

Original Research Article

## Medical Students' Perception of the Educational Environment at the University of Gadarif, Sudan: A Cross-Sectional Study

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**Abstract:** *Background:* The educational environment (EE) has a significant impact on medical students' learning, academic success, and professional development. Systematic EE evaluation provides important data for curriculum reform and quality assurance. However, evidence from resource-limited and underrepresented settings remains limited. This study aims to assess medical students' perceptions of the EE at the University of Gadarif in Sudan using Dundee Ready Educational Environment Measure (DREEM). *Methods:* A cross-sectional descriptive study was carried out with third, fourth, and fifth-year medical students. A total of 125 out of 361 eligible students participated. The standardized DREEM questionnaire, which assesses five domains—students' opinions of learning, instructors, academic self-perception, environment, and social self-perception—was used to gather the data. SPSS version 20 was utilized for data analysis. Descriptive statistics were computed, and independent samples t-test and one-way ANOVA were used to assess associations between students' characteristics and DREEM domain scores, with statistical significance set at  $p < 0.05$ . *Results:* Of 361 eligible students, 125 participated (response rate 34.6%). The mean total DREEM score was 111.2/200 (55.6%), indicating a borderline positive EE. Domain scores ranged from 53.9% to 57.5%, reflecting consistently moderate perceptions across all domains, with students' social self-perceptions scoring the lowest. Eleven items (22%) scored below two, highlighting key problem areas, particularly related to timetabling, teaching effectiveness, and student support systems. DREEM domains are variably affected by gender, residence, and academic level. *Conclusions:* The EE at the Faculty of Medicine, University of Gadarif was perceived as borderline positive, which is comparable to regional and international institutions. However, the relatively low response rate may limit representativeness. The findings highlight specific domains requiring targeted interventions and demonstrate the value of systematic EE assessment in informing evidence-based improvements, particularly in resource-limited medical schools.

**Keywords:** Educational Environment, Medical Students, DREEM, Medical Education, Sudan.

## INTRODUCTION

The educational environment (EE) is widely acknowledged as an essential part of the medical curriculum and a major factor in determining students' academic achievement, professional growth, learning, and overall satisfaction [1-3]. Understanding students' perceptions of the EE is increasingly recognized as a cornerstone of quality assurance, curriculum reform, and accreditation processes in medical education worldwide, particularly in low- and middle-income countries where contextual challenges may significantly influence learning experiences. The learning environment has been highlighted by the World Federation for Medical Education (WFME) as a key criterion for assessing medical education programs [2]. By identifying the EE's positive as well as negative aspects, educators and administrators may carry out focused interventions meant to raise the standard of education and student-centered learning [3].

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The assessment of the EE necessitates the use of legitimate, trustworthy, and thorough tools due to its multifaceted and complicated character [2]. Many instruments have been created over the last several decades to evaluate medical learning settings, but their comparability and worldwide application have been constrained by differences in design and psychometric robustness [4]. The Dundee Ready Educational Environment Measure (DREEM), which was created in 1997 by an international Delphi panel at the University of Dundee, continues to be the most popular and globally recognized instrument for evaluating students' perceptions of the EE in medical and health professions education [5-7]. It has shown acceptable validity and reliability across a variety of cultural and educational contexts [8, 9].

DREEM is a 50-item inventory that evaluates the EE across five domains: students' perceptions of learning, teachers, academic self-perceptions, atmosphere, and social self-perceptions, providing both overall and domain-specific insights into the learning climate [10, 11]. It has been widely utilized to identify curricular gaps, evaluate the effects of curricular modifications, and compare EE across institutions, academic levels, and student subgroups [6-9]. Additionally, significant educational outcomes such as academic achievement, student well-being, burnout, and professional identity formation have been linked to DREEM scores [8-13].

Overall ratings typically range from 50.5% to 69.5%, indicating settings that are more positive than negative but still have clear opportunities for development, according to DREEM surveys conducted worldwide [11]. Institutions in Oman, the UK, South Africa, and Ireland have reported higher scores, whereas institutions in areas of Asia and Europe have reported lower scores, underscoring the impact of curricular, cultural, and contextual elements on students' opinions [10]. Variable DREEM scores have also been shown in studies from Arab and Middle Eastern medical schools, highlighting the necessity of institution-specific assessment and benchmarking [1-14].

Research has revealed inconsistencies in DREEM data analysis and reporting, as well as variations in internal consistency between domains, despite its extensive use. These issues highlight the significance of consistent implementation and cautious interpretation of findings to guarantee significant findings and successful educational initiatives [4-15].

In Sudan, medical education has expanded rapidly since the 1990s, with the establishment of more than 50 medical schools nationwide. However, systematic evaluation of EE using standardized quality assurance tools remains limited. Only a few studies have assessed students' perceptions of the learning environment in Sudanese medical schools, notably at Gezira University [8]. To date, no published study has evaluated the EE at the Faculty of Medicine, Gadarif University, which was established in 1998.

The Faculty of Medicine, University of Gadarif, follows a hybrid curriculum with limited resources, relatively large class sizes, and constrained infrastructure typical of many Sudanese medical schools. These contextual factors may significantly influence students' perceptions of the EE.

Despite the growing global emphasis on evidence-based evaluation of EE, data from sub-Saharan Africa and resource-limited medical schools remain scarce, limiting the generalizability of existing evidence and the development of context-sensitive improvement strategies.

By providing institution-specific and contextually grounded evidence, this study aims to inform local quality improvement initiatives while also contributing to the international literature on medical EE in underrepresented settings.

## METHODS

A cross-sectional descriptive study was conducted among undergraduate medical students at the Faculty of Medicine, University of Gadarif, Sudan. The study population comprised students enrolled in the third, fourth, and fifth academic years, as senior students are considered to have sufficient exposure to the EE to provide informed and reliable perceptions.

A census sampling approach was intended, including all 361 eligible students. However, participation was voluntary, and a total of 125 students completed the questionnaire, yielding a response rate of 34.6%.

Data were collected using the Dundee Ready Educational Environment Measure (DREEM), a validated instrument consisting of 50 items distributed across five domains: students' perceptions of learning (SPL) (12 items), students' perceptions of teachers (SPT) (11 items), students' academic self-perceptions (SASP) (8 items), students' perceptions of atmosphere (SPA) (12 items), and students' social self-perceptions (SSSP) (7 items). Each item was rated on a five-point Likert scale ranging from strongly agree (4) to strongly disagree (0). Negatively worded items ( $n = 9$ ) were reverse scored before analysis. Domain-specific and overall DREEM scores were calculated by summing the corresponding item scores.

The questionnaire was distributed to all students of the selected batches after providing a brief explanation of the study objectives and obtaining verbal informed consent. The students were given the questionnaire for one week, during which the batch representative continuously reminded them to complete it and collected the completed copies regularly. The role of the batch representative was limited to coordination and communication with students and carried no academic, administrative, or evaluative authority. This role changed periodically from one course to another and therefore was not expected to influence students' responses. Participation was entirely voluntary, and confidentiality was ensured by collecting completed questionnaires without personal identifiers.

Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 20. Continuous variables were presented as mean  $\pm$  standard deviation (SD). Independent samples t-test was used to compare mean scores between male and female students. One-way ANOVA was used to compare mean scores across residence and academic levels. A  $p$ -value  $< 0.05$  was considered statistically significant.

The internal consistency of the DREEM instrument was assessed using Cronbach's alpha.

McAlear and Roff practical guideline was used to interpret the results: an overall score of 0 to 50 as very poor, 51 to 100 as plenty of problems, 101 to 150 as more positive than negative, and 151 to 200 as excellent [11].

Ethical approval was obtained from the Ethics Committee of the Faculty of Medicine and Health Sciences, University of Gadarif (Ref. No.: RC. Q4.2.12.25). Participation was voluntary, confidentiality was ensured, and verbal informed consent was obtained as approved by the ethics committee, which waived the requirement for written consent due to the minimal-risk nature of the study.

## RESULTS

Of 361 eligible students, 125 participated (response rate 34.6%), they aged 20–26 years (mean  $23 \pm 1.95$ ). Most participants were older than 20 years (76%), while 24% were aged 20 years or younger. The gender distribution was nearly equal, with males comprising 51.2% and females 48.8% of the sample.

More than half of the students were residents of Gadarif city (56%), followed by students from Khartoum and Gezira (26.4%), while 17.6% were from other regions. Regarding academic level, 24% were third-year students, 39.2% fourth-year students, and 36.8% fifth-year students.

The overall reliability of the DREEM was  $\alpha = 0.89$ , indicating excellent internal consistency. Domain-specific Cronbach's alpha values were as follows: students' perception of learning (SPL)  $\alpha = 0.84$ , students' perception of teachers (SPT)  $\alpha = 0.81$ , students' academic self-perception (SASP)  $\alpha = 0.78$ , students' perception of atmosphere (SPA)  $\alpha = 0.83$ , and students' social self-perception (SSSP)  $\alpha = 0.76$ .

### DREEM Domain Scores

Using the standard DREEM scoring system (0–4), the overall mean DREEM score was 111.2 out of 200 (55.6%).

SPL domain comprises 12 items with a maximum score of 48. The mean item scores ranged from 1.45 to 2.67. The overall mean SPL score was 26.9/48 (56%) (Table 1).

SPT domain includes 11 items with a maximum score of 44. Mean item scores ranged from 1.45 to 2.61. The overall mean SPT score was 24.7/44 (56.2%) (Table 2).

SASP domain consists of 8 items with a maximum score of 32. Mean item scores ranged from 1.67 to 2.57. The overall mean SASP score was 18.4/32 (57.5%) (Table 3).

SPA domain comprises 12 items with a maximum score of 48. Mean item scores ranged from 1.06 to 2.74. The overall mean SPA score was 26.1/48 (54.4%) (Table 4).

SSSP domain includes 7 items with a maximum score of 28. Mean item scores ranged from 1.70 to 2.62. The overall mean SSSP score was 15.8/28 (53.9%) (Table 5).

### Individual Item Analysis

Eleven out of the 50 DREEM items (22%) scored below 2.0, identifying areas requiring attention. The lowest-scoring item was related to timetabling of the academic program. Other low-scoring items were related to teaching focus, constructive feedback, efficient use of teaching time, student confidence, academic workload, availability of student support systems, feelings of loneliness, and accommodation quality. No item achieved a mean score of 3.0 or more.

Statistical analysis demonstrated significant differences in students' perceptions across several domains. Gender was significantly associated with students' academic self-perception ( $p = 0.02$ ) and perception of atmosphere ( $p = 0.04$ ). Place of residence showed significant differences in perception of learning ( $p = 0.01$ ), perception of teachers ( $p = 0.02$ ), perception of atmosphere ( $p = 0.01$ ), and social self-perception ( $p = 0.01$ ). Additionally, academic level was significantly associated with all DREEM domains ( $p < 0.05$ ).

**Table 1: Descriptive statistics for SPL domain items**

Items	Mean	Std. Deviation
I am encouraged to participate in classes	2.54	1.0434
The teaching is often stimulating	2.19	1.0903
The teaching is student centered	2.32	0.9384
The teaching helps to develop my competence	2.67	1.0378
The teaching is well focused	1.89	1.0177
The teaching helps me develop my confidence	1.45	1.0656
The teaching time is put to good use	1.96	1.1101
The teaching over emphasizes factual learning *	2.20	0.9246
I am clear about the learning objectives of the course	2.48	1.0595
The teaching encourages me to be active learner	2.34	1.0921
Long term learning emphasized over short-term learning	2.37	0.9464
The teaching is too teacher centered *	2.45	0.8749
<b>Total</b>	<b>26.9/48</b>	<b>56%</b>

SPL: Students' Perception of Learning.

\* Negatively worded items were reverse scored before analysis

**Table 2: Descriptive statistics for SPT domain items**

Items	Mean	Std. Deviation
The teachers are knowledgeable	2.61	0.9911
The teachers are patient with patients	2.41	0.9983
The teachers ridicule the students *	2.25	1.1263
The teachers are authoritarian *	1.45	0.9285
The teachers have good communication skills with patients	2.40	1.1570
The teachers are good at providing feedback to students	2.41	1.0123
The teachers provide constructive criticism here	1.90	0.9872
The teachers give clear examples	2.51	1.0520
The teachers get angry in class *	2.33	1.1555
The teachers are well prepared for their class	2.21	1.1093
The students irritate the teachers *	2.25	1.0369
<b>Total</b>	<b>24.7/44</b>	<b>56.2%</b>

SPT: Students' Perception of Teachers.

\* Negatively worded items were reverse scored before analysis

**Table 3: Descriptive statistics for SASP domain items**

Items	Mean	Std. Deviation
Learning strategies which worked for me before continuing to work for me now	2.52	0.9470
I am confident about my passing this year	1.67	1.1272
I feel I am being well prepared for my profession	2.46	1.0121
Last year's work has been good preparation for this year's work	2.24	1.0560
I am able to memorize all I need	1.99	1.1358
I have learned a lot about empathy in my profession	2.44	0.9275
My problem-solving skills are being well developed here	2.52	0.9640
Much of what I have to learn seems relevant to a career in medicine	2.57	0.9453
<b>Total</b>	<b>18.4/32</b>	<b>57.5%</b>

SASP: Students' Academic Self Perception.

**Table 4: Descriptive statistics for SPA domain items**

Items	Mean	Std. Deviation
The atmosphere is relaxed during the ward teaching	2.03	1.0772
This college is well time-tabled	1.06	1.1964
Cheating is problem in this college *	2.74	1.1155
The atmosphere is relaxed during lectures	2.01	1.0356
There are opportunities for me to develop inter-personal skills	2.35	1.0721
I feel comfortable in class socially	2.38	1.2494
The atmosphere is relaxed during tutorials/seminars	2.06	1.1166
I find the experience disappointing *	2.41	0.93409
I am able to concentrate well	2.20	0.99190
The enjoyment outweighs the stress of studying medicine	2.30	1.0853
The atmosphere motivates me as a learner	2.14	1.0679
I feel able to ask the questions I want	2.42	1.0021
<b>Total</b>	<b>26.1/48</b>	<b>54.4%</b>

SPA: Students' Perception of Atmosphere.

\* Negatively worded items were reverse scored before analysis

**Table 5: Descriptive statistics for SSSP domain items**

Items	Mean	Std. Deviation
There is a good support system for students who get stressed	1.70	1.0927
I am too tired to enjoy the course *	2.62	1.0760
I am rarely bored on this course	2.13	1.1638
I have good friends in this college	2.27	1.4777
My social life is good	2.49	1.1473
I seldom feel lonely	1.90	1.1697
My accommodation is pleasant	1.97	1.3556
<b>Total</b>	<b>15.8/28</b>	<b>53.9%</b>

SSSP: Students' Social Self Perception.

\* Negatively worded items were reverse scored before analysis

## DISCUSSION

This study explored medical students' perceptions of the EE at the Faculty of Medicine, Gadarif University using the Dundee Ready Educational Environment Measure (DREEM), a globally validated instrument for evaluating learning climates in medical education [5-10]. Given the well-established influence of EE on students' satisfaction, learning behavior, academic achievement, and professional development [1-12], the findings of this study provide important baseline data for curriculum evaluation and quality assurance at Gadarif University.

According to the interpretive framework put forward by McAleer and Roff [9, 11], the study's total DREEM score of 55.6% falls marginally within the "more positive than negative" category, indicating a borderline favorable EE with substantial room for improvement. This finding is consistent with reports from several regional and international medical schools, where DREEM scores commonly range between 50.5% and 75% [10, 11]. Comparable scores have been reported from Kuwait, Yemen, Saudi Arabia (Tabuk university, faculty of medicine, girl section scores 105.0±22.9, 53% of maximum score), and parts of Asia (Korean medical school scores 94.65 out of 200) [14-16]. Despite variations in resources, curricular structure, and sociocultural background, these parallels imply that Gadarif University's EE is generally comparable to that of many well-known medical institutions.

The findings are particularly relevant within the Sudanese context, where medical schools face substantial challenges related to limited resources, infrastructure constraints, and faculty shortages. These contextual factors may partly explain lower scores in organizational efficiency, student support systems, and learning atmosphere. Comparison with the Gezira University [8], this study suggests broadly similar patterns, supporting the notion that these challenges may extend across Sudanese medical education institutions.

Although there are some positive characteristics of the EE, the results of this study show that student satisfaction is somewhat low and emphasize the necessity of focused interventions. The relatively narrow variation between the five DREEM domains reflects a generally balanced perception of the EE. Among these domains, Students' Academic Self-

Perceptions (SASP) achieved the highest mean score (57.5%), suggesting reasonable student confidence in academic progress and preparedness, which aligns with the literature emphasizing the role of EE in shaping academic self-efficacy and professional identity formation [8-13]. Conversely, Students' Social Self-Perceptions (SSSP) recorded the lowest domain score (53.9%), although still within the positive range. This result is consistent with findings from earlier research carried out in environments with low resources, where social welfare, accommodations, and student support networks continue to be difficult EE components [3-8]. Challenges such as inadequate student support systems, accommodation issues, and financial stress may negatively affect students' social experience. Addressing these factors is essential, as social well-being is closely linked to academic performance and mental health.

Individual item analysis showed that 11 items (22%) had scores lower than 2, pointing to particular issue areas that need focused action. A structural problem that might interfere with students' academic continuity, financial planning, and psychological stability is highlighted by the lowest-scoring item, which is about poor timetabling. Similar concerns have been reported in studies emphasizing the importance of administrative organization and learning structure as core elements of a positive EE [3-7]. Other low-scoring items related to teaching focus, constructive feedback, confidence building, and student support systems underscore the need for faculty development and enhanced student services, consistent with prior literature emphasizing teacher competence and student-centered learning environments [3-11].

Notably, no item achieved a mean score  $\geq 3$ , suggesting the absence of strongly perceived excellence within the EE. This pattern has also been documented in several regional and international studies and reflects the complex, multifactorial nature of EE, where strengths often coexist with persistent weaknesses [4-10]. As highlighted in the literature, EE is measurable and modifiable, and identifying such gaps is essential for evidence-based curriculum reform [3-9].

The study also demonstrated that students' perceptions were significantly influenced by gender, residence, and study level, a finding well supported by previous research [7-17]. Gender differences were evident in academic self-perception and perception of atmosphere, possibly reflecting variations in learning experiences, stressors, and social expectations. Residence significantly affected perceptions across most domains, highlighting the role of social background and living conditions in shaping students' educational experiences. Importantly, study level influenced all five domains, supporting the assertion that accumulated academic exposure and clinical experience enhance students' ability to critically evaluate their learning environment [7, 8]. This reinforces the rationale for selecting senior students, as emphasized in earlier studies [8-10].

From a practical perspective, the findings highlight several actionable areas for improvement. Administrative reforms are needed to address timetabling inefficiencies and ensure better organization of academic activities (need for improved academic scheduling through earlier timetable release and enhanced interdepartmental coordination). Faculty development programs should be implemented to enhance teaching effectiveness, particularly in providing constructive feedback and promoting student-centered learning. Additionally, strengthening student support systems (e.g. establishing formal psychological counseling services, peer mentoring programs, and institutional student support mechanisms) may help improve students' overall experience and well-being.

The findings of this study should be interpreted in light of the relatively low response rate (34.6%), which may have influenced the representativeness of the sample, as non-response might bias the results (e.g., whether dissatisfied or highly motivated students may be overrepresented).

It is possible that students with stronger views regarding the EE were more inclined to participate, potentially affecting the overall perception scores reported. Furthermore, as no direct comparison between respondents and non-respondents was feasible, the extent of this potential bias cannot be fully determined. This may limit the generalizability of the findings, and future studies should aim for broader participation to provide a more representative evaluation of the institutional EE.

Overall, the results of this study are in good agreement with the body of research that identifies EE as a significant contributor to the quality of medical education and student outcomes. The findings offer empirical backing for Gadarif University's use of DREEM as a diagnostic tool to direct faculty development, curricular evaluation, and institutional policy planning.

### Limitations

It is important to recognize the many limitations of this study. First, the findings may not be as broadly applicable as they may be due to the relatively small sample size (125 participants out of 361 eligible students) which may limit representativeness and introduce non-response bias. Second, the voluntary nature of participation may have introduced self-selection bias, as students with particularly positive or negative perceptions of the EE may have been more likely to

participate, potentially affecting the findings. In addition, no comparison of basic demographic characteristics between respondents and non-respondents was performed; therefore, the extent of selection bias could not be assessed. Furthermore, the exclusion of first- and second-year students, although intended to ensure adequate exposure to the EE, limits the generalizability of the findings to the full undergraduate cohort and may have influenced the overall perceptions reported. Future studies including students from all academic levels with broader participation would provide a more comprehensive institutional assessment. Also, a self-reported questionnaire was used to gather the data, which is prone to response bias and might be impacted by students' transient emotional states or expectations, and the cross-sectional approach only records students' opinions at one particular moment in time, making it difficult to evaluate changes in the learning environment over time or draw conclusions about causality. Finally, the study assessed students' perceptions only and did not directly evaluate objective academic outcomes such as academic performance, burnout, or psychological wellbeing.

Despite these limitations, the study provides valuable baseline data on students' perceptions of the EE at the Faculty of Medicine, University of Gadarif.

## CONCLUSIONS

Medical students at Gadarif University's Faculty of Medicine view the EE as marginally within the “more positive than negative” category, and it is generally comparable to what has been observed by several regional and worldwide medical institutions. Even if the overall results are positive, significant shortcomings were found, especially in the areas of scheduling, instructional efficacy, student support networks, and social welfare. Gender, academic standing, and place of residence all had an impact on students' opinions, which emphasizes the need of context-sensitive educational preparation. These findings underscore the need for targeted institutional interventions, including improved academic organization, structured faculty development programs, and strengthened student support services. Implementing such measures may enhance both the quality of education and student well-being. Regular assessment of the EE using validated tools such as DREEM is recommended to monitor progress and support continuous quality improvement, particularly in resource-limited medical schools.

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### Ethical Approval

The study was approved by the medical ethics committee of the University of Gadarif, Faculty of Medicine, Sudan (Ref. No.: RC. Q4.2.12.25).

**Competing Interests:** The author declares that he has no competing interests.

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### AI Use Disclosure

The authors declare that artificial intelligence (AI) tools were used solely for language editing, grammar refinement, and improvement of clarity and readability of the manuscript. The AI tools did not generate original scientific content, analyze data, or influence the study design, results, or conclusions. All content was reviewed, verified, and approved by the authors, who take full responsibility for the manuscript.

### Author Contribution

MAAA, YFA, and BGKA participated in the conception and design of the study. MAAA, YFA and BGKA collected and analysed the data, performed literature review, partially interpreted the data, and contributed to manuscript drafting. MAAA and YFA conducted a critical review of results' interpretation, revised the manuscript critically for strengthening intellectual contents, and took part in the final writing. All authors read the final manuscript and approve it.

## REFERENCES

1. Nosair E, Mirghani Z, Mostafa RM. Measuring students' perceptions of educational environment in the PBL program of Sharjah Medical College. *J Med Educ Curric Dev.* 2015;2:JMECD.S29926. doi:10.4137/JMECD.S29926.
2. Soliman MM, Sattar K, Alnassar S, Alsaif F, Alswat K, Alghonaim M, Alhaizan M, Al-Furaih N. Medical students' perception of the learning environment at King Saud University Medical College, Saudi Arabia, using DREEM Inventory. *Adv Med Educ Pract.* 2017 Mar 17;8:221-227. doi: 10.2147/AMEP.S127318. PMID: 28360540; PMCID: PMC5364010.

3. Farajpour A, Raisolsadat SMA, S Moghadam S, Mostafavian Z. Perception of educational environment among undergraduate students of health disciplines in an Iranian university. *Int J Med Educ.* 2017 Aug 18;8:300-306. doi: 10.5116/ijme.5977.7129. PMID: 28829330; PMCID: PMC5572426.
4. Farooqi FA, Khan SQ, Khabeer A, Ali S, Al-Ansari A. Dundee Ready Educational Environment Measure Tool for Evaluating the Educational Environment: A Systematic Review and Meta-analysis. *Open Access Maced J Med Sci.* 2020;8(F):108–16. <https://doi.org/10.3889/oamjms.2020.4280>
5. Sengupta P, Sharma A, Das N. Perception of Learning Environment among Undergraduate Medical Students in Two Different Medical Schools through DREEM and JHLES Questionnaire. *J Clin Diagn Res.* 2017 Feb;11(2):JC01-JC04. doi: 10.7860/JCDR/2017/23810.9248. Epub 2017 Feb 1. PMID: 28384888; PMCID: PMC5376910.
6. Mogre V, Amalba A. Psychometric properties of the dundee ready educational environment measure in a sample of Ghanaian Medical Students. *Educ Health (Abingdon).* 2016 Jan-Apr;29(1):16-24. doi: 10.4103/1357-6283.178921. PMID: 26996794.
7. Vaughan B, Carter A, Macfarlane C, Morrison T. The DREEM, part 1: measurement of the educational environment in an osteopathy teaching program. *BMC Med Educ.* 2014 May 20;14:99. doi: 10.1186/1472-6920-14-99. PMID: 24884931; PMCID: PMC4048620.
8. Ahmed Y, Taha MH, Al-Neel S, Gaffar AM. Students' perception of the learning environment and its relation to their study year and performance in Sudan. *Int J Med Educ.* 2018 May 24;9:145-150. doi: 10.5116/ijme.5af0.1fee. PMID: 29805119; PMCID: PMC6129164.
9. Miles S, Swift L, Leinster SJ. The Dundee Ready Education Environment Measure (DREEM): a review of its adoption and use. *Med Teach.* 2012;34(9):e620-34. doi: 10.3109/0142159X.2012.668625. Epub 2012 Apr 3. PMID: 22471916.
10. Prashanth GP, Ismail SK. The Dundee Ready Education Environment Measure: A prospective comparative study of undergraduate medical students' and interns' perceptions in Oman. *Sultan Qaboos Univ Med J.* 2018 May;18(2):e173-e181. doi: 10.18295/squmj.2018.18.02.009. Epub 2018 Sep 9. PMID: 30210847; PMCID: PMC6132523.
11. Patil AA, Chaudhari VL. Students' perception of the educational environment in medical college: a study based on DREEM questionnaire. *Korean J Med Educ.* 2016 Sep;28(3):281-8. doi: 10.3946/kjme.2016.32. Epub 2016 Jun 30. PMID: 27363503; PMCID: PMC5016262.
12. van Vendeloo SN, Prins DJ, Verheyen CCPM, Prins JT, van den Heijkant F, van der Heijden FMMA, Brand PLP. The learning environment and resident burnout: a national study. *Perspect Med Educ.* 2018 Apr;7(2):120-125. doi: 10.1007/s40037-018-0405-1. PMID: 29476425; PMCID: PMC5889377.
13. Yoo, DM., Kim, DH. The relationship between students' perception of the educational environment and their subjective happiness. *BMC Med Educ* 19, 409 (2019). <https://doi.org/10.1186/s12909-019-1851-0>
14. Altemani AH, Merghani TH. The quality of the educational environment in a medical college in Saudi Arabia. *Int J Med Educ.* 2017 Apr 14;8:128-132. doi: 10.5116/ijme.58ce.55d2. PMID: 28412724; PMCID: PMC5420461.
15. Schubiger M, Lechthaler F, Khamidova M, Parfitt BA, Prytherch H, van Twillert E, Wyss K. Informing the medical education reform in Tajikistan: evidence on the learning environment at two nursing colleges. *BMC Med Educ.* 2019 Mar 18;19(1):85. doi: 10.1186/s12909-019-1515-0. PMID: 30885172; PMCID: PMC6423760.
16. Kim H, Jeong H, Jeon P, Kim S, Park YB, Kang Y. Perception Study of Traditional Korean Medical Students on the Medical Education Using the Dundee Ready Educational Environment Measure. *Evid Based Complement Alternat Med.* 2016;2016:6042967. doi: 10.1155/2016/6042967. Epub 2016 Nov 28. PMID: 28003851; PMCID: PMC5149675.
17. Colbert-Getz JM, Tackett S, Wright SM, Shochet RS. Does academic performance or personal growth share a stronger association with learning environment perception? *Int J Med Educ.* 2016 Aug 28;7:274-8. doi: 10.5116/ijme.57a6.f141. PMID: 27570912; PMCID: PMC5018355.