

Psychometric Properties of the Persian Version of Learner Satisfaction Survey in Online Courses: A Transcultural Adaptation and Psychometric Study

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ABSTRACT

Background: Following the importance of assessing the online courses from Iranian learner's viewpoint, this study aimed to examine the psychometric properties of the Learner Satisfaction Survey (LSS) in online courses in the Iranian

Methods: In this transcultural adaptation and psychometric study, 526 students who had studied at least 2 semesters online were selected based on convenience sampling method and enrolled in eight public universities of Iran (Based on geographical distribution) from October 2022 to January 2023. The learner satisfaction survey (Chang, 2013), a short version of the Online Satisfaction Survey (Strachota, 2003), was used to evaluate the learners' satisfaction with online courses. It comprises 25 self-report items measuring four types of interaction (learner–content, learner–instructor, learner–learner, and learner–technology interactions) and a general satisfaction. The tool was translated using standard forward–backward technique. Second, psychometric properties, including the face, content, construct, convergent and divergent validities, and reliability were examined using Cronbach's alpha and McDonald's omega coefficients.

Results: Linguistic and conceptual equivalence of the translated questionnaire was higher than 1.5 and content validities values (CVR>0.78 & CVI>0.79) were calculated at an acceptable level according to experts. None of 25 items was removed based on face and content validity coefficients. The exploratory factor analysis showed that five factors were identified that predicted 73.723% of the total variance. A factors structure with adequate fit indices ($\chi^2/df=2.23<3$, RMSEA=0.069, GFI=0.96, NFI=0.97, CFI=0.98, RMR=0.045, SRMR=0.047) based on five second-order factors (learner–content, learner–instructor, learner–learner, and learner–technology interactions, and general satisfaction) and one second-order factor (total score for academic satisfaction) were confirmed. Reliability of LSS was satisfactory, with McDonald's omega ranging from 0.880 to 0.955 and Cronbach alpha ranging from 0.881 to 0.955. The findings confirmed the convergent validity (AVE>0.5 and CR>AVE) for each subscale and total scale. Also, ASV<AVE & MSV<AVE p confirmed the divergent validity for each subscale and total scale.

Conclusion: The results indicate that the LSS has acceptable psychometric properties and can be considered as a suitable tool for measuring satisfaction with online courses in the Iranian context.

Keywords: Online education, Learner satisfaction, Validity, Reliability, Transcultural adaptation

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Introduction

New technologies have had significant effects on all aspects of life, especially education and learning. Online education has become prevalent in recent decades and its importance has increased, particularly after the COVID-19 pandemic. Students have gained diverse experiences in online courses (1). However, one of the most important aspects of online education is student satisfaction.

Satisfaction is recognized as an essential factor in effective and successful learning (2, 3). Learners' appraisal of the degree to which their expectations, needs, and demands have been met during their educational experience is generally defined as academic satisfaction (4). In addition, the literature indicates a positive relationship between satisfaction with academic performance and learner engagement (5, 6).

According to Moore (7), three types of interactions are necessary for effective learning in the distance education context: learner–content interaction, learner–instructor interaction, and learner–learner interaction. The first refers to the learners' interaction with course contents, lessons, learning activities, learning objects, videos, websites, and projects. The learner-instructor interaction implies two-way communication between the learner and instructor, which is necessary to clarify contents, receive and give feedback, and minimize the impact of online education on communication. Finally, learner–learner interaction refers to two-way communication between a learner and other learners. Palloff and Pratt (8) added a fourth type of interaction that Strachota (9) labeled learner–technology interaction, referring to learners' ability and level of comfort in their interactions with online environments (e.g., use of computers, software, and the Internet). Several studies confirmed the essential role of the mentioned types of interaction in achievement outcomes, meaningful learning experience, and learner satisfaction (10-16).

Strachota (9) developed the Online Satisfaction Survey (OSS), a 42-item self-

report instrument that measures the learner satisfaction with online courses, based on the mentioned interactions. In addition to considering the four types of interaction mentioned above (learner–content, learner–instructor, learner–learner, and learner–technology), the OSS also includes a general satisfaction section. More recently, Chang (17) developed Learner Satisfaction Survey (LSS), a short version of the OSS, comprising 25 self-report items reflecting the factors; however, some of the questions were reworded so that the questionnaire could be used to assess the learner satisfaction with different learning settings (i.e., online, blended, or traditional education). Overall, Chang (17) found that distance learners were less satisfied with their interactions with the content, instructors, and other learners than traditional learners but more satisfied with technology interactions. In addition, he found no significant difference in satisfaction between male and female students in the online setting. Importantly, however, he did not analyze the psychometric properties of the LSS. Thus, there is no validity evidence based on the internal structure of the LSS.

Although there are several instruments in Iran for measuring learner satisfaction, most focus on face-to-face courses (18-21). In the online setting, most studies used questionnaires without reporting their psychometric properties. Consequently, there are no instruments with adequate psychometric properties for measuring satisfaction with online courses based on the four aforementioned types of interactions in the Iranian context.

Given that learner satisfaction plays a vital role in academic achievement and is key to successful and practical learning, it is crucial to have adequate tools in our cultural context for measuring this construct in an online environment.

It should be noted that a complete evaluation of learner satisfaction concerning the learner–content, learner–instructor, learner–learner, and learner–technology interactions, as well as general satisfaction, is possible by LSS. This assessment can provide instructors with

valuable information about the areas that mostly need improvement. The main strengths of the LSS are usability at all levels of higher education, its relatively small number of items, and its potential applicability to other learning settings (e.g., blended and traditional), thus enabling comparison of learner satisfaction across these different approaches.

It is necessary to point out that the accepted validity and reliability of a tool in one language do not guarantee that these features be confirmed after its translation into other languages because culture, language, and geographical location are the factors that must be considered when using a tool in a different context from where it was developed. On the other hand, there is currently a need for standard questionnaires that can be used in different countries and cultures due to the multinational nature of many research projects, major differences in the socio-economic and cultural conditions of different countries.

This study aimed to adapt the LSS into Persian and examine its psychometric properties. To this end, the most important questions that this research seeks to answer are:

1- To what extent is the online learner satisfaction survey valid in the Iranian context?

2- To what extent is the online learner satisfaction survey reliable in the Iranian context?

Methods

Study Design

This transcultural adaptation and psychometric study was conducted in eight public universities in Iran from October 2022 to January 2023. The procedure was carried out by selecting 4 universities from the central region (1 from the east, 1 from the west, 1 from the south, and 1 from the north of the country) and providing students with the to access the questionnaire to collect their responses.

Participants

The participants in this study included

several groups as follows: 2 bilingual translators native in Persian and 1 native English speaker with a good command of Persian in the first step of the study (translation phase). 9 experts in educational sciences and psychology, familiar with the psychometric processes and for measuring face and content validities and 526 students who were selected based on convenience sampling method and surveyed over the web to answer the translated and adapted Iranian version of the learner satisfaction survey (LSS) in online courses. Participants entered the study link using an Iranian online survey platform named Porsline).

Inclusion criteria consisted of all students who had studied at least 2 semesters online and were willing to participate in this research. Participants who did not fill more than 20 percent of the questionnaire were excluded from the study. All participants were informed about the study objective, and it was made clear that their responses would remain anonymous.

Tool

Learner Satisfaction Survey (LSS) in Online Courses

A short version of the Online Satisfaction Survey (8), was used to evaluate the learner satisfaction with online courses. It comprises 25 self-report items that measure four types of interaction (learner–content, learner–instructor, learner–learner, and learner–technology interactions) and a general satisfaction section. Each item is rated on a 4-point Likert scale (1=strongly disagree, 2=disagree, 3=agree, and 4=strongly agree), and higher scores indicate higher satisfaction levels (Cut-point was 2.5). The questionnaire took about 10 min to be completed.

Procedure

This research was divided into two stages: translation technique and cultural adaptation; the first stage included tool translation technique and cultural adaptation. The second stage involved evaluating the psychometric

properties of the tool to examine its validity (face, content, construct, convergent and divergent validity) and reliability.

1. Translation Technique and Transcultural Adaptation

In the first step, the LSS was translated into Persian using the standard forward–backward technique. The technique comprised the following steps:

1-1. The original English version of the LSS was translated into Persian by two bilingual translators native in the Persian language (forward translation).

1-2. The discrepancies in the initial translation were discussed and resolved by translators. Afterward, a native English speaker with a good command of Persian translated the temporary Persian LSS into English without knowledge of the original English version (back-translation). The back-translated English version was then compared to the original version to ensure that both versions have a psychological meaning in common.

1-3. All translated versions were discussed for clarification and consolidation in an expert review session, in which a few minor changes were made to the temporary Persian LSS.

2. Validity and Reliability

In the second step, validity and reliability of the Persian version of Learner Satisfaction Survey (LSS) in online courses were determined.

2-1. Validity: To determine the validity of LSS, face validity, content validity, and construct validity were calculated as follows:

Face validity: to determine face validity quantitatively, the impact score was calculated for each item. Initially, a 5-point Likert scale for all of the 25 items were utilized: Strongly Agree (Score 5), Agree (Score 4), No Comments (Score 3), Disagree (Score 2), and Strongly Disagree (Score 1). The questionnaire was filled out by 48 students. After the target group completed the questionnaires, the face validity was calculated using the item impact formula, i.e., Importance * frequency (in

percentage)=impact score (22).

Content validity: To calculate the content validity qualitatively, nine experts in educational sciences and psychology who were familiar with the psychometric process were asked to comment on the position and grammar of the items, use of appropriate words in the phrases, importance of the questions, proper placement, and completion time.

In addition, the content validity ratio (CVR) and content validity index (CVI) were examined to calculate the content validity of the questionnaire quantitatively. To determine CVR, nine experts (in the fields of education who were familiar with the subject matter) independently were asked to rate the items using a three-point ranking scale (necessary, helpful but unnecessary, and unnecessary). After obtaining expert opinions, using the formula:

$$CVR = \frac{N_s - N/2}{N/2}$$

and Lawshe's table, questions with content validity ratios above 0.78 were retained in the questionnaire, and the rest were deleted (23).

the content validity index was calculated based on Waltz and Basel's content validity index (24). To this end, experts were asked to determine the degree of relevance, clarity, and simplicity of each item using a 4-point Likert scale (irrelevant (1), partially relevant (2), related (3), entirely related (4)). Accordingly, the content validity index was calculated based on the number of experts who chose the options three and four divided by the total number of experts. Questions with a content validity index higher than 0.79 are accepted.

Construct validity: To assess the construct validity, first of all, the LSS factor structure was determined using exploratory factor analysis (EFA) through SPSS version 28. In the next step, the confirmatory factor analysis (CFA) was performed using the structural equation modeling with LISREL 10.20. Therefore, the second-order model was designed, and fit indices were reported.

Table 1: Means (M), standard deviation (SD), Impact score, content validity ratio (CVR), content validity index (CVI), skewness, and kurtosis for items of the LSS

Items	M	SD	Impact score	CVR	CVI	Skewness	Kurtosis
1. The course notes, lessons, or lecture used in this course have facilitated my learning	2.75	0.949	2.23	0.80	0.92	-0.226	-0.904
2. The assignments or projects in this course have facilitated my learning	2.72	0.924	2.41	0.81	0.88	-0.131	-0.891
3. Preparation for quiz/exams in this course has facilitated my learning	2.66	0.994	2.53	0.82	0.82	-0.235	-0.976
4. The learning activities in this course have required application of problem solving skills which facilitated my learning	2.56	1.001	2.42	0.79	0.94	-0.025	-1.063
5. The learning activities in this course have required critical thinking which facilitated my learning	2.59	0.939	2.12	0.80	0.84	-0.081	-0.874
6. In this course the teachers have been active members of discussion groups, offering direction to our discussions	2.84	0.924	1.95	0.79	0.80	-0.492	-0.535
7. I have received timely feedback from my teachers	2.66	1.009	2.35	0.79	0.81	-0.203	-1.039
8. I have been able to get individualized attention from my teachers when needed	2.70	1.032	3.12	0.83	0.85	-0.275	-1.067
9. In this course the teachers have functioned as the facilitators of the course by continuously encouraging communication	2.74	0.974	3.45	0.84	0.87	-0.329	-0.862
10. When I have attended the course, the teacher knew I was present	3.08	0.949	3.74	0.82	0.90	-0.768	-0.380
11. In this course the discussion activities have provided opportunity for problem solving with other students	2.60	1.072	3.58	0.90	0.92	-0.143	-1.226
12. This course has created a sense of community among students	2.47	1.054	2.85	0.85	0.91	-0.023	-1.207
13. In this course I have been able to share my viewpoint with other students	2.65	1.033	3.10	0.81	0.88	-0.243	-1.081
14. In this course I have received timely feedback from other students	2.52	1.006	3.14	0.85	0.89	-0.024	-1.071
15. In this course I have been encouraged to discuss ideas and concepts covered with other students	2.59	1.025	2.89	0.84	0.87	-0.115	-1.110
16. I enjoy working with computers	3.10	0.883	2.75	0.81	0.85	-0.662	-0.398
17. Computers make me much more productive	3.10	0.896	3.54	0.88	0.92	-0.772	-0.159
18. I am very confident in my abilities to use computers	3.06	0.943	3.63	0.89	0.92	-0.734	-0.394
19. Some computer software packages definitely make learning easier	3.37	0.766	1.85	0.79	0.91	-1.098	0.741
20. Computers are good aids to learning	3.36	0.755	1.75	0.80	0.90	-1.030	0.589
21. I am very satisfied with this course	2.75	1.016	2.12	0.82	0.86	-0.313	-1.013
22. I would like to take other courses with the same learning setting	2.79	1.062	3.12	0.84	0.90	-0.404	-1.067
23. This course definitely meets my learning needs	2.60	1.013	3.02	0.82	0.83	-0.090	-1.089
24. I would definitely recommend this course to others	2.57	1.060	2.14	0.90	0.93	-0.109	-1.202
25. I feel this course is as effective as other courses with different learning settings (for example, traditional face-to-face learning)	2.50	1.080	4.12	0.90	0.90	-0.023	-1.266
Total mean	2.77	0.97	2.79	0.88	0.83	-0.78	-0.34

Also, to determine convergent and divergent validity, the Composite Reliability, Average Variance Extracted, Maximum Shared Variance, and Average Shared Variance were calculated.

2-2. Reliability: Finally, to assess the reliability of the questionnaire, Cronbach's alpha and McDonald's omega coefficients were calculated to examine the internal consistency of the questionnaire.

Results

Demographic Characteristics

The participants' age ranged from 18 to 58 years old, with a mean of 32.29 (SD=10.18). It comprised of males (N=279, 53 %) and females (N=247, 47%), graduate students (N=300, 57%), and postgraduate students (N=226, 43%).

Descriptive Statistics

The observed LSS total scores were based on the sample, ranging from 25 to 100, with a mean of 69.25 (SD=6.24, N=526), suggesting a higher-than-average level of online satisfaction. Table 1 shows results from the descriptive analysis of LSS item scores. Overall, the mean item scores were around 3 (rated from 1 to 4). The skewness and kurtosis indices indicated no deviation from the normal distribution (absolute values were considered extreme for skewness greater than 3 and kurtosis greater than 2), and Impact score, the ratio and index of content validity values were acceptable.

Content Validity: According to the Lawshe table (22), the acceptable CVR value based on evaluations of 9 experts should be greater than 0.78. The mean CVR value of all

LSS items was determined to be 0.88, and the CVR value of each questionnaire item was higher than the minimum acceptable value (0.78). Lastly, the CVI for each item and the mean CVI of LSS items were obtained (0.83) greater than the acceptable value (0.79) (23). Thus, the content validity of the scale was confirmed (Table 1).

Face Validity: The results of the item impact method indicated that all questions had a score greater than or equal to 1.5, so they were included in the questionnaire, and the face validity of the instrument was confirmed (22).

Construct Validity: EFA should be followed by CFA using a different sample (or samples) to evaluate the EFA-informed a priori theory about the measure's factor-structure and psychometric properties (25). Therefore, for higher reliable r and less error, 526 participants were randomly participated into two groups— 263 participants for exploratory factor analysis (EFA) and 263 participants for confirmatory factor analysis (CFA). The factor analysis capability was first investigated through Kaiser-Meyer-Olkin and Bartlett's test of Sphericity for exploratory factor analysis. The Kaiser-Meyer-Olkin index value (0.944) indicated the sampling adequacy, and the Bartlett Sphericity Index (5268.337/300, $P < 0.001$) also showed that the correlation matrix was not indeed an identity matrix.

To determine whether LSS is saturated with several factors, Eigenvalue (equal to one), explained variance, and the scree plot were examined. Table 2 and Figure 1 show the E values of the principal components analysis and the scree plot, respectively.

Table 2: The indices for LSS factors after a Varimax rotation by principal component analysis

Factors	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	12.266	49.063	49.063	12.266	49.063	49.063	4.307	17.228	17.228
2	2.824	11.296	60.359	2.824	11.296	60.359	4.195	16.781	34.009
3	1.333	5.331	65.690	1.333	5.331	65.690	3.590	14.361	48.370
4	1.115	4.158	69.848	1.115	4.158	69.848	3.136	12.942	61.312
5	1.091	3.925	73.773	1.091	3.925	73.773	3.099	12.461	73.773

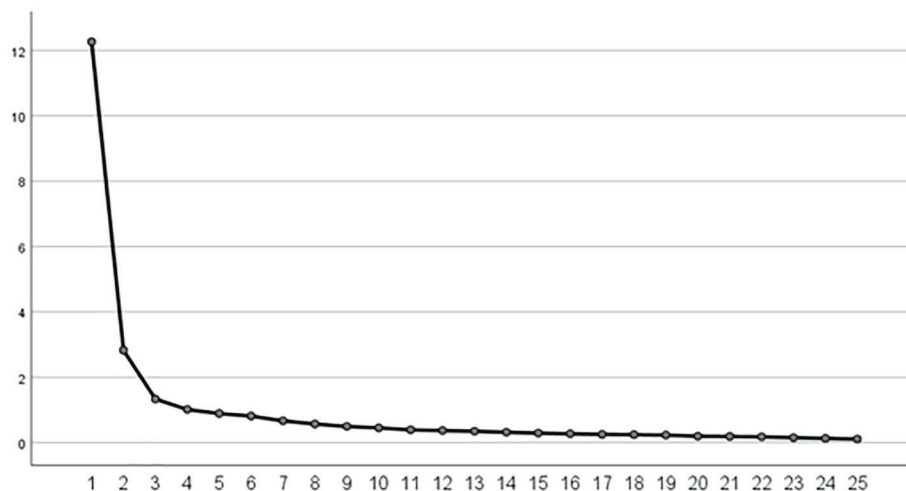


Figure 1: The scree plot

The factor loadings obtained for the 25 items confirm the validity of the factors. These five factors account for 73.773% of the total variance.

In Table 3, factor loadings of the 25 items are presented after rotating on factors. Accordingly, items 11,12,13,14,15 on factor 1 (Learner–learner interaction), items 21,22,23,24,25 on factor 2 (General satisfaction), items 1,2,3,4,5 on factor 3 (Learner–content interaction), items 16,17,18,19, 20 on factor 4 (Learner–technology interaction), and items 6,7,8,9,10 on factor 5 (Learner–instructor interaction) were loaded.

In order to confirm the factors structure of the questionnaire, confirmatory factor analysis model was performed using LISREL. The results are reported in Table 4.

Table 4 shows that the second-order factor model is valid. The RMSEA value is 0.069,

lower than 0.09, the ratio of χ^2 to the degree of freedom is lower than 3, the values of GFI, CFI, and NFI are higher than 0.9, SRMR lower than 0.05, and RMR is lower than 0.09, indicating that the data are well-fitted and the model is acceptable.

According to Figure 2, the parameters for measuring the structures are appropriately identified under the model reported in Table 4, which confirms the suitability of the model. The standardized parameter values represent the factor loadings of each question on the factor of the various components indicating how much each question explains the component variance. The larger the factor load, the better the variance, and in sum, these factor loadings represent the total variance of each component. The path coefficients of the five-factor pattern were statistically meaningful ($T > 1.96, P < 0.01$). Therefore, the Persian version of the Learner Satisfaction Survey is well-fitted.

Table 3: Factor loads on subscales

Items	Subscales	Learner–content interaction (Third factor)	Learner–instructor interaction (Fifth factor)	Learner–learner interaction (First factor)	Learner–technology interaction (Forth interaction)	General satisfaction (Second factor)
1. The course notes, lessons, or lecture used in this course have facilitated my learning		0.697				
2. The assignments or projects in this course have facilitated my learning			0.678			

3. Preparation for quiz/exams in this course has facilitated my learning	0.704
4. The learning activities in this course have required application of problem solving skills which facilitated my learning	0.587
5. The learning activities in this course have required critical thinking which facilitated my learning	0.548
6. In this course the teachers have been active members of discussion groups, offering direction to our discussions	0.469
7. I have received timely feedback from my teachers	0.556
8. I have been able to get individualized attention from my teachers when needed	0.591
9. In this course the teachers have functioned as the facilitators of the course by continuously encouraging communication	0.669
10. When I have attended the course, the teacher knew I was present	0.486
11. In this course the discussion activities have provided opportunity for problem solving with other students	0.777
12. This course has created a sense of community among students	0.745
13. In this course I have been able to share my viewpoint with other students	0.786
14. In this course I have received timely feedback from other students	0.677
15. In this course I have been encouraged to discuss ideas and concepts covered with other students	0.693
16. I enjoy working with computers	0.836
17. Computers make me much more productive	0.812
18. I am very confident in my abilities to use computers	0.839
19. Some computer software packages definitely make learning easier	0.785
20. Computers are good aids to learning	0.748
21. I am very satisfied with this course	0.696
22. I would like to take other courses with the same learning setting	0.840
23. This course definitely meets my learning needs	0.741
24. I would definitely recommend this course to others	0.789
25. I feel this course is as effective as other courses with different learning settings (for example, traditional face-to-face learning)	0.809

Table 4: Fit indices for the second-order factor models of the Persian version of the LSS

Model	χ^2/df	RMR	GFI	NFI	CFI	SRMR	RMSEA
Second-order factor model	2.23	0.045	0.96	0.97	0.98	0.047	0.069

CFI: Comparative Fit Index; NFI: Normed Fit Index; GFI: Goodness of Fit Index; RMR; Root Mean Square Residual; SRMR: Standardized Root Mean Square Residual; RMSEA: Root Mean Square Error of Approximation

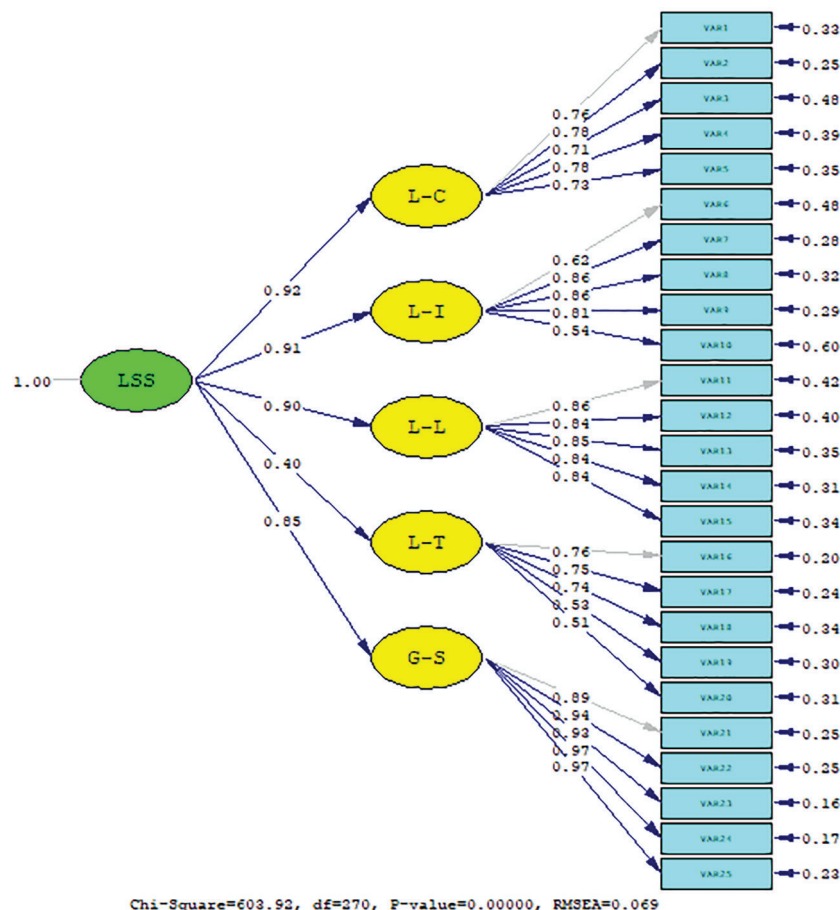


Figure 2: Fully standardized estimates for a factor structure based on second-order CFA of the Persian version of the Learner Satisfaction Survey (LSS) in online courses

According to Table 5, the values obtained from Cronbach’s alpha and McDonald’s omega range from 0.88 to 0.95 indicate that each of the subscales and total scale has a good internal consistency, so its reliability is accepted. Also, the findings proved convergent validity due to $AVE > 0.5$ and $CR > AVE$ for each subscale. Also, $ASV < AVE$ & $MSV < AVE$ confirmed divergent validity, as shown in Table 5.

Discussion

Studies have shown the essential role of learner satisfaction as a predictor of academic

performance in online learning environments (2, 3) and since no research-approved Persian tool was found for measuring learner satisfaction in online contexts, this study aimed to examine Psychometric properties of the Learner Satisfaction Survey (LSS) in online environments.

The reason for choosing this scale was that it has been used in various societies, and some studies have emphasized its high power as a valid tool for measuring learner satisfaction in online learning environments (9, 17, 26). The finding showed that the mean CVR value of all LSS items was determined to be 0.88,

Table 5: Convergent validity, divergent validity, construct reliability and internal consistency of Learner Satisfaction Survey (LSS) in online courses

Subscales	The number of items	CR	AVE	MSV	ASV	Cronbach's alpha coefficient	McDonald's omega coefficient
Learner–content interaction	5	0.89	0.62	0.43	0.33	0.88	0.88
Learner–instructor interaction	5	0.87	0.65	0.49	0.31	0.86	0.87
Learner–learner interaction	5	0.91	0.66	0.46	0.30	0.90	0.90
Learner–technology interaction	5	0.88	0.63	0.43	0.38	0.88	0.88
General satisfaction	5	0.95	0.81	0.53	0.42	0.95	0.95
Total scale	25	0.85	0.64	0.45	0.31	0.95	0.95

and the CVR value of each questionnaire item was higher than the minimum acceptable value (0.78). Lastly, the CVI for each item and the mean CVI of LSS items were (0.83) greater than the acceptable value (0.79). Thus, the content validity of the scale is confirmed. These results are consistent with those of previous research (9, 17, 26).

Also, conducting an exploratory factor analysis, five factors were identified that predicted 73.723% of the total variance. These findings are also in line with those of other studies which found a five-factor structure (9, 17, 26). Also, the results obtained by CFA indicated a second-order factor structure with good fit indices consistent with previous studies. In addition, reliability coefficients for the whole questionnaire and its subscales with values of McDonald's omega which ranged from 0.86 to 0.94 and Cronbach alpha which ranged from 0.86 to 0.94 are satisfactory and close to the results of other studies (9, 17, 26).

Limitation and Suggestion

This study has some limitations that should be acknowledged. First, collecting data through self-reporting has limitations. People are often biased when they report on their own experiences (27). Second, there was no more tools to examine the concurrent validity.

Conclusion

The present study offers robust evidence on the psychometric characteristics of the LSS, an online satisfaction scale, based on an Iranian university student sample, which has

not been investigated previously. Overall, the study revealed a factor structure consisting of five first-order factors, including learner-content, learner-instructor, learner-learner, learner-technology interactions, and general satisfaction, alongside a second-order factor representing the total satisfaction score. Notably, the fit indices of the factor structure were adequate, and the reliability of the LSS factor scores was satisfactory. These findings provide valuable insights into the psychometric properties of the LSS, thereby contributing to the literature on satisfaction scales. In general, given the examined psychometric properties, being short and simple to implement, this tool can be used by researchers widely. Therefore, this tool has shown acceptable reliability and validity in the Iranian context and can be used in studying online environments.

Authors' Contribution

A.T. designed the study, supervised data collection and analysis, participated in the coordination of the study, and critically revised the manuscript. Z.S. collected data, participated in the study concept, performed the analyses and N.S. drafted the manuscript. contributed to all the mentioned steps. All authors reviewed and confirmed the final version.

Conflict of Interest: None declared.

Ethical Considerations

No ethical issues were found. Participants attended this study willingly, and data were

presented anonymously. Participants were assured that their information would remain confidential.

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Appendix

ردیف	عبارات	کاملا موافقم	موافقم	مخالقم	کاملا مخالفم
۱	مواد آموزشی ارائه شده در طی این دوره مجازی (متون یا سخنرانی ها) یادگیری مرا تسهیل کرده است				
۲	پروژه ها یا تکالیف ارائه شده در طی این دوره مجازی یادگیری مرا تسهیل کرده است				
۳	آماده شدن برای آزمون های میان ترم و پایان ترم یادگیری مرا تسهیل کرده است				
۴	فعالیت های یادگیری این دوره مجازی بکارگیری مهارت های حل مسئله را طلب می کرده که سبب شده یادگیری مرا تسهیل کند				
۵	فعالیت های یادگیری این دوره مجازی بکارگیری تفکر انتقادی را طلب می کرده که سبب شده یادگیری مرا تسهیل کند				
۶	در طی این دوره مجازی معلمان بعنوان اعضای فعال گروه، جهت دهی بحث های یادگیرندگان را عهده دار بودند				
۷	در طی این دوره مجازی بازخوردهای به موقعی از مدرسان دریافت کرده ام				
۸	در طی این دوره مجازی در هنگام نیاز راهنمایی های اختصاصی را از سوی مدرس دریافت نموده ام				
۹	در طی این دوره نقش مدرس بعنوان تسهیلگر در ترغیب یادگیرندگان به تعامل مداوم با یکدیگر بود				
۱۰	در طی این دوره مجازی مدرس از حضورم در کلاس مطلع بود				
۱۱	در طی این دوره مجازی بحث های گروهی صورت گرفته فرصتی را برای حل مساله بصورت مشارکتی فراهم نمود				
۱۲	این دوره مجازی حس تعلق جمعی را میان یادگیرندگان ایجاد نمود				
۱۳	در طی این دوره مجازی قادر بودم تا دیدگاه خود را با سایر یادگیرندگان به اشتراک بگذارم				
۱۴	در طی این دوره مجازی بازخوردهای به موقعی را از سایر یادگیرندگان دریافت نمودم				
۱۵	در طی این دوره مجازی ترغیب شدم تا به بحث با سایر یادگیرندگان در خصوص مفاهیم و ایده های درسی بپردازم				
۱۶	از کارکردن با کامپیوتر لذت می برم				
۱۷	استفاده از کامپیوتر ابتکار مرا افزایش می دهد				
۱۸	به توانایی خود در بکارگیری کامپیوتر اطمینان زیادی دارم				
۱۹	برخی از نرم افزارهای کامپیوتری قطعا فرایند یادگیری را تسهیل می کنند				
۲۰	کامپیوترها ابزارهای مناسبی برای کمک به یادگیری بشمار می روند				
۲۱	از شرکت در این دوره مجازی رضایت بالایی دارم				
۲۲	تمایل دارم تا در دیگر دوره های ارائه شده به شکل مجازی شرکت نمایم				
۲۳	این دوره مجازی قطعا نیازهای یادگیری مرا برآورده می سازد				
۲۴	قطعا شرکت در این دوره را (بشکل مجازی) به سایرین پیشنهاد می کنم				
۲۵	بنظرم این دوره مجازی به اندازه سایر دوره های حضوری اثربخش است				