

Original Article

Validating Modified PHEEM Questionnaire for Measuring Educational Environment in Academic Emergency Departments

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Abstract

Background: The quality of the educational environment is a key determinant in postgraduate training programs. In order to evaluate and understand this environment a valid and reliable instrument is required. The PHEEM (Postgraduate Hospital Educational Environment Measure) questionnaire is one of the most widely used tools for evaluating the perception of hospital-based residents. The aim of this study was to examine the psychometric quality of the PHEEM in the context of emergency medicine program.

Method: This study evaluated the reliability, construct validity and applicability of the Persian version of the PHEEM questionnaire using a sample of emergency medicine residents from 3 emergency medicine residency programs in Iran. Eighty-nine residents were asked to complete the questionnaire and indicate their agreement with each of the 37 statements using a 5-point Likert scale (strongly disagree: 0 to strongly agree: 4). Cronbach's alpha coefficient was calculated to determine internal consistency. Confirmatory and explanatory factor analyses were performed to assess the construct validity of the original 3 subscales of the questionnaire.

Results: The mean score for the total questionnaire was 2.24 (SD: 0.06). The Cronbach's alpha value was found to be 0.86. Factor analysis did not confirm the original three subscales of the PHEEM questionnaire.

Conclusion: The Persian version of PHEEM proved a reliable and practical tool for assessing clinical educational environment in emergency medicine departments.

Keywords: Educational environment, emergency medicine, PHEEM, postgraduate

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Introduction

The context in which training takes place, known as the educational environment, affects the motivation of learners.

This in turn has a great impact on the students' satisfaction level and plays a critical role in their successful training and future achievements.^{1,2} The atmosphere strongly influences the hidden curriculum, suggested to be more effective than the planned curriculum³ (Figure 1). As a result, understanding and measuring the educational environment are fundamental for managing curriculum development.⁴ Such an evaluation would provide valuable data and enable us to assess the educational performance of a department and make necessary changes in order to provide a climate which is conducive to learning.²

Many important aspects comprise the educational environment. In hospital settings, these include quality of clinical supervision, quality of preceptors, facilities and atmosphere.²

Considering the presence of complicated and severely ill patients, mismatch between resources and demands, overcrowding, and rapidly changing conditions, the working environment in emergency departments appears to be even more challenging.⁵

In a quest for a valid and reliable method to assess the quality of the medical learning environment, several instruments have been introduced.⁶⁻¹⁰ The 50-item DREEM (Dundee Ready Education Environment Measure) questionnaire, for instance, was developed to measure perceptions of undergraduate educational climate.⁷ Later on, the PHEEM (Postgraduate Hospital Educational Environment Measure) questionnaire was developed to evaluate the perceptions of hospital-based residents.¹¹ This 40-question instrument represents an overall indicator of the quality of the learning environment. It is composed of 3 subscales: "role autonomy", "quality of teaching", and "social support".

Although the PHEEM questionnaire has been investigated in diverse settings and different languages,^{1, 2, 4, 5, 12-20} validation of the Persian version in an Iranian hospital setting and evaluation of its psychometric properties are necessary before it can be confidently applied. Furthermore, to the best of our knowledge, the educational environment in emergency departments has not been measured previously.

Validation of such a tool in local emergency departments would allow the assessment of the current educational atmosphere that our residents experience and provide a basis for planning interventions to improve it.¹⁰ We set out to assess the reliability and practicality of PHEEM to measure the quality of the educational environment in emergency medicine residency programs.

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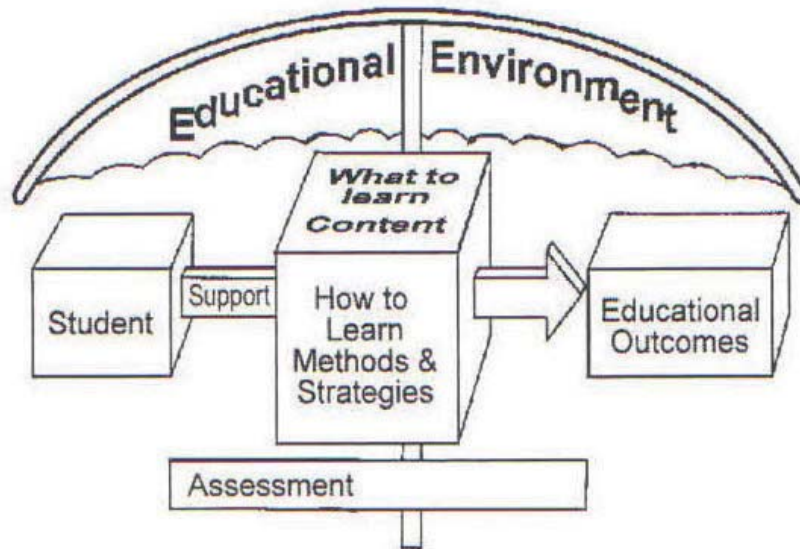


Figure 1. The educational environment and its relation to the educational process (adapted from principles of curriculum development by Margery Davis, Center for Medical Education, University of Dundee, 2006).

Method

The PHEEM questionnaire has 40 items in 3 defined subscales (perceptions of role autonomy, perceptions of teaching, and perceptions of social support). Information on gender and seniority in terms of the postgraduate year of training were also requested as part of the questionnaire.

We used the modified Brislin technique to validate the Persian version of the PHEEM questionnaire.²¹ With permission of the developer of the original questionnaire, it was first translated from English into Persian and then translated back into English by a professional translator. Some minor differences in meaning between the two versions were adjusted and three items of the original questionnaire (numbers 7, 11 and 18) were deleted because they were deemed irrelevant to either the Iranian setting or the emergency medicine concept. Item 7 (there is racism in this post) was not applicable as all residents are Iranian of the same racial group. Item 11 (I am bleeped inappropriately) was omitted because emergency medicine residents are generally required to stay within the emergency department when on duty, and they are not on call when leaving their hospital shifts. Item 18 (I have the opportunity to provide continuity of care) was removed since patient care in the emergency medicine service is by definition temporary and does not include follow up visits.

The final form was then sent to one of the original developers (Sue Roff) who considered this version equivalent to the original and confirmed its validity.

We administered the questionnaire to all emergency medicine residents who had passed at least 6 months of their educational course ($n = 89$). After signing an informed consent, participants were asked to complete the questionnaire and indicate their agreement with each statement using a 5-point Likert scale (from strongly disagree: 0 to strongly agree: 4; as in the original PHEEM). Agreement with the items demonstrates a good environment. Since two items contained negative statements (questions 8 and 13), we had their score inverted on the scale. Hence, the minimum and maximum possible scores for the modified questionnaire were 0 and 148, respectively. Moreover, a subsam-

ple of 30 participants responded again to the questionnaire after a 30-day interval.

Statistical analysis

Data were analyzed with SPSS 15.0, Stata 10.0 and EQS 6 statistical programs. Two methods were used to assess the reliability of the questionnaire. Cronbach's alpha coefficient was calculated to determine internal consistency. Agreement between the two subsamples was assessed by calculating the Kappa coefficient.

To evaluate the construct validity of the original 3 subscales of PHEEM, a confirmatory factor analysis was applied; also, an explanatory factor analysis (principal components analysis) was used and followed by varimax rotation; factors with extraction values above 0.5 and Eigen values above 1.0 were included (Kaiser-Guttman criterion). We used the Kaiser-Meyer-Olkin (KMO) measure to assess the suitability of data for detecting structure. Bartlett's test of sphericity was used to test the hypothesis that the correlation matrix is an identity matrix. This would indicate that the variables are unrelated and therefore, unsuitable for structure detection.

Results

The PHEEM questionnaire was completed by all 89 emergency medicine residents from 3 active Iranian training programs. Of the respondents, 70 (79.5%) were male. Their training was as follows: postgraduate year (PGY)-1 residents: 26 (29.2%); PGY-2 residents: 39 (43.8%); and PGY-3 residents: 24 (27.0%).

Out of 3293 possible responses to the 37 items, only 6 were missing. The mean score for the total questionnaire was found to be 2.24 (SD: 0.06). The subscale mean scores for role autonomy, teaching quality and support social were 2.40 (0.58), 2.57 (0.35) and 2.21 (0.67), respectively. The mean score and standard deviation on each item are reported in Table 1.

Subgroup analysis revealed no significant difference in terms of gender, level of training and training site for the total questionnaire (Table 2). The administration of the Persian PHEEM revealed a Cronbach's alpha value of 0.86 for the whole ques-

Table 1. Descriptive statistics of ratings by 89 Iranian emergency medicine residents to the 37-item PHEEM questionnaire (Persian version) on a five-point Likert scale (strongly disagree: 0 to strongly agree: 4)

Subscale	Item	Mean	SD	Cronbach's alpha, if item deleted	Kappa (SE)*
Perceptions of role autonomy	1. I have a contract of employment that provides information about hours of work	3.48	0.60	0.74	0.70 (0.11)
	4. I had an informative induction program	2.34	1.05	0.74	0.80 (0.10)
	5. I have the appropriate level of responsibility in this post	2.65	0.74	0.71	0.31 (0.07)
	8. I have to perform inappropriate tasks	2.10	1.08	0.74	0.89 (0.09)
	9. There is an informative Junior Doctors Handbook	1.12	0.96	0.74	0.85 (0.10)
	11. I am bleeped inappropriately [†]				
	14. There are clear clinical protocols in this post	2.03	0.89	0.70	0.70 (0.09)
	17. My hours conform to the New Deal	2.40	0.99	0.75	0.81 (0.09)
	18. I have the opportunity to provide continuity of care [†]				
	29. I feel part of a team working here	2.62	0.98	0.69	0.76 (0.10)
	30. I have opportunities to acquire the appropriate practical procedures for my grade	2.57	0.86	0.73	0.78 (0.11)
	32. My workload in this job is fine	1.96	1.02	0.73	1.00 (0.10)
	34. The training in this post makes me feel ready to be an SpR/Consultant	2.72	0.76	0.70	1.00 (0.12)
40. My clinical teachers promote an atmosphere of mutual respect	2.90	0.93	0.72	0.89 (0.11)	
Perceptions of teaching	2. My clinical teachers set clear expectations	2.52	0.79	0.86	0.68 (0.10)
	3. I have protected educational time in this post	2.27	0.90	0.87	0.47 (0.09)
	6. I have good clinical supervision at all times	2.77	0.71	0.86	0.67 (0.11)
	10. My clinical teachers have good communication skills	2.90	0.86	0.85	0.62 (0.11)
	12. I am able to participate actively in educational events	2.94	0.69	0.87	0.77 (0.12)
	15. My clinical teachers are enthusiastic	2.71	0.92	0.86	0.74 (0.09)
	21. There is access to an educational program relevant to my needs	2.38	0.78	0.86	0.76 (0.10)
	22. I get regular feedback from seniors	2.05	0.94	0.87	0.82 (0.09)
	23. My clinical teachers are well organized	2.70	0.89	0.85	0.86 (0.11)
	27. I have enough clinical learning opportunities for my needs	1.88	1.02	0.87	0.77 (0.09)
	28. My clinical teachers have good teaching skills	2.78	0.92	0.85	1.00 (0.12)
	31. My clinical teachers are accessible	3.25	0.62	0.87	1.00 (0.15)
	33. Senior staff utilize learning opportunities effectively	2.38	0.83	0.86	1.00 (0.13)
37. My clinical teachers encourage me to be an independent learner	2.65	0.83	0.86	0.73 (0.10)	
39. My clinical teachers provide me with good feedback on my strengths and weaknesses	2.45	0.90	0.86	0.92 (0.11)	
III. Perceptions of social support	7. There is racism in this post [†]				
	13. There is sex discrimination in this post	2.80	1.12	0.60	0.92 (0.10)
	16. I have good collaboration with other doctors in my grade	3.00	0.69	0.63	1.00 (0.11)
	19. I have suitable access to careers advice	1.70	1.02	0.62	0.75 (0.09)
	20. This hospital has good quality accommodation for junior doctors, especially when on call	1.32	1.11	0.63	0.89 (0.09)
	24. I feel physically safe within the hospital environment	2.70	0.89	0.58	0.83 (0.10)
	25. There is a no-blame culture in this post	2.01	1.12	0.58	0.93 (0.09)
	26. There are adequate catering facilities when I am on call	1.17	1.16	0.56	0.80 (0.12)
	35. My clinical teachers have good mentoring skills	2.75	0.85	0.64	1.00 (0.12)
	36. I get a lot of enjoyment out of my present job	2.85	0.87	0.59	0.74 (0.09)
	38. There are good counseling opportunities for junior doctors who fail to complete their training satisfactorily	1.87	0.84	0.59	0.85 (0.09)

SD: Standard Deviation; SE: Standard Error; *Test-Retest in 30 residents; [†]Items 7, 11 and 18 have been deleted in Persian PHEEM questionnaire.

tionnaire and 0.87, 0.75 and 0.62 for its comprising subscales: perception of teaching, role autonomy, and social support, respectively. Values of "alpha if item deleted" which estimates what the questionnaire's Cronbach's alpha would be if a particular item is removed has been shown in Table 1. The Kappa coefficient for each question, estimated by test-retest in a smaller subsample, is reported in the last column of Table 1.

Confirmatory factory analysis revealed that there is a significant model misfit based on the 3 original subscales ($P < 0.00001$, chi-square = 1496 based on 626 degrees of freedom). The adjusted goodness of fit index (AGFI) was 0.491.

The KMO measure of sampling adequacy indicates that 0.725 of

the variance in variables might be caused by underlying factors. The P value for Bartlett's test was < 0.001 . All initial communalities were more than 0.493 and the questions 15 and 11 had the least initial communalities (less than 0.5); all extracted communalities were more than 0.277 and only three questions (11, 8 and 15) had extracted communalities less than 0.3.

On exploratory factor analysis, eleven components had eigenvalues more than 1 (accounting for 72.87% of the variance); of these, four components had more than five percent contribution in total variance. The first component had an eigenvalue of 10.27 (accounting for 27.76% of variance), and the other 10 components had eigenvalues between 3.16 and 1.08 (Figure 2). The cu-

Table 2. Subgroup analysis of the total scores

Variable	Number	Mean	Standard Deviation	P value
Gender				0.76
Male	67	89.08	14.80	
Female	17	87.76	22.12	
Training level				0.09
PGY-1	25	94.20	13.68	
PGY-2	39	87.38	17.51	
PGY-3	21	84.23	16.18	
Training site				0.32
TUMS	37	88.18	13.30	
SBMU	27	85.81	20.88	
IUMS	21	92.95	14.66	

Table 3. Components of PHEEM questionnaire with eigenvalues more than 1 and list of questions with extraction factors more than 0.5 in each component (more explanation is provided in the Results section)

Component	Item
C1	6, 10, 15, 23, 28, 30, 31, 35, 40
C2	21, 29, 34, 37, 39
C3	3, 27, 32
C4	24, 25, 26
C5	8, 22
C6	19, 38
C7	20
C8	4
C9	5, 12
C10	16
C11	2

Scree Plot

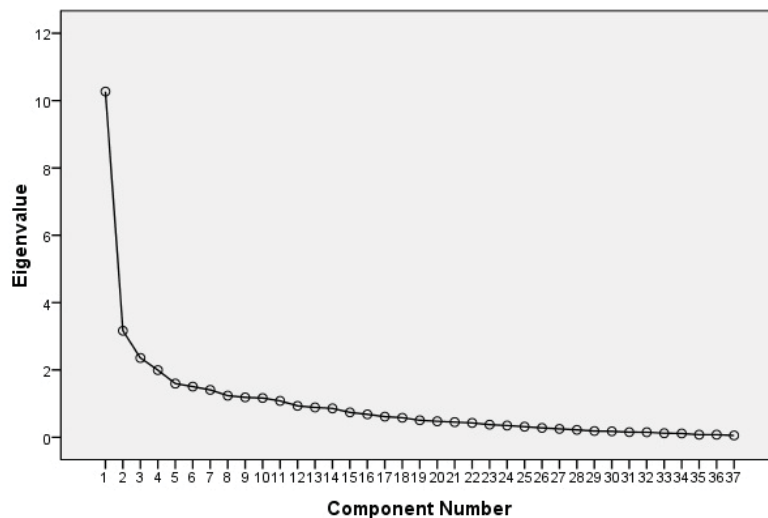


Figure 2. Scree plot depicting the eigenvalues of the components of the Persian version of PHEEM questionnaire

mulative variability explained by the extracted components was 61.71%, a difference of 11.16% from the initial solution. Thus, about 11% of the variation explained by the initial solution cannot be explained by the factor model. Table 3 shows the list of questions in each component with extraction values more than 0.5 in varimax rotation.

Discussion

This study evaluated the reliability, construct validity and applicability of the Persian version of PHEEM instrument using a

sample of emergency medicine residents.

Mean scores

According to the published guide suggested for interpretation of the mean total score,¹¹ the results of this survey revealed a more positive than negative environment with room for improvement. The scores in the three subscales were as follows: perceptions of role autonomy, a more positive perception of one’s job; perceptions of teaching, moving in the right direction; and perceptions of social support, more pros than cons.

The lowest recorded score was 1.12 (for item 9: “There is an

informative junior doctors handbook”) and the highest was 3.48 (for item 1: “I have a contract of employment that provides information about hours of work). While no item was rated > 3.5 , three items were rated ≥ 3 pointing to the positive aspects of our programs. These included clarity of work hours, faculty accessibility, and collaborative relationship. Weaknesses in the environment, as indicated by a mean score of less than 2, appeared in 7 items. These serious problem areas need to be recognized and remedial actions should be planned accordingly. Interestingly, the remaining 27 questions were rated between 2 and 3. These are the elements of the environment that can be enhanced.

Subgroup analysis

We also performed subgroup analysis in terms of gender, level of training and training site to determine if the educational environment was uniform across all these variables or possibly varied between them. Our findings revealed no significant difference in the above-mentioned subgroups for the total questionnaire or its subscales. Previous studies have shown varying results in this respect. Data from other studies revealed statistically significant differences between students of different genders.^{5,10} Boor et al., however, found no significant difference between the response patterns of men and women.² In our study, only a small fraction of participants were female and this might have impacted our observation. Clapham et al. found some differences between various levels of trainees,⁵ while Kanashiro & Roff demonstrated that the overall score did not indicate any differences between junior and senior residents except in the amount of support that junior residents have to achieve.¹⁰ Furthermore, while Clapham et al. found that the perceptions of the educational environment differ between training sites,⁵ Kanashiro & Roff concluded that the educational environments within their program at the 2 training sites were generally comparable.¹⁰ Neither these studies attempted to explain the reasons for these discrepancies.

Internal consistency

We have shown that administration of PHEEM in the emergency medicine department established a good internal consistency as reflected by a high Cronbach's alpha coefficient (0.86). This means that the items of the questionnaire measure a single underlying construct: the overall “educational environment.” Furthermore, since no value of “alpha if item deleted” was greater than the alpha of the whole questionnaire, one can conclude that there is no need to delete any of them.

According to Wall et al. who analyzed scores from 1563 sets of data from the UK, Brazil, Chile and the Netherlands, PHEEM has been demonstrated to give reliable outcomes within different settings, with an overall value of 0.92 for Cronbach's alpha.²² All other studies, including ours, have shown comparable results yielding Cronbach's alpha > 0.8 .^{4,13,19,23} However, as Cronbach's coefficient is dependent on the number of items, one should be cautious while interpreting the alpha values.²² Schönrock-Adema et al. used a 36-item PHEEM in their study and showed that the reliability of one subscale with 5 items changed from 0.66 to 0.81 after correction for the test length.²⁴ In our study, the modified PHEEM with 37 items might have been affected to some extent by the fact that the number of items were reduced from 40 to 37.

Kappa

The Kappa coefficient, as a measure of agreement between the

two samples taken within a 30-day interval, was more than 0.74 for 29 items, indicating excellent inter-sample agreement. Items 2, 3, 6, 10, 37 (related to perception of teaching), 1 and 14 (related to role autonomy) had coefficients that suggested good agreement. None of the questions scored in the “fair agreement” range and only item 5 “I have the appropriate level of responsibility in this post” (related to perception of role autonomy), had a coefficient that suggested poor agreement (< 0.40). The poor agreement observed for this item may be attributed to the fact that during the 30-day test interval, a written job description was given to the residents and this may have affected their answers to this question. Our findings are in concert with those of Vieira.¹⁸

Construct validity

As the empirical data did not conform well to the model, we could not find any evidence to support the construct validity of the 3 distinct subscales of PHEEM, as driven by original developers through *a priori* theoretical reasoning. As shown by factor analysis, this modified version of PHEEM is in fact a one-factor single scale instrument and measures a one dimensional construct. This is similar to the findings of some other researchers,^{2, 4, 24} but differs from the Pinnok's, Wall's and Riquelme's perspectives that found two, three and five subscales, respectively.^{19,22,23} This can be due to the fact that the variables which influence the learning environment are numerous, complex, and interrelated. Although one can argue that the construct might have been altered through modification of the instrument, the existing literature supports our argument that the scale is one dimensional. The existence of several lesser subscales, however, cannot be ruled out although we found only one principal component. Summarizing the results of PHEEM into 3 categories might be useful from a practical point of view.

Implication and suggestion

Measuring the educational environment is useful for quality assurance of medical residency programs by identifying both the examples of excellence and the areas of concern. Curriculum developers should consider these results as they plan to improve the training programs. A measure of this kind can inform the teachers and the trainees of the quality of their educational climate and can also serve as a basis for comparison of educational climate at different points in time.

Feasibility

We did not formally measure the time required to complete the form. However, our anecdotal experience was that the residents found it a simple and practical task.

Limitations

Our study faces several limitations that should be considered when the results are to be used. First, our results might have been influenced by a relatively small sample size. This is due to the fact that emergency medicine is a rather young specialty and there were only three active training programs in our country at the time of the study. The problem is more pronounced when trying to perform subgroup analysis as there were not enough cases in some subgroups.

Secondly, although our method of reliability assessment and the proposition that the instrument is reliable for measuring the educational environment in the setting of emergency department

may be reproducible, the scores driven from administration of the questionnaire in our hospitals may not be generalizable.

Finally, our results depict a snapshot of the climate prevailing at the time of the study. Hence, frequent administrations of the questionnaire may be useful in tracing the impact of interventions made to enhance the educational environment. Major changes in the environment in which postgraduate training takes place may necessitate revision of the instrument items.

In conclusion, the results from this study support the use of the Persian version of PHEEM as a simple, practical and reliable questionnaire for assessing the clinical educational environment in the emergency department as well as giving a useful indication of the priorities for curricular reform. It seems that the overall PHEEM scale is more valuable than its three subscales.

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Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

References

1. Tokuda Y, Goto E, Otaki J, Jacobs J, Omata F, Shapiro M, et al. Educational environment of university and non-university hospitals in Japan. *International Journal of Medical Education*. 2010; **1**: 10 – 14.
2. Boor K, Scheele F, van der Vleuten CPM, Scherpbier AJJA, Teunissen PW, Sijtsma K. Psychometric properties of an instrument to measure the clinical learning environment. *Med Educ*. 2007; **41**: 92 – 99.
3. Demirören M, Palaoglu Ö, Kemahli S, Özyurda F, Ayhan IH. Perceptions of Students in Different Phases of Medical Education of Educational Environment: Ankara University Faculty of Medicine. *Med Educ Online*. 2008; **13**: 8.
4. Gooneratne IK, Munasinghe SR, Siriwardena C, Olupeliyawa AM, Karunathilake I. Assessment of Psychometric Properties of a Modified PHEEM Questionnaire. *Annals of Academic Medicine Singapore*. 2008; **37**: 993 – 997.
5. Clapham M, Wall D, Batchelo A. Educational environment in intensive care medicine: use of Postgraduate Hospital Educational Environment Measure (PHEEM). *Med Teach*. 2007; **29**: 184 – 191.
6. Pololi L, Price J. Validation and use of an instrument to measure the learning environment as perceived by medical students. *Teach Learn Med*. 2000; **12**: 201 – 207.
7. Roff S, McAleer S, Harden RM, Al-Gahtani M, Ahmed AU, Deza H, et al. Development and validation of the Dundee Ready Education Environment Measure (DREEM). *Med Teach*. 1997; **19**: 295 – 299.
8. Holt MC, Roff S. Development and validation of the Anaesthetic Theatre Educational Environment Measure (ATEEM). *Med Teach*. 2004; **26**: 553 – 558.
9. Cassar K. Development of an instrument to measure the surgical operating theatre learning environment as perceived by basic surgical trainees. *Med Teach*. 2004; **26**: 260 – 264.
10. Kanashiro J, Roff S. Assessing the educational environment in the operating room—a measure of resident perception at one Canadian institution. *Surgery*. 2006; **139**(2): 150 – 158.
11. Roff S, McAleer S, Skinnera. Development and validation of an instrument to measure the postgraduate clinical learning and teaching educational environment for hospital-based junior doctors in the UK. *Med Teach*. 2005; **27**(4): 326 – 331.
12. Boor K, Scheele F, van der Vleuten C, Teunissen P, den Breejen E, Scherpbier A. How undergraduate clinical learning climates differ: a multi-method case study. *Med Educ*. 2008; **42**: 1029 – 1036.
13. Aspegren K, Bastholt L, Bested KM, Bonnesen T, Ejlersen E, Fog I, et al. Validation of the PHEEM instrument in a Danish hospital setting. *Med Teach*. 2007; **29**: 504 – 506.
14. Filho GO, Vieira JE. The Relationship of Learning Environment, Quality of Life, and Study Strategies Measures to Anesthesiology Resident Academic Performance. *Anesth Analg*. 2007; **104**: 1467 – 1472.
15. Khan JS. Evaluation of the educational environment of postgraduate surgical teaching. *J Ayub Med Coll Abbottabad*. 2008; **20**(3): 104 – 107.
16. Lucas MN, Samarage DK. Trainees' perception of the clinical learning environment in the postgraduate training programme in paediatrics. *Sri Lanka Journal of Child Health*. 2008; **37**: 76 – 80.
17. Taguchi N, Ogawa T, Sasahara H. Japanese dental trainees' perceptions of educational environment in postgraduate training. *Med Teach*. 2008; **30**: 189 – 193.
18. Vieira JE. The postgraduate hospital educational environment measure (PHEEM) questionnaire identifies quality of instruction as a key factor predicting academic achievement. *Clinics*. 2008; **63**: 741 – 746.
19. Pinnock R, Reed P, Wright M. The learning environment of paediatric trainees in New Zealand. *J Paediatr Child Health*. 2009; **45**: 529 – 534.
20. Gough J, Bullen M, Donath S. PHEEM 'Downunder'. *Med Teach*. 2010; **32**: 161 – 163.
21. Jones PS, Lee JW, Phillips LR, Zhang XE, Jaceldo KB. An adaptation of Brislin's Translation Model for Cross-cultural Research. *Nurs Res*. 2001; **50**: 300 – 304.
22. Wall D, Clapham M, Riquelme A, Vieira J, Cartmill R, Aspegren k, Roff S. Is PHEEM a multi-dimensional instrument? An international perspective. *Med Teach*. 2009; **31**: 521 – 527.
23. Riquelme A, Herrera C, Aranis C, Oporto J, Padilla O. Psychometric analyses and internal consistency of the PHEEM questionnaire to measure the clinical learning environment in the clerkship of a Medical School in Chile. *Med teach*. 2009; **31**: 221 – 225.
24. Schönrock-Adema J, Heijne-penninga M, Van Hell EA, Cohen-Schotanus J. Necessary steps in factor analysis: Enhancing validation studies of educational instruments. The PHEEM applied to clerks as an example. *Med Teach*. 2009; **31**: 226 – 232.