



## Psychometric Properties of Clinical Learning Environment Comparison Survey Questionnaire in Nursing Students

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### Abstract

**Introduction:** Continuous evaluations of clinical education and learning in nursing require the use of valid and reliable instruments. The present study aimed to evaluate the validity and reliability of the CLECS questionnaire (a questionnaire for assessing the clinical learning environment) in nursing students.

**Methods:** This is a psychometric study conducted on 118 nursing students. Through email correspondence with the corresponding author, permission was obtained from the developer to translate, validate, and use the CLECS. The CLECS was translated into Persian. The psychometric process was performed after the translation and cultural adaptation steps. Cronbach's alpha was used to assess the reliability. The instrument validity was assessed through convergent, discriminant, and confirmatory factor analysis. We used AMOS 18 for confirmatory factor analysis and SPSS-20 for reliability, convergent, and discriminant validity.

**Results:** A total of 118 nursing students participated in the study. The Cronbach's alpha value of the questionnaire was 0.942. Convergent validity was obtained in all dimensions above 0.4. The confirmatory factor analysis results confirmed the fit of the final model and showed that the present questionnaire was 6-dimensional. Most of the questions in the questionnaire did not have a good differential validity. The highest and lowest means were related to the nursing process and holism dimensions, respectively.

**Conclusion:** Based on the findings of this study, CLECS, except in the discriminant validity, has good validity and reliability, which can be considered to examine the learning environment of undergraduate nursing students.

**Keywords:** Learning, Validity, Reliability, Nursing, Students

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### Introduction

Learning environment, as the most effective determinant of behavior, includes all physical facilities, psychological conditions, and cultural and social factors that affect the growth and development of the learner in an educational institution (1). The literature defines the learning environment as external conditions, forces, and stimuli that challenge

the individual (2, 3). Recent studies have also highlighted the importance of a clinical learning environment for final-year nursing students to integrate clinical skills and competencies (4, 5). The clinical environment is an important environment for basic learning in the education of medical students, especially nursing students (6). Due to the importance of the clinical environment in choosing or rejecting the nursing

profession, it is necessary for nursing planners and practitioners to pay special attention to these environments (3). It has been shown that nursing students may encounter difficulties while learning in the clinical setting, such as the lack of adequate learning opportunities and clinical time (7). The clinical education environment is a place used to develop the students' clinical skills to enter their work community (8, 9). Clinical environments play an important role in nursing students' learning as they allow them to work with patients and deal with real problems (10).

The clinical learning environment can help students develop their knowledge, attitudes, competencies, and psychomotor skills to strengthen their communication, problem-solving, critical thinking, and professional and clinical competencies. Studies have shown that educators and learning environments are two key determinants of performance quality (11). Clinical education environments affect performance readiness, learning outcomes, and students' satisfaction with the nursing profession; therefore, identifying clinical education problems and finding a way to make them effective have always been emphasized. To accomplish this, we need to continually assess the current state of education and pinpoint its advantages and disadvantages (3, 6, 12). Since the 1970s, studies have been conducted on investigating the student's attitudes toward learning experiences and the learning environment. Differences between educational environments have given rise to different educational questionnaires (13). One of the instruments used in the study of the clinical learning environment is the Clinical Learning Environment Comparison Survey (CLECS), and several studies have been conducted to evaluate the validity and reliability of this questionnaire (1, 14).

The CLECS consists of 27 items, distributed on six subscales developed by Leighton (15) to provide empirical data in nursing education as an alternative to clinical practice for nursing students. Nursing students completed the CLECS at the conclusion of each clinical course and again at the conclusion of the program to rate how well each environment met the students' learning needs in previous studies (1, 16). The results of a study conducted on nursing student's perceptions of clinical learning environment showed that the lowest score was related to the area of support by the staff; the highest score was related to the area of supervisory communication, and the average total score obtained from understanding the clinical learning environment was reported to be 2.79 out of 5 (17). Another

study stated that nursing students had a positive perception of the educational environment, and there was a statistically significant relationship between the score of the DREEM instrument and the scientific result. The authors report that understanding the learning environment is influenced by various factors affecting its scientific outcome (18). Another study on clinical instructors and nursing students' perception of the clinical learning environment showed that most students had a positive view of the clinical learning environment, supervision, and nursing instructor (19). Gu et al. (20) examined the validity and reliability of the Chinese version of this questionnaire among undergraduate students. In Norway, the psychometric properties of the CLECS questionnaire were reviewed and approved by Olaussen et al. (1). Due to the fact that the clinical learning environment has not been studied in the form of a CLECS questionnaire in Iran, the present study was conducted to evaluate the validity and reliability of this instrument.

## Methods

### *Translation procedure of the questionnaire*

Each instrument needs to undergo translation and psychometrical evaluation in another language and culture. Translation and cultural adaptation were performed to assess the validity and reliability of the tool used in this study (CLECS questionnaire). First, the questions of the main version of the questionnaire were translated, and a version was created that was conceptually and semantically close to the main questionnaire. This step was performed by two expert Persian translators who were fluent in English from Karaj University of Medical Sciences (Karaj, Iran). Each translator translated a copy of the questionnaire into Persian, and after discussion and exchange of views between the different translators, the final translation of the first stage was prepared. In the next step, the questions translated by an experienced English-speaking translator who were fluent in Persian were back-translated to English; after resolving the inconsistencies and differences in translations, the final Persian version of the questionnaire was prepared for testing by students.

### *Sample size and sampling method*

Sampling was done using convenient sampling method from nursing students in the second and higher semesters. According to the psychometric literature (21), which considers the sample size to be four people per item, the number of items was 27 items, and the sample size with 10 people attrition was 118 people in this study.

### Research instrument

The instrument used in the present study was the CLECS questionnaire. The purpose of this study was to standardize the questionnaire and evaluate its validity and reliability. Kim Leighton designed the questionnaire in the United States in 2015, and its validity and reliability were evaluated. In this questionnaire, the clinical learning environment is evaluated in 6 dimensions (communication, nursing process, holism, critical thinking, self-efficacy, teaching-learning) through 27 questions. The answers are in the form of a 5-point Likert scale (22). In the original article, the reliability and validity of the questionnaire was acceptable. With the exception of the Holism subscale, which decreased from 0.935 to 0.913, and the Critical Thinking subscale, which decreased from 0.889 to 0.873, all subscales had Cronbach's alpha values above 0.7 and were even higher after revisions. Six subscales were found by confirmatory factor analysis. The relationship between the survey subscales was found to be moderately to highly positive (15).

### Validity and Reliability

Items like following Persian grammar, using appropriate words, placing items in the proper places, proper scoring, the amount of time needed to complete the designed tool, and the suitability of the chosen domain were taken into consideration when evaluating the content validity. Thus, all instrument items were reviewed and corrected several times by four nursing faculty members. Also, to determine the face validity, the items were first modified qualitatively. Then, to reduce and eliminate items, we calculated the item impact score index, and a complete list of questionnaire questions was provided to 5 members of the target group separately. Item impact scores were calculated, and impact scores above 1.5 were acceptable for subsequent steps.

For validation, we examined the validity of the structure. Construct validity consists of three parts, including convergent, discriminant and confirmatory factor analysis. A statistical method known as confirmatory factor analysis (CFA) was used to confirm the factor structure of a group of observed variables. The researcher could test whether there was a link between the observed variables and the latent constructs that underlie them using CFA. This approach uses factor analysis after selecting the pertinent variables and indicators based on the initial theory. In this type of factor analysis, the basic assumption of the researcher is that each factor is related to a specific subset of indicators. Therefore, several fit indices were recommended, such as normed  $\chi^2$  test,

comparative-fit index (CFI)>0.90, Normalized fit index (NFI)>0.90, and root mean square error of approximation (RMSEA)<0.07 (23, 24).

The item-total correlation was assessed for convergent validity in order to calculate the correlation between each item and the total of the other items (12). Those items with low item-total correlations (less than 0.40) were deleted. For discriminant validity, items that were in one dimension should have low correlations with other dimensions (less than 0.6). We used AMOS 18 for confirmatory factor analysis and SPSS-20 for reliability, convergent, and discriminant validity. Reliability means that constant results are always obtained if the test is repeated. Cronbach's alpha was used to assess the reliability;  $0.7 \leq \alpha$  indicates the reliability of the questionnaire.

### Ethical Considerations

All ethical principles are considered in this article. The participants were informed of the purpose of the research and its implementation stages IR.ABZUMS.REC.1399.110.

### Inform Consent

Informed consent was obtained from the students to participate in the research study.

### Results

A total of 118 nursing students were recruited to participate in this study. The mean and standard deviation (SD) of the participants' age was 21.7 (1.65) years, ranging from 19 to 27 years. Also, 65.3% of the participants were female. The Holism dimension with Cronbach's alpha of 0.941 had the highest reliability, and the Critical Thinking dimension had the lowest reliability with Cronbach's alpha of 0.817. Convergent validity coefficient is the degree of correlation between the score of each item and the total score of the same dimension, and in all dimensions it was obtained above 0.4 (Table 1). Discriminant validity value in the first dimension, for questions 6,7,9, 11 to 20, 23, and 27; in the second dimension, for questions 1 to 3, 11 to 21, 23 to 25, and 27; in the third dimension, for questions 2 to 7, 9 17 to 20, 23, 26, and 27; in the fourth dimension, for questions 2, 9, 12 to 16, 20, 23, 25, and 27; in the fifth dimension, for questions 12, 13, 16, 17, 18, 23, 24, 25, 27; and in the sixth dimension, for questions 1, 9, 12 to 22, it was obtained above 0.6. As a result, most of the questionnaire questions did not have good discriminant validity (Table 2).

The chi-square to df ratio (CMIN / DF), normalized fit index (NFI), comparative fit index (CFI), and root means the square error of approximation (RMSEA) indices are presented

**Table 1:** Convergent validity of the questionnaire dimensions

Convergent validity											
Communication		Nursing Process		Holism		Critical Thinking		Self-Efficacy		Teaching-Learning	
Validity percentage=100		Validity percentage=100		Validity percentage=100		Validity percentage=100		Validity percentage=100		Validity percentage=100	
Question number	Correlation with a total score	Question number	Correlation with a total score	Question number	Correlation with a total score	Question number	Correlation with a total score	Question number	Correlation with a total score	Question number	Correlation with a total score
1	0.809**	5	0.912**	11	0.844**	17	0.976**	19	0.863**	23	0.898**
2	0.802*	6	0.893**	112	0.851**	18	0.975**	20	0.864**	24	0.867**
3	0.881**	7	0.865**	13	0.918**			21	0.888**	25	0.884**
4	0.809**	8	0.893**	14	0.949**			22	0.912**	26	0.812**
		9	0.916**	15	0.909**					27	0.917**
		10	0.814**	16	0.891**						

\* Correlation is significant at the 0.05 level (2-tailed). \*\* Correlation is significant at the 0.01 level (2-tailed).

**Table 2:** Discriminant validity of the questionnaire dimensions

Question number	Dimensions	Communication	Nursing Process	Holism	Critical Thinking	Self-Efficacy	Teaching-Learning
Validity percentage		0.21	0.28	0.33	0.24	0.21	0.04
1		0.803**	0.603	0.538	0.586	0.546	0.637
2		0.803**	0.633	0.664	0.685	0.599	0.587
3		0.880**	0.725	0.680	0.542	0.556	0.592
4		0.812**	0.562	0.682	0.550	0.444	0.398
5		0.586	0.902**	0.696	0.555	0.574	0.539
6		0.620	0.892**	0.664	0.541	0.490	0.487
7		0.648	0.842**	0.608	0.523	0.560	0.565
8		0.587	0.863**	0.569	0.462	0.489	0.516
9		0.682	0.916**	0.773	0.756	0.593	0.666
10		0.576	0.805**	0.551	0.428	0.577	0.501
11		0.677	0.718	0.840**	0.545	0.594	0.526
12		0.778	0.715	0.841**	0.720	0.721	0.710
13		0.769	0.779	0.910**	0.707	0.675	0.743
14		0.736	0.718	0.945**	0.725	0.546	0.607
15		0.687	0.717	0.896**	0.732	0.517	0.635
16		0.624	0.660	0.843**	0.623	0.689	0.585
17		0.715	0.692	0.731	0.723**	0.617	0.714
18		0.728	0.702	0.760	0.977**	0.614	0.740
19		0.647	0.602	0.616*	0.570**	0.710**	0.703**
20		0.623	0.693**	0.689**	0.713	0.852**	0.752
21		0.554	0.621	0.493	0.440	0.849**	0.612
22		0.521	0.590	0.536	0.490	0.887**	0.715
23		0.620**	0.612**	0.604**	0.701**	0.721**	0.806**
24		0.558**	0.622**	0.575**	0.595**	0.632**	0.900**
25		0.526**	0.607**	0.536**	0.646**	0.749**	0.848**
26		0.587**	0.553**	0.624**	0.595**	0.572**	0.889**
27		0.691**	0.713**	0.769**	0.672**	0.766**	0.804**

\* Correlation is significant at the 0.05 level (2-tailed). \*\* Correlation is significant at the 0.01 level (2-tailed).

in Table 3. Based on the confirmatory factor analysis results, the values of the indicators confirmed the fit of the final model. According to Table 4, the highest and lowest means were related to the nursing process and the holism dimensions. Cronbach's alpha related to the students' clinical learning environment was above 0.7 and acceptable (Table 5).

## Discussion

This study aimed to investigate the psychometric properties of the CLECS (clinical learning environment comparison survey) questionnaire on 118 undergraduate nursing students in Alborz University of Medical Sciences (Alborz, Iran). The results indicated that the Persian version of this tool had been

**Table 3:** Value of fit indices of confirmatory factor analysis model (N=118)

	CMIN/DF	NFI	CFI	RMSEA
Model	3.028	0.817	0.829	0.078

CMIN/DF; the chi-square to df ratio between 3 and 5, comparative-fit index (CFI)>0.90, Normalized fit index (NFI) >0.90, and root mean square error of approximation (RMSEA)<0.07.

**Table 4:** Mean and standard deviation of scores by dimensions (N=118)

Dimensions	Mean	SD	Min-Max
Communication	2.22	0.81	1-4
Nursing Process	2.33	0.87	1-4
Holism	2.07	0.91	1-4
Critical Thinking	2.12	0.99	1-4
Self-Efficacy	2.16	0.92	1-4
Teaching- Learning	2.29	0.92	1-4

**Table 5:** Cronbach's alpha value of the subscale

Dimensions of the questionnaire	Cronbach's Alpha	95% confidence Interval
Communication	0.842	0.79-0.88
Nursing Process	0.935	0.91-0.95
Holism	0.941	0.92-0.95
Critical Thinking	0.817	0.73-0.87
Self-Efficacy	0.883	0.84-0.91
Teaching-Learning	0.932	0.91-0.95
Total score	0.942	0.92-0.95

prepared by fluent and knowledgeable people, following the principles of translation and paying attention to its correct process and accuracy in the cultural adaptation of meanings. The value of Cronbach's alpha in different dimensions (0.81 to 0.94) in the present study indicated that the questionnaire had a good internal consistency. Internal consistency and relatively high Cronbach alphas were also reported by earlier research, except the communication subscale. In the original version of the CLECS questionnaire, the lowest Cronbach alpha score for all the subscales was 0.73 (15).

Furthermore, in the psychometrics of the same questionnaire in Norway, this value was between 0.69 and 0.89 in the dimensions of the questionnaire (1), which is consistent with the results of the present study. Test-retest reliability was evaluated by the intraclass correlation coefficient in the study carried out by Olaussen et al. (1), as opposed to Pearson's correlation coefficient, which was used by Leighton (15) to evaluate reliability in the original CLECS. Accordingly, Leighton (15) only discovered two subscales in the original CLECS: holism and teaching-learning, with valued above 0.5 indicating moderate reliability. Olaussen et al. (1) discovered one subscale (Teaching-Learning dyad) with good reliability and three subscales (Nursing Process, Holism, and Self-Efficacy) with moderate reliability. Previous research suggested

that instrument instability, such as problematic words, topics, or expressions, could be the cause of the low test-retest correlations (25).

Also, in this study, validity was assessed through convergent validity, discriminant validity, and confirmatory factor analysis. Most of the questions in the questionnaire did not have good discriminant validity. In the study of Olaussen et al. (1) on the same questionnaire, construct validity results were obtained optimal by examining the CFA fit indices. The sample size and the different populations between the two studies may explain this discrepancy in the results. According to the goodness-of-fit indicators from CFA, the Norwegian version of CLECS in the study in question has acceptable construct validity (1). Like the original CLECS, CFA was used to test and revise subscale compositions (15). Convergent validity was obtained in all dimensions of the questionnaire above 0.4 and was significant. In Haidari and Karakus's study, although the amount of variance extracted (AVE) was between 0.36 and 0.43, the CR value was appropriate (above 0.7), which can be alternative evidence to confirm the convergent validity (26).

This study performed confirmatory factor analysis using AMOS software version 18. Based on the good fit indices, if CMIN/DF indices are less than 5, RMSEA less than 0.08, NFI and CFI higher than 0.8, it indicates a suitable and desirable fit (27-29). The results showed that the present

questionnaire was 6-dimensional. In the study of Ozkok et al. (30), a set of confirmatory factor analyses was performed to examine four models and compare the conceptualization differences of infrastructures. All variables had at least eight items in each domain. Values above 0.5 are acceptable, and those above 0.7 are appropriate for the factor load. In the mentioned study, the factor load related to the items of questionnaire was consistent with the present study. The highest and lowest averages were related to the critical thinking and holistic dimensions, respectively. In line with the present study results, another study reported the highest and lowest averages for the critical thinking and the holism dimension, respectively (1).

The present study results show that the CLECS questionnaire can be an instrument for assessing the students' learning in Iranian nursing education. Understanding how learning needs are met by the methods of instruction is a crucial first step in enhancing nursing students' clinical education (20). The CLECS might serve as a guide for nursing educators as they work to improve simulation exercises that might make up for students' difficulties learning in clinical practice. The internal consistency and construct validity tests were run for the relatively small sample of 118 respondents in the present study. When sample sizes are less than 50, factor analyses are not appropriate, according to the literature (31). Despite the fact that studies recommend a maximum subject-to-variables ratio of 5 (32), this criterion in this study was 4:1. It should be noted that since the original version of CLECS does not have a specific scoring method and leaves it up to the user to decide how to rate the tool, it may be difficult to compare CLECS results internationally.

## Conclusion

The results indicate that the Persian version of this instrument, except for discriminant validity, has good validity and reliability and can be considered to examine the clinical learning environment in undergraduate nursing students. Due to the small number of studies conducted in this field, it is suggested that studies should be carried out to evaluate the discriminant validity, confirmatory factor analysis, and reliability of the questionnaire using more samples in other populations. The strength of the present study is the psychometrics of this tool for the first time in Iran. The low sample size is our limitation, so we recommend that the researcher consider this limitation in the next study.

## Authors' contribution

Sh.R, M.A, M.A contributed to the conception and design of the work; the acquisition, analysis, or interpretation of data for the work. All Authors contributed in drafting and revising the manuscript critically for important intellectual content. All authors have read and approved the final manuscript and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

**Conflict of Interest:** None declared.

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