that can be easily explained, (c) Assigning and interpreting each factor based on the estimated values of loadings to Factors.

EFA was performed using Factor software version (10.10.03). The main reason for choosing to do the analysis with this program was its ability to do (EFA) using a polychoric correlation coefficients matrix, which is appropriate for the scale that was responded to by the five Likert scale, by using an inappropriate correlation coefficient for the level of measurement, this leads to biasness, increased error and contributes to the misinterpretation of constructive validity, which is the cornerstone of theoretical and applied research. The Unweighted Least Squares (ULS) method was used for estimation, and the oblique rotation method assuming a correlation between the factors of the study scale because there is a certain amount of correlation between factors, thus relying only on the results of orthogonal rotation will result in the loss of valuable information if there is correlation between factors.

To select the number of factors, the Eigenvalue criterion based on Kaiser was used, which is accurate only when the number of items is less than (30), the sample size

is greater than (250) and the average values of the communalities are greater than (0.60), which was achieved in the sample used for exploratory factor analysis. Finally, the results were interpreted based on the values of the loads on a factor greater than or equal to (0.30).

In the initial stage of EFA, data were examined using the Kaiser-Mayer-Olkin Scale (KMO) for the adequacy of sample size, and its value ranges between (0-1) with a value of (0.60) considered suitable for factor analysis, as well as Bartlett's Sphericity Test. The Kaiser criterion was used with the ULS method to determine the number of factors to be kept in the model. (27) items and a sample size of (300) were calculated, and factors with an Eigenvalue (>1) were taken. Five factors were identified, thus giving confidence to proceed with completing the analysis and considering the results.

Table 5 shows descriptive statistics for the items through the mean, standard deviation, kurtosis, and skewness, where the range of the mean was between (0.618) and (1.84), and the range of the standard deviation was between (0.486) and (1.243). The skewness ranged between (-0.487) and (1.00), and kurtosis between (-1.76) and (1.24).

Table 5. Descriptive statistics (means and standard deviations) (n = 300)

No.	M	SD	Skewness	Kurtosis
1	1.841	1.178	-0.042	-0.886
2	1.492	1.114	0.289	-0.659
3	1.528	1.036	0.176	-0.619
4	1.286	1.216	0.658	-0.491
5	1.555	1.103	0.188	-0.881
6	1.243	1.243	0.778	-0.411
7	1.037	1.043	0.847	0.042
8	1.668	1.145	0.196	-0.689
9	1.631	1.204	0.200	-0.952
10	1.422	1.056	0.300	-0.749
11	1.465	1.071	0.458	-0.332
12	1.312	0.890	0.223	-0.039
13	1.375	1.009	0.363	-0.417
14	1.651	1.059	0.078	-0.831
15	1.346	0.968	0.343	-0.560
16	0.618	0.486	-0.487	-1.760
17	0.801	0.821	1.001	1.240
18	1.153	0.899	0.384	-0.377
19	1.037	0.868	0.634	-0.159
20	1.056	0.886	0.350	-0.658
21	1.143	0.914	0.528	0.001
22	1.093	0.944	0.578	-0.119
23	1.100	0.936	0.437	-0.731
24	1.086	0.904	0.452	-0.488
25	1.535	1.116	0.243	-0.714
26	1.329	1.003	0.476	-0.445
27	1.445	1.082	0.213	-0.769

In this study, the KMO value was (0.92), indicating that the sample was sufficient to perform EFA, and Bartlett's Sphericity Test was statistically significant (χ^2= 3340.7, df= 351, p= 0.00); which indicates that the relationship between the variables is strong, and the data is suitable for conducting EFA.

Using the Kaiser criterion (1960), (5) factors were

obtained that have (Eigenvalue> 1), and the values were in order as follows: (12.92), (1.99), (1.40), (1.21), (1.00). The extracted factors were explained through a total variance of (69%). Then the five factors were named as follows: The first factor (F1): Institutional Support with items (1,2,3,4,5) with loading values from (0.390) to (0.771), the second factor (F2): E-learning Characteristics with items (6,7,8,9,10) with loading values from (0.326) to (0.744), the third factor (F3): Instructional Design with items (11,12,13,14) with loading values From (0.384) to (0.489), the fourth factor (F4): Electronic Interactions with items (16,17,18,19,20,21) with loading values from (0.519) to (0.761), and the fifth factor (F5): Measurement and Assessment with items (22,23,24,25,26,27) with loading values from (0.440) to (0.792). Table 6 displays the loading values that exceed (0.30) only, which are the significant ones.

Looking at Table 6, we find that the item (Q15) has not been loaded on any of the five factors with a value greater than or equal to (0.30). Therefore, it was excluded from the scale after theoretically reviewing it. While it appeared that the items (Q22) and (Q23) were loaded with a high value on the measurement and assessment factor, instead of the electronic interactions factor, and after theoretically reviewing it; it was adopted to be within the measurement and assessment factor as it appeared in the pattern matrix.

Table 6. Factor loadings by EFA (Pattern Matrix of the factors and item)

Items	Factors				
	F1	F2	F3	F4	F5
Q1	0.771				
Q2	0.741				
Q3	0.766				
Q4	0.390				
Q5	0.498				
Q6		0.551			
Q7		0.744			
Q8		0.625			
Q9		0.707			
Q10		0.326			
Q11			0.421		
Q12			0.390		
Q13			0.384		
Q14			0.489		
Q15					
Q16				0.696	
Q17				0.699	
Q18				0.519	
Q19				0.761	
Q20				0.747	
Q21				0.731	
Q22					0.559
Q23					0.660
Q24					0.689
Q25					0.792
Q26					0.440
Q27					0.502

After that, the reliability of the factors was confirmed, and it was found that all five factors had values higher than

(0.75) indicating good reliability (Factor 1= 0.871; Factor 2= 0.766; Factor 3= 0.885; Factor 4= 0.914; Factor 5= 0.892). As for the Convergent Validity, this was validated by looking at the structure matrix, and it was found that the items are converging because it appeared to have high loadings on the same factor and low loadings on the other factors. Discriminant Validity was achieved by looking at the pattern matrix, and it was found that all the items were loaded on only one factor with a high value with the absence of cross-loading on more than one factor. With this, the exploratory Factor structure of the TSS was investigated.

Question 2: What is the confirmatory factor structure of the teacher satisfaction scale "TSS" for distance education during the Covid-19 pandemic?

The confirmatory factor analysis (CFA) requires prior knowledge of the basic structure of the scale [7], and this was done through the results of the exploratory factor analysis (EFA), through which a factor structure was reached that included five factors and (26) items. To estimate the individual parameters of the model, we used the AMOS program by choosing the Maximum Likelihood (ML) method for estimation.

Firstly, cross-validation between the five factors was investigated to confirm the usefulness of the CFA procedure, the correlation between the factors was determined, as there was a positive correlation between the factors, and the values ranged between (0.77) and (0.94) see Table 7.

Table 7. Correlation matrix of the factors in the CFA model

	F1	F2	F3	F4	F5
F1	1.00				
F2	0.79	1.00			
F3	0.81	0.91	1.00		
F4	0.77	0.90	0.88	1.00	
F5	0.80	0.90	0.92	0.94	1.00

The results presented in Table 8 show the standard and estimates for the (26) items of the five factors. The results of the standard estimates ranged from (β= 0.71) to (β= 0.89) with a significant value of (p< 0.001).

Table 8. Results of estimates in the CFA model

Factors	Items	Standardized estimate	Factors	Items	Standardized estimate
F1	Q1	0.71***	F4	Q15	0.87***
	Q2	0.81***		Q16	0.89***
	Q3	0.77***		Q17	0.87***
	Q4	0.72***		Q18	0.84***
	Q5	0.77***		Q19	0.89***
F2	Q6	0.80***	F5	Q20	0.88***
	Q7	0.86***		Q21	0.86***
	Q8	0.86***		Q22	0.83***
	Q9	0.82***		Q23	0.89***
	Q10	0.74***		Q24	0.83***
F3	Q11	0.85***		Q25	0.84***
	Q12	0.82***		Q26	0.77***
	Q13	0.86***			
	Q14	0.81***			
***P < 0.001					

Figure 1 displays the model with non-standard estimates, while the model with standard estimates is presented in Figure 2. The chi-square statistic was statistically significant (χ^2= 2454; df= 289; p= 0.00). It is extremely sensitive to model fit; therefore, it increases the probability of rejecting the null hypothesis when the sample or model is large [98]–[100]. Due to the limitations of the chi-square, several other indices were used to assess the model fit including: (CFI; IFI; TLI; SRMR; RMSEA), which indicated that it was supported by most of the indices: CFI= 0.90; IFI= 0.96; TLI= 0.952; RMSEA= 0.059; and SRMR= 0.04. These results were within acceptable range; indicating that the five factors obtained from (EFA) were validated in Figure 2.

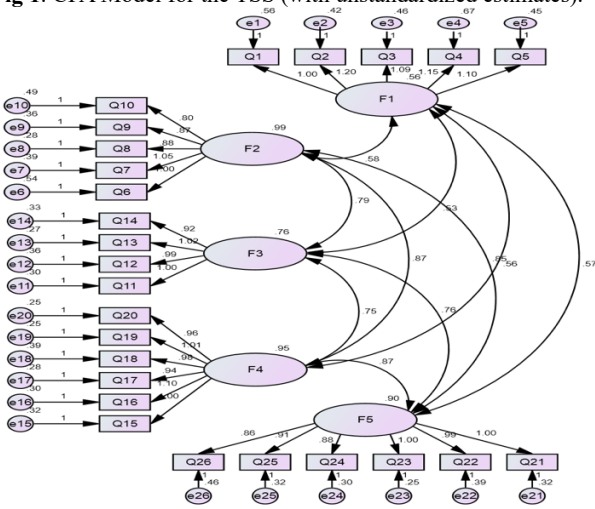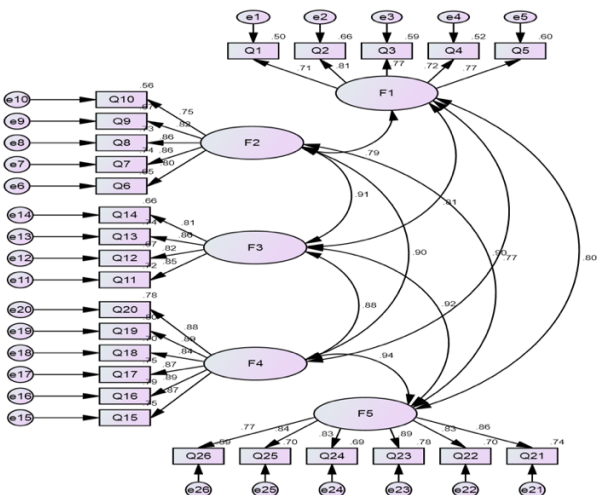**Fig 1**. CFA Model for the TSS (with unstandardized estimates).

Fig 2. CFA Model for the TSS (with standardized estimates). Chi-square goodness of fit (χ^2= 2454; df = 289; p= 0.00); CFI= 0.90; IFI= 0.96; TLI= 0.952; RMSEA= 0.059; SRMR=0.041.

The Convergent Validity of the model was investigated by using the Average Variance Extracted index (AVE), so that the value of (AVE) for any factor should be higher than

(0.50), and Construct Reliability (CR) higher than (0.70) according to [101], [102]. The results shown in Table 9. It was found that according to the (CR) and (AVE) indicators, the convergent validity of all factors was validated.

Table 9. Average variance extracted and construct reliability of the five factors TSS

	AVE	CR
F1	0.55	0.88
F2	0.67	0.91
F3	0.56	0.84
F4	0.76	0.95
F5	0.70	0.93

Thus, the teacher's satisfaction with distance education depended on several interrelated factors. In this study, factor analysis was used, which is a multivariate statistical analysis approach that works to identify statistically important items. The Exploratory Factor Solution (EFA) produced five factors that affected teacher satisfaction with distance education, namely: Factor One (F1): institutional support; Factor Two (F2): e-learning characteristics; Factor Three (F3): instructional design; Factor four (F4): electronic interactions, and finally the Factor five (F5): measurement and assessment. All five factors contributed to a total (69%) of the total change in variance.

Through Confirmatory Factor Analysis (CFA), the model was tested and validated, using several indicators of fitness of the model: (CFI; IFI; TLI; SRMR; RMSEA) as recommended by [103], [104]. The five-factor model was found to be a valid and reliable scale for measuring teacher satisfaction with distance education during the Covid-19 pandemic.

Question 3: What is the Level of Measurement Invariance level for the teacher satisfaction Scale for distance education during the Covid-19 pandemic across the gender variable?

The term Measurement Invariance or Factorial Invariance is used to assess the equivalence of the scale across groups or across different measures. The equivalence of measurement has several types, and it is considered the key to psychological research because it is a prerequisite for meaningful comparison between the averages of different groups. Therefore, before performing a test for differences between means, researchers must first ensure the equivalence of the measurement between different groups (Multi-group invariance) because the structure of the scale can change with different groups [9], [10], [104]–[107].

To test the levels of measurement invariance of the TSS with distance education during the Covid-19 pandemic in the case of the gender variable, a Multiple Group Confirmatory Factor Analysis model (MGCFA) was used to test the factorial invariance. Table 10 shows the order of the level of measurement invariance in the order starting from (Configural invariance: M0), then (Metric invariance: M1), and finally (Scalar invariance: M2). This was tested by

testing the difference in the value of the chi-square test ($\Delta\chi^2$) between groups.

To assess the measurement invariance, several CFA models were tested. First, we restricted the factors to be equal, to assess the invariance of the five-factor structure across groups, i.e., validation of configural invariance. Metric invariance was validated by restricting the loadings of the factors by making them equal, and thus assuming the loadings were constant, we allowed each parameter to be estimated freely. This reveals that there is a difference in the loadings across the groups. Finally, scalar invariance which is done by requiring that the values of intercepts for the items be equal across the sample. Therefore, respondents with the same score on the trait scale are supposed to have equal values on the item, which is a basis for the trait scale [108]–[110]. The model was evaluated by chi-square quality (χ^2; p <0.05), CFI> 0.95, TLI> 0.95, GFI> 0.95, and RMSEA≤ 0.05 according to [7], [9]. See Table 10 for an overview of the results according to the gender variable. For both groups, the values of the original five-factor model fit indices were within the recommended limit, except for the value of the (GFI) index, which was less than the recommended limit for males and females with values of (0.86) and (0.88), respectively. Thus, we can say that the original five-factor model showed a suitable fit of the data in both groups. We concluded from this that the configural-invariance of the factor structure across the gender (male and female) was validated.

After validating the first level of invariance (configural-invariance) across the gender variable, the second level was investigated, which is metric-invariance, which expresses the consistency of estimating items loadings on factors across the gender variable. The difference in chi-squared ($\Delta\chi^2$) was calculated between the two models to find out whether the model (M1) is statistically significant. As can be seen from Table 10, the difference in the value of chi-square ($\Delta\chi^2$) between the two models (M0) and (M1) was not statistically significant. In addition, the quality of fit indices (RMSEA), (TLI), (CFI), and (GFI), in which the percentage of change was (0), (0.002), (0), and (0), respectively, which indicate the achievement of fit. This confirms the metric-invariance, meaning that items loadings on factors across the gender variable were constant. When the metric-invariance values were calculated across the gender variable, the difference in the chi-square value ($\Delta\chi^2$) was statistically insignificant ($\Delta\chi^2=$ 11.351; p= 0.956). This indicated metric invariance. After validating the second level of factorial invariance (metric-invariance) across the gender variable, the third level was validated, which is called scalar-invariance, which expresses the equivalent of item intercepts across the gender variable. The difference in chi-squared ($\Delta\chi^2$) was calculated between the two models to find out whether the (M2) model is statistically significant. As can be seen from Table 10, the difference in the value of chi-square ($\Delta\chi^2$) between the two

models (M2) and (M1) was not statistically significant. In addition, the quality of fit indices (RMSEA), (TLI), (CFI), and (GFI), in which the percentage of change was (0), (0), (0), and (0), respectively, which indicate good fit. This confirms that scalar-invariance was achieved, that is, that Intercept across the gender variable was equivalent. When the scalar-invariance were calculated across the gender variable, the difference in the chi-square value ($\Delta\chi^2$) was statistically insignificant ($\Delta\chi^2=$ 11.411; p= 0.958), indicating that scalar -invariance was achieved. By validating the scalar -invariance, we move to the next level, which is residual -invariance, which is also called full uniqueness. It means that the residual or measurement error across the gender variable is equivalent, and given the significance value, we find that it was not achieved. Thus, the following conclusion could be drawn: That the TSS with distance education during the Covid-19 pandemic has achieved the third level factorial invariance across the gender variable.

Table 10. Examination for factorial-invariance (measurement and structural) across gender groups

Model		χ^2 (df)	GFI CFI TLI RMSEA	Model comp	$\Delta\chi^2$ (Δdf) p-value ΔGFI ΔCFI ΔTLI ΔRMSEA
M	Male	1110.302 (289)	0.86 0.94 0.93 0.071		
	Female	964.891 (289)	0.88 0.95 0.94 0.063		
M0		3615.554 (929)	0.88 0.95 0.95 0.035	M0	
M1		3626.905 (950)	0.88 0.95 0.95 0.035	M1-M0	11.351(21) 0.956 0 0 0.002 0
M2		3638.316 (965)	0.88 0.95 0.95 0.035	M2-M1	11.411(15) 0.958 0 0 0 0

Question 4: What is the degree of teacher satisfaction with distance education during the Covid-19 pandemic?

Based on the responses of the study sample on the TSS according to the five Likert scale, the degree of teacher satisfaction with distance education during the Covid-19 pandemic was considered according to Table 11, where it was determined as follows (5-1= 4), and by dividing the range by the number of ranking levels - which are (5) levels - each of them is equal to (0.8), and its limits are clarified

as indicated. Then, the means and standard deviations were calculated.

Table 11. Criteria used for interpreting results

Mean Range	Level of agreement	Level of satisfaction
4.20 – 5.00	Strongly agree	Completely satisfied
3.40 – 4.19	Agree	Satisfied
2.60 – 3.39	Slightly agree	Slightly satisfied
1.80 – 2.59	Disagree	Dissatisfied
1.00 – 1.79	Strongly disagree	Completely dissatisfied

First: At the scale level as a whole:

The means and standard deviations were found for the responses of the sample members according to the TSS factors as shown in Table 12. It is noticed that the mean response of the study sample on the TSS for all factors ranged between (3.67-3.87), where the third factor, "instructional design," achieved the highest mean of (3.87) with a level of satisfied, while the first factor, which is "institutional support" has the least mean of (3.67) with a level of satisfied. Therefore, the overall degree of teacher satisfaction with the TSS factors in the distance education system during the Covid-19 pandemic was satisfied.

Table 12. Means and standard deviations of the sample according to TSS factors

Factor	Number	Mean	SD	Rank	Level of satisfaction
Institutional support	5	3.67	1.10	5	Satisfied
E-learning characteristics	5	3.86	1.13	2	Satisfied
Instructional design	4	3.87	1.03	1	Satisfied
Electronic interactions	6	3.68	1.12	4	Satisfied
Measurement and assessment	6	3.69	1.07	3	Satisfied
Total	26	3.74	1.09		

Second: At the level of one factor:

The means and standard deviations of the responses of the sample members were found according to the TSS factors as shown in Table 13.

Table 13. Sample means, standard deviations, and percentages of the 1st factor (institutional support)

No.	Strongly agree	Agree	Slightly agree	Disagree	Strongly disagree	M SD
	Freq (%)					
1	617 (29.4%)	787 (37.2%)	456 (21.7%)	162 (7.7%)	77 (3.7%)	3.81 1.05
2	491 (23.4%)	776 (37.0%)	514 (24.5%)	206 (9.8%)	112 (5.3%)	3.63 1.10
3	440 (21.0%)	761 (36.3%)	567 (27.0%)	253 (12.1%)	78 (3.7%)	3.59 10.6
4	579 (27.6%)	691 (32.9%)	454 (21.6%)	233 (11.1%)	142 (6.8%)	3.63 1.18
5	492 (23.4%)	871 (41.5%)	443 (21.1%)	203 (9.7%)	90 (4.3%)	3.70 1.06

It is noticed from Table 13 that the mean response of the

study sample on the first factor ranged between (3.59-3.81), where item No. (1) which states: "The educational institution provides me with the necessary training courses to master distance education" got the highest mean value of (3.81) with a level of satisfied, while the item (3), which states: "Technical support is available to me during the use of distance education programs," has the lowest mean value of (3.59) with a level of satisfied. Accordingly, the overall degree of teacher satisfaction with institutional support in the distance education system during the Covid-19 pandemic was satisfied.

Table 14. Sample means, standard deviations, and percentages of the 2nd factor (e-learning characteristics)

No.	Strongly agree	Agree	Slightly agree	Disagree	Strongly disagree	M SD
	Freq (%)					
6	824 (39.3%)	547 (26.1%)	393 (18.7%)	193 (9.2%)	142 (6.8%)	3.82 1.23
7	688 (32.8%)	627 (29.9%)	425 (20.2%)	213 (10.1%)	146 (7.0%)	3.71 1.21
8	864 (41.2%)	729 (34.7%)	336 (16.0%)	110 (5.2%)	60 (2.9%)	4.06 1.01
9	745 (35.5%)	795 (37.9%)	384 (16.6%)	137 (6.5%)	74 (3.5%)	3.95 1.04
10	527 (25.1%)	846 (40.3%)	431 (20.5%)	224 (10.7%)	71 (3.4%)	3.73 1.05

It is noticed from table 14 that the mean response of the study sample on the second factor ranged between (3.71-4.06), where item (8) which states: "Distance education enables the learner to access various sources" got the highest mean value of (4.06) with a level of satisfied. While item (7), which states "Distance education provides a good opportunity for the learner to learn," got the lowest mean value of (3.71) with a level of satisfied. Therefore, the overall degree of teacher satisfaction with the characteristics of e-learning in the distance education system during the Covid-19 pandemic was satisfied.

Table 15. Sample means, standard deviations, and percentages of the 3rd factor (instructional design)

No.	Strongly agree	Agree	Slightly agree	Disagree	Strongly disagree	M SD
	Freq (%)					
11	721 (34.3%)	796 (37.9%)	369 (17.6%)	154 (7.3%)	59 (2.8%)	3.94 1.03
12	589 (28.1%)	765 (36.4%)	488 (23.2%)	194 (9.2%)	63 (3.0%)	3.77 1.05
13	582 (27.7%)	818 (39.0%)	469 (22.3%)	163 (7.8%)	67 (3.2%)	3.80 1.03
14	692 (33.0%)	864 (41.2%)	354 (16.9%)	141 (6.7%)	48 (2.3%)	3.96 0.98

It is noticed from table 15 that the means response of the study sample on the third factor ranged between (3.77-3.96), where item (14) which states: "The learner has flexibility in moving between parts of the content in the electronic course" got the highest mean value of (3.96) with a level of satisfied, while item (12), which states "Educational resources in distance education is characterized by accuracy of documentation," got the lowest mean value of (3.77) with a degree of satisfied.

Table 16. Sample means, standard deviations, and percentages of the 4th factor (electronic interactions)

No.	Strongly agree	Agree	Slightly agree	Disagree	Strongly disagree	M SD
	Freq (%)					
15	565 (26.9%)	750 (35.7%)	451 (21.5%)	231 (11.0%)	102 (4.9%)	3.69 1.12
16	550 (26.2%)	669 (31.9%)	465 (22.2%)	273 (13.0%)	142 (6.8%)	3.58 1.19
17	530 (25.3%)	795 (37.9%)	505 (24.1%)	191 (9.1%)	78 (3.7%)	3.72 1.05
18	537 (25.6%)	703 (33.5%)	465 (22.2%)	301 (14.3%)	93 (4.4%)	3.61 1.14
19	545 (26.0%)	747 (35.6%)	516 (24.6%)	190 (9.1%)	101 (4.8%)	3.69 1.09
20	586 (27.9%)	798 (38.0%)	454 (21.6%)	185 (8.8%)	76 (3.6%)	3.78 1.06

It is noticed from Table 16 that the means response of the study sample on the fourth factor ranged between (3.58-3.78), where item (20) which states: "Distance education contributes to the transfer and exchange of information between learners", got the highest mean value of (3.78) with a level of satisfied, while item No. (16), which states "Distance education increases the learner's motivation to learn", got the lowest mean value of (3.58) with a level of satisfied.

Table 17. Sample means, standard deviations, and percentages of the 5th factor (measurement and assessment)

No.	Strongly agree	Agree	Slightly agree	Disagree	Strongly disagree	M SD
	Freq (%)					
21	512 (24.4%)	744 (35.4%)	353 (25.5%)	200 (9.5%)	108 (5.1%)	3.64 1.10
22	467 (22.2%)	747 (35.6%)	507 (24.2%)	257 (12.2%)	121 (5.8%)	3.56 1.13
23	437 (20.8%)	803 (38.3%)	532 (25.3%)	230 (11.0%)	97 (4.6%)	3.60 1.07
24	588 (28.0%)	891 (42.4%)	421 (20.1%)	134 (6.4%)	65 (3.1%)	3.86 0.99
25	493 (23.5%)	880 (41.9%)	440 (21.0%)	219 (10.4%)	67 (3.2%)	3.72 1.03
26	577 (27.5%)	819 (39.0%)	453 (21.6%)	159 (7.6%)	91 (4.3%)	3.78 1.06

It is noticed from table 17 that the means response of the study sample on the fifth factor ranged between (3.56-3.86), where item (24), which states "Distance education creates self-evaluation opportunities for the learner", has the highest mean value of (3.86) with a level of satisfied. While item (22), which states "Distance education achieves justice in the learners' access to content, has the lowest mean value of (3.56) with a level of satisfied.

We note from the foregoing that the factor of instructional design received the highest level of satisfaction among the sample, and this did not agree with [21], [45], [75] in terms of the lack of modern equipment for the faculty members, as well as not allocating working hours for their training on designing electronic courses, and not paying for them as well. The factor of e-learning characteristics was ranked second in satisfaction from the research sample, which was compatible with Aboagye et al. [111], which represented the characteristics of e-learning by the interaction that occurs between the teacher and the learner through e-learning methods, and this agreed with Giovannella [65] and Marpa [66] in the process of transferring the learning process in schools and universities to distance education.

While satisfaction with the measurement and assessment factor of the research study agreed with the Topchyan and Woehler [27] and Toropova et al. [17] study, that it positively affects teacher job satisfaction as well as the quality of education. Electronic assessment is better for learners than traditional one. As for the factor of electronic interaction, it took fourth place in the level of satisfaction of the research sample and did not agree with the study of Han et al. [32] and Wang et al. [75] regarding the difficulty of providing feedback to students to determine their current level. Institutional support came last, and this may be due to the need for training in the use of the Internet, or perhaps due to the presence of negative feelings of teachers towards distance education during the Covid-19 pandemic as a result of their increased workload, which led to deficiencies in their training in digital skills and e-transactions [16]–[18], [24], [29], [32], [75].

Question 5: Are there statistically significant differences attributed to the variables of (gender, experience in years, educational level) in the degree of teacher satisfaction with distance education during the Covid-19 pandemic?

The means and standard deviations were calculated for

the study sample on the TSS according to the variables of (gender, educational level, experience in years), and the results of the analysis appeared in Table 18.

Table 18. means and std deviations by gender, educational level, and experience in years

Educational level	Experience in years	Gender					
		Male		Female		Total	
		M	SD	M	SD	M	SD
Primary	Less than 5	3.84	1.0	3.60	1.06	3.61	1.05
	Between (5-10)	4.04	.49	3.70	.91	3.76	.87
	Between (11-20)	3.61	.88	3.60	.84	3.65	.85
	More than 20	3.71	.79	3.74	.81	3.73	.80
	Total	3.70	.82	3.70	.87	3.60	.85
Middle School	Less than 5	4.99	.01	3.97	.90	4.10	.90
	Between (5-10)	3.74	.84	3.81	.75	3.79	.78
	Between (11-20)	3.92	.96	3.80	.86	3.83	.89
	More than 20	3.79	.86	3.79	.86	3.79	.86
	Total	3.86	.89	3.82	.83	3.83	.84
High School	Less than 5	3.92	.89	4.02	.70	4.00	.73
	Between (5-10)	3.66	.61	3.75	.89	3.74	.85
	Between (11-20)	3.63	.91	3.73	.78	3.70	.82
	More than 20	3.76	.85	3.81	.82	3.79	.83
	Total	3.69	.84	3.79	.82	3.76	.82
University	Less than 5	2.29	.13	4.00	.87	3.88	.95
	Between (5-10)	4.10	.85	3.56	.98	3.69	.97
	Between (11-20)	3.81	.82	3.50	.95	3.61	.91
	More than 20	3.65	.98	3.71	.87	3.69	.89
	Total	3.78	.91	3.66	.93	3.69	.93

Table 18 shows that there are differences in the means of the study sample's on TSS according to the variables of (gender, educational level, experience in years), and to know the direction of those differences, three way- ANOVA was used, and the results are shown in Table 19.

Table 19. Three- Way- ANOVA Summary table for the data variables: gender, educational level, and experience in years

Source of variation	SS	df	MS	F	p-value
Gender	0.059	1	0.059	0.081	0.776
Educational level	10.24	3	3.41	4.69	0.003*
Experience in years	1.71	3	0.57	0.784	0.503
Gender * Educational level	5.45	3	1.81	2.49	0.058
Gender * Experience in years	2.23	3	0.74	1.02	0.381
Educational level * Experience in years	12.83	9	1.42	1.95	0.041*
Gender * Educational level * Experience in years	15.19	9	1.68	2.31	0.041*
Error	1505.478	2067	0.72		
Total	30962.930	2099			
*P < 0.05					

According to what appeared in Table 19, we can say that there were no statistically significant differences in the means of the study sample responses on the TSS due to the gender variable.

As for the interaction between gender and educational level, and between gender and experience in years, no statistically significant differences appeared in the means of the study sample responses on the TSS. Whereas, statistically significant differences were found in the means of the study sample responses on the TSS due to the interaction between the educational level and experience in years, as well as in the interaction between gender, educational level and experience in years, as the value of the significance level was less than (0.05), meaning that there are differences in the level of Teachers' satisfaction on distance education during the Covid-19 pandemic due to the interaction between gender, educational level, and experience in years.

To find out the significance of the differences attributed to the interaction between gender, educational level and experience in years, post hoc comparisons were made, and Least Significant Difference Fisher's (LSD) test was used for the variable of educational level and experience in years, whether they were male or female, as shown in the Table 20.

Table 20. Results of LSD post hoc test for educational level

Educational level (I)	Educational level (J)	Differences between means (I – J)	Std error	p-value
Primary	Middle School	-0.13*	0.051	0.009*
	High School	-0.07*	0.046	0.152
	University	0.00	0.063	0.945
Middle School	Primary	0.13*	0.051	0.009*
	High School	0.07	0.055	0.214
	University	0.14*	0.070	0.049*
High School	Primary	0.07	0.046	0.152
	Middle School	-0.07	0.055	0.214
	University	0.07	0.066	0.292
University	Primary	0.00	0.063	0.945
	Middle School	-0.14*	0.70	0.049*
	High School	-0.07	0.066	0.292
*P < 0.05				

Table 20 shows that the level of significance for primary and middle school teachers is statistically significant, as the value reached (.009). Middle school teachers, whether male or female, achieved progress in the level of satisfaction with distance education during the Covid-19 pandemic over teachers at the primary school with a difference of (0.13). There were also statistically significant differences between middle school and university teachers in the degree of satisfaction with distance education during the Covid-19 pandemic in favor of middle school teachers. It was also found that there were no statistically significant differences at (p-value=.05) between the mean responses of the study sample on the TSS for male and female teachers in the high school, meaning that the differences attributed to the school level variable are not due to high school teachers.

Table 21. Results of LSD post hoc test for Experience in years

Experience in years (I)	Experience in years (J)	Differences between means (I – J)	Std error	p-value
Less than 5	Between 5-10	0.11	0.072	0.130
	Between 11-20	0.16*	0.069	0.018*
	More than 20	0.12	0.071	0.103
Between 5-10	Less than 5	- 0.11	0.072	0.131
	Between 11-20	0.06	0.047	0.240
	More than 20	0.01	0.050	0.871
Between 11-20	Less than 5	- 0.16*	0.069	0.018*
	Between 5-10	- 0.06	0.047	0.240
	More than 20	- 0.05	0.047	0.313
More than 20	Less than 5	- 0.12	0.071	0.103
	Between 5-10	0.05	0.047	0.313
	Between 11-20	- 0.01	0.050	0.871
*P < 0.05				

Based on Table 21, there are statistically significant differences between the mean responses of male and female teachers whose years of experience are less than (5) years and whose experience ranges between (11-20) years in favor of those whose experience is less than (5) years. There were no statistically significant differences for those whose experience ranged between (5-10) years, and those whose experience was more than (20) years. Table 22 confirms these results, as higher means appeared in favor of middle school teachers and teachers with less than five years of experience.

Table 22. Means of educational level and experience in years

Variables		M
Educational level	Primary	3.70
	Middle School	3.83
	High School	3.77
	University	3.70
Experience in years	Less than 5	3.86
	Between 5 - 10	3.76
	Between 11 - 20	3.70
	More than 20	3.75

5. Conclusion

Generally, the results of the Three-Way ANOVA of the variable of gender, the educational level and the experience in years showed that there are statistically significant differences at the level of (0.05) between the means of the male and female teachers on the TSS. It became clear that these differences are in favor of male and female teachers at middle school whose experience is less than five years, which indicates that the teacher's level of satisfaction with distance education during the Covid-19 pandemic is attributable to middle school teachers who have less than five years of experience. Perhaps this is because they are new teachers and have kept up with e-learning during their studies, meaning that they have previous experience with e-learning. Unlike those who have long experience, as their study period may have been traditional which did not allow distance education and e-learning, and they need more training in the use of the Internet, the ways of presenting lectures and designing tests, and this is agrees with Liu et al. [26] and Toropova et al. [17], they said that the lack of training hinders distance education, thus the teacher feels stress, anxiety and fatigue towards distance education, which limits their level of satisfaction.

It was also clear that the degree of satisfaction of middle school teachers is better than that of the primary school, and this may be due to the age of the students in middle school and their knowledge of using electronic devices which helps the teacher to deal with them. Unlike the primary level in which the teacher may face difficulty due to their young age, ability levels, and the difficulty of their dealing with electronic educational platforms. This is consistent with the study of Froiland et al. [30] and Kassis et al. [45]. Primary school teachers are concerned about distance education, their professional future and dealing with educational platforms. Also, direct assessment of learners at the primary level is easier than distance education, as well as interacting with them and knowing the extent of their understanding of the course directly, and this is consistent with the study of Brezicha et al. [31] and Buonomo et al. [29], who mentioned that face-to-face education is useful for achieving educational goals, and that the middle school population is less than university students and it is easier to deal with them since university education requires more technical support. Significant differences in the level of satisfaction with distance education during the Covid-19 pandemic among university teachers may be due to university students' knowledge of e-learning methods and ease of communication with officials and teachers at any

time [16], [20], [21], [24]. The absence of differences in the gender variable in the degree of satisfaction with distance education during the Covid-19 pandemic may be due to female teachers obtaining all the requirements they need, same as the male teachers and their support in all requirements as is the case for males [19], [75], [75].

Thus, we can summarize the previous results as follows: There were no statistically significant differences in the means of the responses of the study sample on the TSS during the Covid-19 pandemic due to the gender variable. Whereas statistically significant differences were found in the means of the educational level variable. Likewise, statistically significant differences were found in the means on the TSS due to the experience in years variable.

6. Significant

The process of measuring teacher's satisfaction and its impact on the educational process is still not receiving the attention of researchers, in addition to the difficulty of evaluation and the weakness of its culture in Arab societies, including Saudi society. Therefore, this study may contribute to bridging the gap in this context, by providing a standardized measurement scale that can be used in measuring teacher satisfaction at different levels in the Kingdom regarding the distance education system This helps those in charge of the educational process to know the difficulties and problems that teachers face in distance education, which helps them solve them in the future. It also helps in preparing and qualifying teachers in line with the needs of the Saudi society and in line with distance education in a way that achieves teachers' satisfaction.

7. Limits

They are:
1. *Objective limits:* The study was limited to identifying the factor structure of the teacher satisfaction scale for distance education during the Covid-19 pandemic.
2. *Human limits:* The scale was applied to a random sample of (2399) male and female teachers from public schools and university in the Kingdom of Saudi Arabia.
3. *Time limits:* The scale was applied during the first semester of (2020).

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