

Psychometric Properties of the Dundee Ready Educational Environment Measure in a Sample of Ghanaian Medical Students

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ABSTRACT

Background: The Dundee Ready Educational Environment Measure (DREEM) has been widely accepted and recognized for the assessment of the educational environment in a variety of health professions education programs. Concerns regarding the psychometric properties of the DREEM have been raised. This study evaluated the psychometric properties of the DREEM in a sample of Ghanaian medical students following a problem-based learning curriculum. **Methods:** A sample of 234 second to fourth year medical students of the University for Development Studies, School of Medicine and Health Sciences were invited to complete the DREEM questionnaire. Psychometric measures employed included Cronbach's alpha analysis, confirmatory factor analysis and principal component analysis with varimax rotation. **Results:** The internal consistency for the overall DREEM was 0.92. Apart from two subscales that had Cronbach's alpha values < 0.70, the remainder had values ranging from 0.73 – 0.78. Confirmatory factor analysis did not support the original five factor structure of the DREEM. Large significant correlation coefficients were found between the five factors raising concerns about the independency of the individual subscales. Exploratory factor analysis suggested various factor solutions ranging from 4 to 14 factors. The four factor structure was interpretable and was maintained. All of the four factors achieved eigenvalues > 1, and in total they accounted for 37.6% of the variance. Alpha values for the subscales of the new four factor structure ranged from 0.618 – 0.915. **Discussion:** The overall internal consistency of the DREEM was found to be excellent. The internal consistency of the individual subscales was variable, as two subscales had alpha values < 0.70 and the remainder exceeding 0.70. The original five factor structure of the DREEM was not supported. Exploratory factor analysis suggested a four factor solution as a possible alternative to the five factor structure of the DREEM.

Keywords: Dundee Ready Educational Environment Measure, Ghana, learning environment, medical students, psychometric properties

Background

A school's educational environment encompasses student-teacher relationships, teaching and learning strategies, students' psychosocial and emotional needs, as well as the physical structures and facilities provided of the institution.^[1] A


productive and conducive learning environment is provided if the higher education institution is able to provide all of these. It is generally recognized that the learning environment affects students' competencies, academic achievement and success.^[2,3] It is therefore not surprising that the educational environment has been identified as one of the targets for the evaluation of medical education programmes by the World Federation for Medical Education.^[4]

Several tools have been developed to assess a school's educational environment over the last four decades.^[5-7]

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Although several of these tools have been shown to have robust validity and high measurement reliability,^[8] the most widely used and accepted one in medical education is the Dundee Ready Educational Environment Measure (DREEM),^[9] developed by Roff *et al.*^[10] It measures students' perceptions of the educational environment in five areas: Teaching, course organization, academic self-perception, atmosphere and social self-perception. The DREEM has been used for several purposes including to identify weaknesses in the curricula to inform change,^[11-14] to compare students' expectations with actual experiences to identify gaps that requires improvement^[13] and to compare the learning environments at different training sites^[15,16] and at various stages^[14] of their training. The DREEM also provides an opportunity to compare the educational environment across higher education institutions internationally^[17,18] allowing medical schools to benchmark their educational environments.^[19,20]

The use of the DREEM for both within-country and cross-national comparisons makes it pertinent to continuously assess its psychometric properties^[21] because variations across countries in its reliability and validity can affect the meaning of comparisons. The few studies that have assessed the psychometric properties of the DREEM have reported mixed results that do not fully support the validity and reliability of its original structure.^[19,21-26]

In 2007 the University for Development Studies, School of Medicine and Health Sciences (UDS-SMHS) adopted and implemented PBL (Problem-based learning) for the training of its medical students through a curriculum referred to as the Problem-based learning, Community-based Education and Service Curriculum.^[27] Out of Ghana's five medical schools, the UDS-SMHS is one of two that uses the PBL methodology. After graduating two annual cohorts of students through this curriculum, a curriculum review has led to changes. Given these changes, it is important to assess students' perceptions of the educational environment to serve as baseline data for the local curriculum review. Furthermore, the educational environment has been accorded little attention in Ghana and other countries in sub-Saharan Africa. Therefore the data generated from this study will supplement the limited research on the educational environment in sub-Saharan Africa through the application and validation of the DREEM for the first time here.

This study aims to investigate the psychometric properties of the DREEM in a sample of Ghanaian medical students.

Methods

Setting and participants

This cross-sectional study was conducted among preclinical medical students of the University for Development Studies,

School of Medicine and Health Sciences (UDS-SMHS). The UDS-SMHS medical programme is seven years during which students complete their preclinical training in years one through four, and subsequently move to clinical training in years five through seven. In year one, students follow a classical teaching and learning methodology as a preparatory year for subsequent years. The curriculum for years two through seven follows a PBL methodology. To allow for uniformity of teaching and learning methodologies and for convenience, only students from years two to four were eligible to participate in this study, which was voluntary. This study was approved by the Ethics Committee of the University for Development Studies, School of Medicine and Health Sciences, Ghana.

Measures

The DREEM questionnaire as well as three questions on demographic characteristics (age, gender and year of study) was self-administered to all eligible students.

The Dundee Ready Educational Environment Measure

Developed by Roff *et al.*^[9] through a Delphi approach involving a range of health professional educators in different settings and various countries, the DREEM is a 50-item questionnaire used for assessing the educational environment in health professions education programs. Each item is rated on a five-point Likert scale: 0 is strongly disagree, 1 is disagree, 2 is neither agree or disagree, 3 is agree and 4 is strongly agree. With a maximum score of 200, the 50 items are categorized into five major domains: 1) perceptions of learning (max. score = 48), 2) perceptions of teachers (max. score = 44), 3) academic self-perceptions (max. score = 32), 4) perceptions of atmosphere (max. score = 48), and 5) social self-perceptions (max. score = 28). These five domains were identified through the initial psychometric assessment of the DREEM by Roff *et al.*^[9] Nine items (Items 4, 8, 9, 17, 25, 35, 39, 48 and 50) are negatively worded and are recoded prior to calculating total and subscale scores. The entire DREEM questionnaire was employed for this study with a few minor changes.

Data collection procedure

The DREEM questionnaire was administered to all students following an exam given at the end of a curriculum block. Although voluntary, all students agreed to participate. Students spent typically 10 to 15 minutes to complete the questionnaire.

Statistical analysis

All data were manually entered into IBM SPSS version 21 (IBM Corp., USA) and later saved as a Microsoft Excel 2010 file. Descriptive statistics of mean, standard deviation and frequencies were used to describe the study sample. Basic

psychometric properties including reliability and validity were tested. Prior to analyses, the data was assessed for its suitability for factor analysis. With a Kaiser–Meyer–Olkin measure of sampling adequacy of 0.857 and a statistical significance ($P < 0.001$) of Bartlett’s test of Sphericity, the data and sampling were deemed to be adequate and suitable for validity and reliability tests. Internal consistency was tested through Cronbach’s alpha.^[27] In addition, corrected item-total correlation (CITC) and Cronbach’s alpha values if items are deleted (CAID) were also calculated. Both total and subscale Cronbach’s alphas were calculated. Ideally, alpha values should range between 0.7 and 0.9 to demonstrate acceptable reliability, but values as low as 0.6 are sometimes considered acceptable.^[28] Alpha values below 0.6 suggest high heterogeneity and values above 0.9 suggest that the items may be too similar (item redundancy).^[23] To test the original five factor structure of the DREEM using confirmatory factor analysis (CFA), we used AMOS Version 21 (IBM Corp.) and the Maximum Likelihood Estimation method. CFA investigates how the data fits into a predetermined and constructed model by presenting the relationship between the data in the model and estimation of errors.^[22] An array of model fit statistics is produced to describe the relationship between the data and the model. Assessment of model fit of the data was done using model Chi-square goodness-of-fit and approximate fit indices.^[24] A non-significant ($P > 0.05$) Chi-square goodness of fit indicates a model fit. The approximate fit indices employed included: Goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), normed fit index (NFI), relative fit index (RFI), incremental fit index (IFI), Tucker-Lewis fit index (TFI) and comparative fit index (CFI). The rest were root mean square error of approximation (RMSEA) and root mean squared residual (RMR) in which values less than 0.05 would signify reasonable model fit.^[29,30] Values greater than 0.9 arising from the GFI, NFI, RFI, IFI, TFI and CFI indicate model fit,^[30,31] whereas values of 0.85 and greater represent acceptable model fit. RMSEA values of 0.08 and less (preferably less than 0.05) and RMR values of 0.05 and less indicate a reasonable model fit.^[30,31] These descriptive fit indices are very sensitive to sample size,^[23] hence we employed several indices. In our efforts to further assess the factor structure of the DREEM an explorative factor analysis was conducted. Factor loadings were obtained after varimax rotation. Calculating corrected item-to-subscale, item-to-total correlation coefficients, and the respective Cronbach’s alpha coefficients assessed internal consistency. We used Kaiser’s eigenvalue criterion (> 1) and a scree plot^[32] to determine the number of factors to extract.

Results

Two hundred and sixty five questionnaires were distributed to students, and 234 complete questionnaires were returned to yield a response rate of 88.3%. Of the 234 respondents, 118

were male and 81 were female (35 students did not indicate their gender). Respondents had a mean \pm SD age of 22.2 ± 2.1 ranging from 18 to 34 years of age (16 students did not indicate their age).

The basic psychometric properties of the DREEM in our sample are as shown in Table 1. The internal consistency for the overall DREEM score was 0.92. All subscales had Cronbach’s alphas ranging from 0.73 – 0.78 except for the social self-perception and the academic self-perception subscales, which had Cronbach’s alphas < 0.70 .

The mean total score of the DREEM was 115.57. The corrected item-total correlations and Cronbach’s alpha if item deleted of the items according to the subscales of the DREEM are presented in Table 2.

All items had corrected item-total correlations of 0.2 or greater except items 4, 10, 17, 39, 48, and 50. Item 48 (The teaching is too teacher-centred), item 17 (Cheating is a problem in this school), item 50 (The students irritate the teachers), and item 4 (I am too tired to enjoy this programme) had extremely low corrected item-total correlations of -0.003, -0.051, 0.07 and 0.097 respectively. Generally, the deletion of the items with corrected items-total correlations < 0.2 improved the Cronbach’s alphas of their individual subscales [Table 2].

Construct validity

A confirmatory factor analysis was conducted on the original DREEM questionnaire to determine its construct validity [Table 3]. The present data did not fit Roff *et al.*’s five-factor structure of the DREEM questionnaire. Standardized regression weights (factor loadings) ranged from 0.024 to 0.732 indicating that some items did not represent the constructs being measured. A low goodness-of-fit was indicated by a significant Chi-square test ($P < 0.001$), GFI (=0.70), AGFI (=0.67), CFI = (0.67), TLI = (0.65), NFI (=0.52) as well as RMR (=0.094). Only RMSEA (=0.068) showed quite an acceptable fit. Apart from seven items, all items had standardized regression weights ≥ 0.3 . These items were 4, 10, 17, 25, 39, 48 and 50. Items 17 and 48 had extremely low standardized regression weights.

Table 1: Basic psychometric properties of the original Dundee Ready Educational Environment Measure questionnaire (n=234)

Subscale	Mean	Cronbach’s alpha	Average inter-item correlation	n
Perception of learning	27.94 \pm 6.83	0.74	0.19	12
Perception of teachers	25.41 \pm 6.91	0.78	0.25	11
Academic self-perception	20.74 \pm 4.71	0.69	0.22	8
Atmosphere	26.56 \pm 6.97	0.73	0.19	12
Social self-perception	14.92 \pm 4.37	0.54	0.15	7
Total score	115.57 \pm 25.22	0.92	0.19	50

Table 2: Corrected item-total correlations and Cronbach's Alpha if item deleted of the items of the Dundee Ready Educational Environment Measure according to subscales (n=234)

Item	Corrected item-total correlations	Cronbach's alpha if item deleted
Perception of learning		
1	0.390	0.722
7	0.595	0.694
13	0.358	0.726
16	0.599	0.694
20	0.567	0.700
21	0.541	0.702
24	0.512	0.705
25	-0.227	0.792
38	0.364	0.725
44	0.478	0.712
47	0.419	0.718
48	-0.003	0.767
Perception of teachers		
2	0.524	0.758
6	0.487	0.759
8	0.380	0.772
9	0.421	0.767
18	0.559	0.751
29	0.525	0.754
32	0.381	0.771
37	0.524	0.756
39	0.191	0.793
40	0.552	0.754
49	0.315	0.780
Academic self-perception		
5	0.274	0.689
10	0.180	0.696
22	0.536	0.622
26	0.404	0.654
27	0.392	0.656
31	0.396	0.656
41	0.437	0.648
45	0.434	0.647
Atmosphere		
11	0.563	0.682
12	0.357	0.711
17	0.051	0.755
23	0.608	0.677
30	0.458	0.698
33	0.334	0.714
34	0.578	0.68
35	0.318	0.716
36	0.423	0.704
42	0.316	0.717
43	0.529	0.686
50	-0.074	0.762
Social self-perception		
3	0.206	0.531
4	0.097	0.579
14	0.269	0.507

Contd...

Table 2: Contd...

Item	Corrected item-total correlations	Cronbach's alpha if item deleted
15	0.382	0.474
19	0.382	0.463
28	0.334	0.480
46	0.293	0.497

Bold items had correlations <0.2

Correlations between the factors from the confirmatory factor analysis are presented in Table 4. The correlations between the factors are very large raising issues about the independence of the individual factors.

Exploratory factor analysis using principal component analysis with varimax rotation was conducted. Various factor solutions were provided ranging from 4 to 14 factors. However, the four factor structure was found to be both statistical and theoretical logical. Explaining 37.6% of its variance, the four factors had eigenvalues > 1 with items having communalities that ranged from 0.089 to 0.621 [Table 5]. Item 17 had an extremely low communality (0.089). Three items (13, 17 and 50) had communality values < 0.2 [Table 5]. Except items 17 (Cheating is a problem in this school), item 14 (I am rarely bored on this programme) and item 13 (The teaching is student-centred) which had factor loadings < 0.3; all items had loadings ≥ 0.3. Each factor was reviewed and named according to the content of the items loading onto it [Additional File 1]. The review of the individual items loading onto the factors indicated that some items were classified illogically; these items were moved to appropriate factors. Items 28, 42 and 46 were moved from factor 2 to factor 3. In a similar fashion, items 10 and 41 from factor 3 to factor 2. The decision to make the changes was borne out of the fact that the content of the items were either appropriate for the new factor (10, 46, and 42), and/or the items loaded similarly to both factors (28 and 41). Cronbach's alpha analysis of the new four factor solution yielded values ranging from 0.619 to 0.915 indicating an acceptable reliability. Corrected item-subscale correlations were used to determine the adequacy of each item within a factor. The first factor had corrected item-subscale correlations that ranged from 0.376 to 0.714; from 0.323 to 0.590 for the second factor; from 0.245 to 0.537 for the third factor and from 0.195 to 0.385 for the fourth factor. Six items (25, 17, 48, 50, 10 and 14) had corrected item-subscale correlations below 0.3.

Discussion

This study considered the psychometric properties of the DREEM in a sample of Ghanaian preclinical medical students. In this sample the overall DREEM scale had an excellent internal consistency. Even though the Cronbach's alpha of three of the

Table 3: Results of the confirmatory factor analysis of the original Dundee Ready Educational Environment Measure questionnaire (n=234)

Items	Factors				
	I	II	III	IV	V
Factor 1: Perception of learning					
1	0.430				
7	0.646				
13	0.374				
16	0.648				
20	0.732				
21	0.640				
24	0.678				
25	0.282				
38	0.501				
44	0.554				
47	0.495				
48	0.055				
Factor 2: Perception of teachers					
2		0.585			
6		0.552			
8		0.302			
9		0.322			
18		0.638			
29		0.660			
32		0.537			
37		0.599			
39		0.146			
40		0.691			
49		0.379			
Factor 3: Academic self-perception					
5			0.378		
10			0.189		
22			0.652		
26			0.511		
27			0.442		
31			0.510		
41			0.575		
45			0.486		
Factor 3: Atmosphere					
11				0.673	
12				0.467	
17				0.024	
23				0.716	
30				0.579	
33				0.472	
34				0.711	
35				0.326	
36				0.538	
42				0.369	
43				0.564	
50				0.146	
Factor 5: Social self-perception					
3					0.454
4					0.133
14					0.411
15					0.390

Contd...

Table 3: Contd...

Items	Factors				
	I	II	III	IV	V
19					0.417
28					0.416
46					0.491

χ^2 : P<0.001; GFI=0.700; AGFI=0.672; NFI=0.521; RFI=0.496; RMR=0.094; RMSEA=0.068
P<0.001

Table 4: Factor correlation matrix of the original Dundee Ready Educational Environment Measure (n=234)

Subscales	I	II	III	IV	V
I. Perception of learning	1				
II. Perception of teachers	0.919	1			
III. Academic self-perception	0.997	0.842	1		
IV. Atmosphere	0.914	0.858	0.928	1	
V. Social self-perception	0.84	0.726	0.900	0.896	1

subscales were above 0.70 indicating an acceptable internal consistency, two subscales had values below 0.70. The five factor structure of the original DREEM was not supported, raising concerns about its construct validity. Exploratory factor analysis suggested a four-factor solution, which was found to have acceptable internal consistency and construct validity.

The total Cronbach's alpha of the DREEM was 0.920, quite similar to those reported previously^[22-24,33] but higher than that reported by Hammond *et al.*^[21] and lower than that of Wang *et al.*^[25] among nursing students in China. The subscales had Cronbach's alpha values that ranged from 0.54 to 0.78. Generally, alpha scores over 0.7 are accepted as indicating good internal consistency.^[19,22,32] Similar to several other studies,^[19,21,23,26,33] the academic self-perception and the social self-perception subscales had Cronbach's alpha values below this threshold, indicating variable internal consistency of these subscales. The variation in the Cronbach's alpha scores suggests the sample-dependent characteristic of the statistic and warrants the call to continue to evaluate the psychometric properties of the DREEM.^[22]

Reviewing the individual items, items Q4, Q10, Q17, Q39, Q48 and Q50 had both low correlations and low factor loadings. Interestingly, most of these items are negatively worded (Q4, Q17, Q39, Q48 and Q50) and have been previously reported^[32-34] to reduce the reliability of the subscales they represent. In the present study the removal of these items improved the Cronbach's alpha values of their individual scales as demonstrated by the Cronbach's alpha values if item is deleted. This suggests that the internal consistency of the subscales could be improved by revising and restructuring these items. Still, the low correlations and low factor loadings of these items could also be as a result of the misinterpretation of these

Table 5: Principal component analysis with varimax rotation for the Dundee Ready Educational Environment Measure questionnaire (n=234)

Item	Factor loadings				Communalities
	1	2	3	4	
24	0.711				0.564
20	0.703		0.308		0.621
18	0.650				0.498
2	0.613				0.412
7	0.603				0.468
6	0.595				0.378
40	0.594				0.479
29	0.577				0.438
23	0.543	0.434			0.793
16	0.532		0.439		0.493
34	0.511	0.475			0.498
21	0.505				0.415
12	0.485	0.315			0.345
22	0.480		0.336		0.419
11	0.471	0.348			0.400
37	0.470	0.385			0.378
3	0.410	0.406			0.373
26	0.384	0.323			0.328
1	0.361		0.313		0.239
32	0.352	0.337			0.313
5	0.323				0.224
43		0.665			0.559
42		0.658			0.456
27		0.596			0.388
36		0.535	0.316		0.423
38		0.496			0.335
44	0.331	0.488			0.400
46		0.471			0.303
47		0.459			0.318
49	0.303	0.447			0.324
28		0.361	0.348		0.280
13		0.282			0.167
33			0.623		0.475
10			0.548		0.310
19			0.547		0.328
30	0.387		0.455		0.411
45			0.423		0.341
31		0.381	0.408		0.360
41		0.392	0.401		0.421
14			0.271		0.245
9	0.351			0.588	0.474
8				0.561	0.387
35				0.518	0.377
39				0.511	0.318
4				0.491	0.317
25	0.390			0.450	0.359
48				0.428	0.200
50				0.345	0.161
17				0.296	0.089
Eigenvalues	7.734	5.107	3.779	2.560	
% explained variance	14.749	10.214	7.558	5.120	
Cumulative %	14.749	24.963	32.521	37.640	
Cronbach's alpha	0.915	0.770	0.738	0.618	

Kaiser-Meyer-Olkin's test: 0.867. Bartlett's test of sphericity: $P < 0.001$

items by the students. High correlations were also observed between the subscales indicating there were significant overlapping and lack of discrimination between them.^[21] These findings also suggest there are repetitions of items measuring similar constructs that compromise the construct validity of the DREEM.^[24] Continued efforts should be made to revise and establish the psychometric properties of the DREEM, as suggested by Vaughan *et al.*^[33] and Hammond *et al.*^[21] Authors using the DREEM should endeavour to always report its psychometric properties.

In agreement with previous findings^[19,21,23,35] and as demonstrated above, our data did not support the original five-factor structure of the DREEM. With this in mind we conducted an exploratory factor analysis. After several factor solutions were suggested, a four-factor solution was arrived at, different from the original five-factor structure of the DREEM. Except factor 4, all factors in the new model had Cronbach's alpha values ranging from 0.750 to 0.915 indicating a good level of internal consistency of the subscales.

In the development of measurement scales, items with corrected item-subscale correlations < 0.20 is usually rejected.^[25] Only item 17 (Cheating is a problem in this school) had a corrected item-subscale correlation of 0.195 compared to six items on the original DREEM. In a study that assessed the internal consistency of the DREEM among Chinese nursing students, Wang *et al.*^[25] also found item 17 to have an item-subscale coefficient < 0.20 . In agreement with the suggestion of Wang *et al.*^[25] this item could be modified or suppressed to improve the internal consistency of the subscales of the DREEM.

Taking into account items with factor loadings ≥ 0.3 ,^[9] the four-factor solution had fewer items that had factor loadings below 0.3 compared to the five-factor structure. Whereas the original DREEM had seven items (14% of the items), the new four-factor solution had three items (6% of the items). These were items 13, 14 and 17. Item 17 has been reported in several studies to have low factor loadings.^[23,25] It stands to suffice that to obtain a reliable and valid DREEM, some factors would have to be revised and restructured. We reluctantly suggest the removal of these factors, as this should be done with caution. Items that might appear to be inappropriate in a particular population might not be so in another. Also the original validity and reliability of the DREEM as demonstrated by Roff *et al.*^[9] was derived from theoretical and qualitative procedures. Evidently, the new four-factor structure has not been proven to be a superior measurement model compared with the original, but could be seen as an alternative structure which can be explored/tested further.

Strengths and weakness of the study

This study is not without limitations. The study constituted medical students from a single institution, with a non-random

sample, limiting the generalizability of its findings. Conceding to the requirement of a sample size of 5-10 per item, with a minimum of 100 participants for factor analysis regardless of the number, our sample size of 234 cannot be said to be adequate for factor analysis for the DREEM instrument with 50 items.

Conclusion

This is the first study to assess the psychometric properties of the DREEM among medical students in Ghana and probably anywhere in Sub-Saharan Africa. The data generated from this study could be useful to other health professions institutions in other developing countries. To stakeholders of health professions educations, the DREEM could be used to assess the educational environment to identify issues and challenges from the perspective of the student.

In these Ghanaian medical students, the overall internal consistency of the DREEM total score was found to be excellent, as it was also for three of its subscales. Internal consistency of two subscales was not good, with Cronbach's alpha values below 0.7. Confirmatory factor analysis did not support the original five-factor structure of the DREEM. Several factors had factor loadings < 0.3. Exploratory factor analysis suggested a four-factor solution as a possible alternative to the five-factor structure of the DREEM. Since it is generally difficult to prove validity of a measurement scale in any *absolute* sense, we advocate for a comprehensive application of the DREEM in future studies across institutions and different nations to establish its psychometric properties.

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Conflicts of interest

There are no conflicts of interest.

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Appendix

The new four factor structure of the Dundee Ready Educational Environment Measure

The original factors of the items are presented in Roman numerals

- **Factor 1: Perception of teachers, learning and academic atmosphere**

- 1-I am encouraged to participate in all teaching and learning sessions I
- 2-The teachers are knowledgeable II
- 3-There is a good support system for students who get stressed V
- 5-Learning strategies which worked for me before continue to work for me now III
- 6-The teachers are patient with the patients/simulated patients II
- 7-The teaching is often stimulating I
- 11-The atmosphere is relaxed during teaching and learning sessions IV
- 12-This school is well timetabled IV
- 16-The teaching is sufficiently concerned with developing my competence I
- 18-The teachers have good communication skills with patients II
- 20-The teaching is well focused I
- 21-I feel I am being well prepared for my profession I
- 22-The teaching is sufficiently concerned with developing my confidence III
- 23-The atmosphere is relaxed during all teaching sessions IV
- 24-The teaching time is put to good use I
- 26-Last year's work has been a good preparation for this year's work III
- 29-The teachers are good at providing feedback to students II
- 32-The teachers provide constructive criticism II
- 34-The atmosphere is relaxed during all teaching and learning sessions IV

40-The teachers are well prepared for their classes II

37-The teachers give clear examples II

- **Factor 2: Motivation and metacognition**

43-The atmosphere motivates me as a learner IV

27-I am able to memorize all I need III

36-I am able to concentrate well IV

44-The teaching encourages me to be an active learner I

38-I am clear about the learning objectives of the course I

47-Long-term learning is emphasized over short-term I

49-I feel confident to ask the questions I want II

13-The teaching is student centered I

41-My problem-solving skills are being well developed here III

10-I am confident about passing this year III

- **Factor 3: Perception of Social environment**

33-I feel comfortable in class socially IV

15-I have good friends in this school V

19-My social life is good V

30-There are opportunities for me to develop interpersonal skills IV

45-Much of what I have to learn seems relevant to a career in medicine III

31-I have learned a lot about empathy in my profession III

14-I am rarely bored on this programme V

42-The enjoyment outweighs the stress of studying medicine IV

46-My accommodation is pleasant V

28-I seldom feel lonely V

- **Factor 4: Poor teaching and learning strategies**

8-The teachers ridicule the students II

9-The teachers are authoritarian II

39-The teachers get angry in class II

17-Cheating is a problem in this school IV

35-I find the experience disappointing IV

4-I am too tired to enjoy this programme V

25-The teaching over-emphasizes factual learning I

48-The teaching is too teacher centered I

50-The students irritate the teachers IV