Perspective of educational environment on students’ perception of teaching and learning

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Abstract
Cross-sectional research was designed using the Dundee Ready Education Environment Measure (DREEM) to examine the impact of the educational environment on students’ perceptions of learning and teaching in a university offering higher education. Using a Likert scale, 300 participants from various streams were assessed. There were no disparities in the students’ judgments in the five DREEM categories of discipline, accommodation, gender, level of study, and disciplines. In general, students judged that the student–teaching environment was satisfactory. To investigate the validity of the DREEM, we conducted Cronbach alpha analysis and exploratory factor analysis (EFA) employing principal component analysis with varimax rotation. Only 44 of the 50 factors were deemed to be significant, with a cumulative explained variance of 46.539%. The total construct dependability of the EFA nine-factor solutions was 0.954. Finally, only five acceptable factors explained 46.539% variance using the criteria of eigenvalue > 1 and Cronbach’s alpha > 0.6. Factor analysis was appropriate as evidenced by the Kaiser-Meyer-Olkin Measure of Sampling Adequacy of 0.942. With a Cronbach alpha of 0.955, the revised first domain of “student perception of learning” was the most trustworthy DREEM item, accounting for 20.19% of the variance. The highest factor loading was for the item “Teaching helps me become a more active learner”. A redesigned DREEM might be valuable for assessing the educational environment at institutions providing higher education.

Keywords DREEM · Educational environment · Factor analysis · Students’ perception · Reliability · Teaching–learning
Introduction

The environment is one of the most important predictable and deterministic domains influencing student instruction, education, and learning (Mayya & Roff, 2004). Academic institutions’ educational environments are evaluated in an attempt to achieve a high-quality, student-centered curriculum (Sahu et al., 2020). There is evidence that students’ educational environments are significant for students’ contentment with their course of study, perceived well-being, motivation and goals, happiness, and academic accomplishment (Audin et al., 2003; Lizzio et al., 2002; Plucker, 1998). Positive environments can facilitate the establishment of high-quality university education and the future success of students (Pimparyon et al., 2000). Students’ impressions of the educational setting can serve as a foundation for making changes and, as a result, improving the educational environment. Meaningful learning is linked to students’ impressions of the educational environment, which affects their learning experiences and outcomes. This learning educational environment has an impact on students’ quality of life, attitudes toward scholarly activities, and ability to cope with the stress that comes with educational programs (Quiroga-Marabol et al., 2019).

Teaching–learning paradigm to assess the educational environment

Teaching behavior is an important element in supporting student learning and achievement (André et al., 2020; Fernández-García et al., 2019; Inda-Caro et al., 2019). Everyday, teachers make a plethora of decisions, such as how to foster interactions with and among pupils (Pianta et al., 2012). Teachers must ensure that their students are engaged in the learning process to optimize each students’ learning and development and to prevent gradual disengagement, school failure, or dropout (Havik & Westergård, 2019; Antoniou et al., 2011) found that the amount of a teacher’s experience had a positive effect on student achievement. Learning and gaining knowledge is not only confined to the mode of instruction or the type of classrooms, but it also includes the kind of relationship that builds up between students and their teachers. It is critical to recognize that the teacher’s effect on the pupils has an impact on the learning quality. To have a better outlook and focus on enhancement of the educational institute, it is important to understand the diverse educational patterns and the best sources that could be provided to the students studying in that particular educational setup. Studies conducted all over the world show that a conducive educational environment helps to develop a positive attitude and a passion to learn. This has a positive impact on the quality of learning also (Audin et al., 2003; Plucker et al., 1998).

Theoretical framework

The effect of teaching and students’ perceptions of learning seem to be the result of a complex interplay between personal and environmental domains. To design intervention strategies, it would be helpful to have a measurement tool to distinguish students who are sensitive to academic failure at this level of experience and to recognize the attributes of the educational environment that some students perceive differently from other students who are accomplishing academic goals. In this context, studies related to students’ perceptions in higher education are very limited. The educational environment can be evaluated and changed. More than 100 medical practitioners from all over the world constituted the
Delphi panel at the University of Dundee, Scotland, to design the tool Dundee Ready Education Environment Measure (DREEM), which consists of 58 items (Roff et al., 1997) to measure the educational environment for the improvement of the medical students’ learning outcomes based on their perceptions. The initial studies focused on statistically-significant disparities between students of different genders and with different years of study. Later survey analyses by several of the administrators helped to group the survey questions under five subscales based on students’ perspectives on teaching, learning, teachers, careers, surroundings, and personal lives. After many more studies, this tool was further validated as a 50-item version. The DREEM is presently the most-popular questionnaire for evaluating the educational environment in undergraduate education programs (Quiroga-Maraboli et al., 2019; Sengupta et al., 2017). It has been translated into many languages and is useful for comparing the educational environment of medical schools at different locations. Following a survey of students, a gap analysis can be undertaken of the constraints of any new curriculum, students’ expectations, students’ experiences, and remedial actions. This questionnaire is promising for identifying students’ perceptions of the learning educational atmosphere, social self-perceptions, teaching, and academic self-perception (Fig.1). The DREEM shows good reliability and validity in a variety of cultures and situations in varied educational institutes (Ahmed et al., 2018; Bakhshialiabadi et al., 2015). Its five-point Likert scales capture students’ degree of agreement with each statement.

Nine negatively-worded items must be reverse scored for analysis and interpretation (Lechthaler et al., 2020) Previous research has indicated that various personal characteristics, such as teaching experience and gender, explain differences in teaching behavior and student outcomes (Inda-Caro et al., 2019). The different components of teaching and learning, understanding the current situation of medical nursing students, and the type of education being provided were taken into consideration. The DREEM has the potential for providing authorities with important knowledge. Its scientific content, pragmatism, social relevance, and maximization were amongst its key attributes. In diverse settings, it has been
demonstrated to be an effective and relevant tool for assessing students’ perspectives of their educational environment. Because of its high reliability and consistency, DREEM is implemented in many universities throughout the world. Components targeting educational characteristics such as the environment developed by the teachers, students’ fellowship, the type of classrooms, the type of technology taken into consideration during teaching, the environment of the college inclusive of year, subject of study, and residential accommodation given to the students were some of the important areas under consideration (Kyriakides & Creemers, 2009; Kyriakides et al., 2009; Sammons & Bakkum, 2011).

**Current study**

DREEM is now a validated diagnostics benchmark for assessing learning settings, addressing major challenges, and enhancing learning efficacy in medical/nursing colleges and universities. In this context, a question arises in our mind concerning the validity of DREEM in different higher-education institutions and universities where limited studies have been undertaken. It is challenging to evaluate any differences among the perceptions of the educational environment by academic achievers. So, students’ perception was used to study the basic constructs into learning, teaching, atmosphere, self, and social perception (Fig. 1). To assess all these facets, a few hypotheses were formulated:

**Hypothesis** $H_{0_0}$: There is no difference in DREEM scores between students of different genders.

$H_{1_0}$: There is a statistically-significant difference in DREEM scores between students of different genders.

$H_{0_1}$: There is no difference in DREEM scores between students living in different accommodation (oncampus vs. offcampus).

$H_{1_1}$: There is a statistically-significant difference in DREEM scores between students living in different accommodation (oncampus vs. offcampus).

$H_{0_2}$: There is no difference in DREEM scores between students at different year levels.

$H_{1_2}$: There is a statistically-significant difference in DREEM scores between students at different year levels.

$H_{0_3}$: There is no difference in DREEM scores between students in different disciplines.

$H_{1_3}$: There is a statistically-significant difference in DREEM scores between students in different disciplines.

In this study, we focused on two aspects. First, we were interested in whether the use of DREEM helps in understanding perceptions of the learning environment among undergraduate students at an Indian university that provides higher education to a wide spectrum of students ranging from the primary to the tertiary levels and covering a wide range of educational fields. Second, although DREEM has been validated for assessing the educational environment in medical and paramedical universities, we were interested in whether it also is a valid generic tool for assessing the educational environment of a non-medical university?
Research design and methods

Data collection

DREEM was administered at a private university in India to undergraduate students who volunteered to participate. A Google form (https://goo.gl/forms/zcQxUb2CY2RabeFl2) was circulated among the students of different disciplines (Engineering, Science, Management, and Arts) after obtaining written informed consent. The author(s) were present during the consent process to respond to any queries. Students who did not consent and those unavailable after three attempts to contact them were excluded from the study.

The data were collected for different year levels (1st year, 2nd year, 3rd year, 4th year) of the undergraduate discipline of study. Initially, in January 2019, data were collected by distributing the questionnaire to the first batch of first-year undergraduate students of arts and science. These students were further divided into two groups, namely, Group I (undergraduate students of the fourth and sixth semester, \( n = 300 \)) and Group II (undergraduate students of the second semester, \( n = 150 \)). This was replicated for the second batch of undergraduate students in engineering and commerce as two groups, namely, Group I (students of the fourth and sixth semester, \( n = 300 \)) and Group II (students of the second semester, \( n = 150 \)) in February 2019. The whole exercise was again repeated for all the streams in March and April 2019 for both batches. DREEM was completed twice: once at the start of the 2019–2020 session and again at the end. Before distribution, all participants were informed of the study’s goals, along with an assurance that responses would be kept anonymous. Ethics approval was obtained from the institute ethics committee. Written informed consent was taken from the students and the consent process was approved by the ethics committee.

Structure of the questionnaire

The DREEM questionnaire can be partitioned into three parts, each with 50 items. The first and second segments each contain 20 items, whereas the third section contains only 10 items. Perceptions were further grouped within five subscale dimensions: Perception of learning (Items 1, 7, 13, 16, 20, 22, 107, 24, 25, 38, 47, 48), Perception of teaching (Items 2, 6, 8, 9, 18, 29, 32, 37, 39, 40, 108), Academic self-perception (Items 5, 10, 21, 26, 27, 31, 41, 45), Perception of the environment (Items 11, 12, 23, 30, 33, 34, 35, 36, 42, 43, 49), and Social self-perception (Items 3, 14, 15, 19, 28, 46).

DREEM items covered relevant aspects of the educational environment. Gender, level of study, and accommodation (oncampus vs. offcampus) were among the demographic details included in the questionnaire. Each item has a five Likert-responses ranging from 0 to 4, with 4 for ‘completely agree’, 3 for ‘agree’, 2 for ‘neither agree nor disagree’, 1 for ‘strongly disagree’, and 0 for ‘completely disagree’. DREEM has 9 negatively-worded items that are scored in a reverse manner before analysis and interpretation (Items 4, 8, 9, 17, 25, 35, 39, 48, and 50).

Statistical analysis

Means generated using the Statistical Package for Social Sciences (SPSS) were used for all comparisons. Results were expressed in the form of mean values for the total scale,
subscals, or items, and the maximum score percentages in each ordinal category were associated with a specific interpretation. One-way ANOVA with a post hoc Tukey’s multiple comparisons test was used to identify significant differences between subgroups.

**Results**

DREEM was used to assess 300 undergraduate students’ perceptions of their educational environment in India. Average scores and standard deviations for all items in five DREEM domains (Perception of learning, Perception of teaching, Academic self-perception, Perception of the environment, and Social self-perception) were calculated using scores generated by undergraduate students’ responses on the Google form. Tables 1, 2, 3 and 4 provide means, standard deviations, *p*-values, and decisions regarding acceptance or rejection of hypothesis for all demographic characteristics such as gender, place of accommodation, level of study, and course discipline.

**Differences in students’ perception of DREEM domains based on gender and place of accommodation**

According to Table 1, the mean score for 38 items lies between 2 and 3, with one question having a mean of greater than 3 and 11 questions with means of less than 2. The highest-rated question was “I am confident about my passing this year”.

Students’ DREEM perceptions were investigated for differences in the views of (a) male and female students and (b) students at different places of accommodation. Results in Table 2 were obtained by performing a *t*-test for independent samples for each DREEM domain to compare, first, students of different genders and, second, students staying at different places of accommodation.

**Differences between oncampus and offcampus students for five DREEM domains**

Analysis of *p*-values revealed that differences between oncampus and offcampus students were statistically-significant for the three DREEM domains of Learning, Teachers, and Academic self-perception, but statistically nonsignificant for the other two DREEM domains (Table 2; Fig. 2).

Similarly, the null hypothesis showed that there was no significant difference at the 5% level in undergraduate students’ perception of learning in all DREEM domains between oncampus and offcampus students. It was also tested of significance. When the students’ opinions of learning were compared based on place of accommodation, the four domains of DREEM of Learning, Teachers, Academic self-perception and Perception of environment were statistically significant while Social self-perception was nonsignificant (Table 2; Fig. 2).

**Differences between year levels of study in domains of DREEM**

A comparison of the five domains of DREEM based on different levels (years) of study and courses of study was also performed (Table 3; Fig. 3b). The students chosen for the study were from different disciplines such as arts, engineering, management, and science.
### Table 1  Item mean and standard deviation for 46 DREEM items assessing students’ perception of Learning, Teaching, Academic Self-perception, the Environment and Social Self-perception

| Item                                                                 | Mean  | Standard deviation |
|----------------------------------------------------------------------|-------|--------------------|
| **Students’ perception of learning**                                  |       |                    |
| 1) I am encouraged to participate during a teaching session           | 2.43  | 1.031              |
| 7) The teaching is often stimulating                                 | 2.02  | 0.947              |
| 13) The teaching is student-centered                                  | 2.15  | 1.102              |
| 16) The teaching helps to develop my competence                       | 2.15  | 1.065              |
| 20) The teaching is well focused                                     | 2.19  | 1.115              |
| 21) I feel I am being well prepared for my profession                | 1.72  | 1.161              |
| 24) The teaching time is put to good use                              | 2.22  | 1.060              |
| 25) The teaching over emphasizes factual learning                    | 1.74  | 0.945              |
| 38) I am clear about the learning objectives of the program          | 2.35  | 1.073              |
| 44) The teaching encourages me to be an active learner                | 2.25  | 1.065              |
| 47) Long term learning is emphasized over short term learning        | 2.11  | 1.108              |
| 48) The teaching is too teacher-centered                              | 1.84  | 1.052              |
| **Students’ academic self-perception**                                |       |                    |
| 5) Learning strategies that worked for me before continuing to work for me now | 2.315 | 1.0297             |
| 10) I am confident about my passing this year                         | 3.38  | 0.981              |
| 22) The teaching helps to develop my confidence                       | 1.94  | 1.095              |
| 26) Last year’s work has been good preparation for this year’s work  | 2.08  | 1.000              |
| 27) I can memorize all I need                                        | 2.02  | 1.098              |
| 31) I have learned a lot about empathy in my profession               | 2.24  | 1.026              |
| 41) My problem-solving skills are being well developed here          | 2.06  | 1.107              |
| 45) Much of what I have to learn seems relevant to a career in the society | 2.05  | 1.117              |
| **Students’ perception of teachers**                                  |       |                    |
| 2) The program organizers are knowledgeable                           | 2.55  | 0.905              |
| 6) The lectures emphasize student care during the teaching sessions? | 1.94  | 1.109              |
| 8) Do teachers ridicule the registrars?                               | 2.54  | 0.942              |
| 9) The teachers are authoritarian                                     | 1.74  | 0.972              |
| 18) The teachers have good communication skills with the students    | 2.29  | 1.125              |
| 29) The teachers are good at providing feedback to students           | 2.42  | 1.122              |
| 32) The teachers provide constructive criticism here                  | 2.07  | 0.988              |
| 37) The teachers give clear examples                                  | 2.41  | 1.017              |
| 39) The teachers get angry in teaching sessions                       | 2.15  | 1.055              |
| 40) The teachers are well prepared for their classes.                 | 2.06  | 1.02               |
| 49) I feel able to ask the questions I want.                          | 2.13  | 1.11               |
| **Students’ perception of atmosphere**                                |       |                    |
| 11) The atmosphere is relaxed during teaching sessions               | 2.51  | 0.997              |
| 12) This program is well timetabled                                   | 2.06  | 1.296              |
| 17) Cheating is a problem in this program                            | 2.07  | 1.226              |
| 23) The atmosphere is relaxed during lectures                         | 2.35  | 1.032              |
| 30) There are opportunities for me to develop interpersonal skills    | 2.36  | 1.123              |
| 33) I feel comfortable in class socially                              | 2.56  | 1.054              |
| 34) The atmosphere is relaxed during seminars/tutorials               | 2.52  | 0.950              |
| 35) I find the experience disappointing                               | 2.08  | 1.121              |
| 36) I can concentrate well                                           | 2.25  | 1.028              |
| 42) The enjoyment outweighs the stress of the program                 | 1.86  | 1.030              |
| 43) The atmosphere motivates me as a learner                          | 1.96  | 1.143              |
Fig. 2 Comparison of students’ average scores for five DREEM domains according to (a) gender and (b) place of accommodation (oncampus vs. offcampus). (n = 360, level of significance 0.05, ± standard deviation)
When ANOVAs were performed for a sample size of 300, there were no significant differences ($p<0.05$) in all domains DREEM according to the level (year) of study (Table 3; Fig. 3)

![Graph comparing average DREEM scores](image)

**Table 3** Comparative statistical analysis on the scoring of the five factors of Dundee Ready Educational Environment Measure (DREEM) viz. students’ Perception of Learning, Perception of Teaching, Academic Self-perception, Perception of the Environment and Social Self-perception on the basis of different levels of study for the different discipline and different courses (Sample size=300, level of significance=0.05)

| DREEM domain                  | Significance difference between Level of study for each domain | Significance difference between discipline for each domain |
|-------------------------------|---------------------------------------------------------------|----------------------------------------------------------|
| Students’ perception of learning | $p = .369 > 0.05$; Accept $H_0$                                | $p = .000 < 0.05$; Reject $H_0$                           |
| Students’ perception of teachers  | $p = .258 > 0.05$; Accept $H_0$                               | $p = .001 < 0.05$; Reject $H_0$                           |
| Students’ academic self-perception | $p = .525 < 0.05$; Accept $H_0$                               | $p = .000 < 0.05$; Reject $H_0$                           |
| Students’ perception of environment   | $p = .536 > 0.05$; Accept $H_0$                               | $p = .004 < 0.05$; Reject $H_0$                           |
| Students’ social self-perception       | $p = .533 > 0.05$; Accept $H_0$                               | $p = .001 < 0.05$; Reject $H_0$                           |
Differences between disciplines studied in DREEM domains

ANOVAAs revealed significant differences in DREEM scores for students from different disciplines (Table 4; Fig. 3a). Engineering students had different perceptions about Teaching, Academic self-perception, and Environment, whereas management students had different perceptions only for Social self-perception (Table 4).

Feedback was also used to identify differences in the opinions of undergraduate students pursuing different courses in the private University of India. Students studying Law (LW), Media and Communication (MC), Humanities and Social Sciences (HSS), Basic Sciences (BS), Mechanical, Mechatronics, Automobile, engineering (MMAE), Computing and Information Technology (CIT), Civil and Chemical Engineering (CCE), Electrical, Electronics and computer engineering (EECE), Business and Commerce (BC) and hotel management (HM) were compared. ANOVA results are shown in Table 4 for the 5% level of significance. Because differences between courses for five domains of DREEM were statistically significant, multiple comparisons were conducted using Tukey’s post-hoc test. IT students had different perceptions in Social, Learning, Environment, and Teaching, whereas students from BC only differed in Teaching, Self-Academic, and Environmental perceptions. When discipline-wise comparisons were undertaken, the Engineering discipline showed the maximum difference in Teaching, Self-academic, and Environment. But, in-school-wise comparison, students of Information Technology showed the maximum difference whereas, in the management stream, students of the basic sciences dominated and had a difference in perception. From the obtained results, we conclude that there were fewer negative results and more positive results in the domain of students’ perception of learning. We also found

### Table 4 Comparison of means and standard deviations for five DREEM factors

| Course studied | Students’ Perception of learning | Students’ Perception of teachers | Students’ Academic self-perception | Students’ Perception of atmosphere | Students’ Social self-perception |
|----------------|-------------------------------|---------------------------------|-----------------------------------|----------------------------------|---------------------------------|
| LW             | 23 ± 12.77                   | 28 ± 10.58                     | 19 ± 11.13                        | 29.33 ± 16.50                   | 15.33 ± 5.50                   |
| MC             | 19.71 ± 7.29                 | 22.52 ± 9.70                   | 18.52 ± 5.80                      | 25.48 ± 11.65                   | 12.24 ± 3.57                   |
| HSS            | 25.05 ± 5.14                 | 26.80 ± 5.26                   | 21.35 ± 4.98                      | 30.70 ± 8.35                    | 14.60 ± 3.92                   |
| BS             | 23.65 ± 5.05                 | 26.85 ± 5.12                   | 20.88 ± 5.20                      | 29.63 ± 7.54                    | 14.18 ± 3.60                   |
| MORE           | 20.33 ± 6.04                 | 23.04 ± 6.49                   | 17.61 ± 5.46                      | 26.88 ± 8.06                    | 13.31 ± 3.40                   |
| CIT            | 19.05 ± 6.95                 | 21.98 ± 6.69                   | 16.49 ± 4.98                      | 25.71 ± 8.11                    | 12.71 ± 3.70                   |
| CCE            | 21.71 ± 4.07                 | 26.19 ± 3.72                   | 15.76 ± 4.20                      | 25.52 ± 5.49                    | 12.86 ± 3.07                   |
| EASE           | 20.23 ± 6.57                 | 24.89 ± 6.86                   | 16.93 ± 4.63                      | 27.81 ± 7.13                    | 13.22 ± 3.96                   |
| BC             | 29.43 ± 2.37                 | 31.86 ± 2.91                   | 25.71 ± 2.62                      | 35.57 ± 4.11                    | 18 ± 1.15                      |
| HM             | 29 ± 0                       | 25 ± 0                         | 21 ± 0                            | 27 ± 0                          | 15 ± 0                         |

Significant difference between schools

Significant at $p = 0.000 < 0.005$ Reject H0

\[ \text{Law (LW), Media and Communication (MC), Humanities and social sciences (HSS), Basic Sciences (BS), Mechanical, Mechatronics, Automobile, engineering (MMAE), Computing and Information Technology (CIT), Civil and Chemical Engineering (CCE), Electrical, Electronics and computer engineering (EECE), Business and Commerce (BC) and hotel management (HM)} \]

Sample size = 300, level of significance = 0.05
the least-negative results and most-positive results in the domain of students’ academic self-perceptions (Fig. 4).

Also, in the domain of students’ perceptions of Teachers, we obtained fewer negative results compared with positive results when considering all items. In the domain of student perception of atmosphere, we found fewer negative results and more positive results across all items, indicating a healthy and conducive environment for teaching and learning in the institution. In the domain of students’ social perception, we obtained fewer negative results and more positive results for all items.

**Associations between DREEM factors and predictors**

The relationship of factor scores with year of study, gender, faculty, and accommodation was also investigated by Spearman rank correlation and multiple regression analysis as shown in Tables 5 and 7, while Pearson’s correlation was used to measure the relationship

| Predictor  | DREEM scale |
|------------|-------------|
|            | Learning    | Teaching    | Academic    | Environ    | Social     |
| Gender     | 0.170**     | 0.172**     | 0.154**     | 0.127      | 0.072      |
| Year       | 0.012       | -0.053      | -0.038      | -0.020     | -0.001     |
| Faculty    | 0.125*      | 0.114       | 0.161**     | 0.115*     | 0.183**    |
| School     | -0.086      | -0.031      | -0.222**    | -0.094     | -0.017     |
| Accommodation | 0.171**  | 0.107       | 0.210**     | 0.127*     | 0.090      |
between the factors as shown in Table 6. Perception of learning showed a significant positive correlation with gender, faculty, and accommodation, but not with year of study. Perception of teaching was only significantly correlated with gender. Perception of Academics was negatively and significantly correlated with school, whereas it was positively and significantly associated with gender, faculty, and accommodation. In Table 5, it is revealed that all the factors are highly positively correlated with each other. Multiple linear regression analysis showed that gender, year of study, and accommodation were significantly contributing to the perception of learning and academic self-perception as \( p < 0.05 \) in Table 7. Gender and faculty had a strong influence on the perception of teaching \( p < 0.05 \) in Table 7. Perception of environment and social self-perception was influenced by faculty.

Also, in the domain of students’ perception of teachers, there were fewer negative results compared with positive results when we considered the total of all items. For student perception of atmosphere, we found fewer negative results and more positive results when compared among the total of all items, indicating a healthy and conducive environment for teaching and learning in the institution. For students’ social perception, there were fewer negative results and more positive results for the total of all items in this domain. The results obtained were 95.4% relevant. A benchmark for data relevance and reliability is nearly 60% (Cronbach et al., 1970). Overall, in the university, students felt that the student–teaching environment was acceptable. Initially, for all subscales of the original DREEM ques-

### Table 7 Regression analysis for associations between predictors and DREEM parameters

| Factor               | Predictor     | \( \beta \) | \( t_{cal} \) | \( p \)  |
|----------------------|---------------|-------------|--------------|---------|
| Perception of learning (Constant) | 12.762 | 6.360 | <0.001 |
| Gender               | 2.423         | 2.870       | 0.004        |
| Year                 | 0.377         | 0.847       | 0.397        |
| Faculty              | 0.966         | 2.162       | 0.031        |
| Accommodation        | 1.791         | 2.057       | 0.041        |
| Perception of teachers (Constant) | 17.187 | 8.303 | <0.001 |
| Gender               | 2.646         | 3.039       | 0.003        |
| Year                 | 0.051         | 0.111       | 0.911        |
| Faculty              | 0.937         | 2.034       | 0.043        |
| Accommodation        | 1.062         | 1.182       | 0.238        |
| Academic self-perception (Constant) | 11.391 | 6.894 | <0.001 |
| Gender               | 1.630         | 2.345       | 0.020        |
| Year                 | 0.016         | 0.043       | 0.966        |
| Faculty              | 0.984         | 2.676       | 0.008        |
| Accommodation        | 1.831         | 2.553       | 0.011        |
| Perception of environment (Constant) | 19.301 | 7.561 | <0.001 |
| Gender               | 2.028         | 1.889       | 0.060        |
| Year                 | 0.386         | 0.682       | 0.496        |
| Faculty              | 1.113         | 1.959       | 0.051        |
| Accommodation        | 1.650         | 1.490       | 0.137        |
| Social self-perception (Constant) | 10.270 | 8.992 | <0.001 |
| Gender               | 0.680         | 1.415       | 0.158        |
| Year                 | 0.214         | 0.845       | 0.399        |
| Faculty              | 0.567         | 2.230       | 0.027        |
| Accommodation        | 0.395         | 0.796       | 0.426        |
tionnaire, corrected item-total correlations and Cronbach’s alpha if the item was shown in Table 8 along with factor loadings.

**Reliability and factor structure of DREEM questionnaire at a non-medical education university**

The DREEM’s reliability was checked using the alpha coefficient developed by Cronbach (1970). If the value of alpha is greater than 0.6, then the questionnaire is said to be reliable. In the present study, the alpha value was 0.954. Bartlett (1954) developed a method to test the suitability to perform factor analysis, namely, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO). This statistic is a measure of the proportion of variance among variables that might be common. If the value of this measure varies between 0 and 1 (with values closer to 1 being better) and is more than 0.6, the data are suited to factor analysis. Our value of the KMO measure was 0.942, indicating that factor analysis was suitable (Bartlett, 1954).

Next confirmatory factor analysis (CFA) was conducted on the original DREEM questionnaire for determining the construct validity. Roff et al., (1997) reported that the DREEM’s structure had low goodness-of-fit indicated according to Tucker-Lewis index (TLI=0.757), Chi-Square test (p<0.0001), comparative fit index (CFI=0.769), Akaike information criteria (AIC=38475.339), Bayesian information criteria (BIC=38882.388), root mean square error of approximation; RMSEA (=0.071) and standardized root mean residual (RMR=0.064) and showed a quite an acceptable fit. The standardized factor loadings 0.034 to 0.849 showed that some items did not represent the construct. All the factors derived from confirmatory factor analysis showed a high correlation as shown in Table 9.

The factor loadings and high correlations raise some issues about the independence of both the original DREEM factors and the CFA factors. So, further analysis was undertaken with exploratory factor analysis (EFA) using principal component analysis with varimax rotation. The loadings for the first two EFA factors for Q1 to Q50 DREEM items are shown in Table 10; Fig. 5. EFA yielded a nine-factor solutions with a total construct reliability of 0.954. However, only five factors were found to be valid after statistical investigation. Some factors contained only one item or some factors had very low Cronbach alpha values. Finally, regarding the criteria of eigenvalue > 1 and Cronbach’s alpha value > 0.6, only five valid factors remained and those explained 46.539% of the variance.

The factor loadings and commonalities are provided in Table 10. Due to very low factor loadings, some items (Q5, Q12, Q17, Q19, Q28, Q 50) were removed from the original DREEM questionnaire. The revised proposed factors (domains and items) of DREEM are listed below:

**Factor 1: students’ perception of learning**

Q1. I am encouraged to participate during teaching sessions.  
Q3. There is a good support system for students who get stressed.  
Q4. I am too tired to enjoy the course.  
Q6. The course organizers emphasize on student approach to consulting.  
Q14. I am rarely bored on this program.
| DREEM item | Corrected item-total correlation | Cronbach’s alpha if item deleted | Standardized factor loading | DREEM item | Corrected item-total correlation | Cronbach’s alpha if item deleted | Standardized factor loading |
|------------|----------------------------------|----------------------------------|-----------------------------|------------|----------------------------------|----------------------------------|-----------------------------|
| Q1         | 0.597                            | 0.869                            | 0.631                       | Q22        | 0.680                            | 0.769                            | 0.797                       |
| Q7         | 0.617                            | 0.868                            | 0.642                       | Q26        | 0.627                            | 0.779                            | 0.654                       |
| Q13        | 0.664                            | 0.865                            | 0.703                       | Q31        | 0.495                            | 0.797                            | 0.569                       |
| Q16        | 0.735                            | 0.861                            | 0.781                       | Q45        | 0.599                            | 0.781                            | 0.732                       |
| Q20        | 0.786                            | 0.857                            | 0.849                       | Q41        | 0.672                            | 0.770                            | 0.756                       |
| Q21        | 0.703                            | 0.862                            | 0.761                       | Q27        | 0.559                            | 0.788                            | 0.553                       |
| Q24        | 0.666                            | 0.865                            | 0.746                       | Q11        | 0.668                            | 0.819                            | 0.692                       |
| Q25        | 0.275                            | 0.911                            | 0.292                       | Q12        | 0.503                            | 0.831                            | 0.526                       |
| Q38        | 0.601                            | 0.869                            | 0.652                       | Q17        | 0.193                            | 0.855                            | 0.195                       |
| Q47        | 0.603                            | 0.868                            | 0.839                       | Q23        | 0.594                            | 0.824                            | 0.637                       |
| Q48        | 0.417                            | 0.879                            | 0.638                       | Q30        | 0.527                            | 0.828                            | 0.586                       |
| Q44        | 0.791                            | 0.857                            | 0.391                       | Q33        | 0.560                            | 0.826                            | 0.583                       |
| Q2         | 0.598                            | 0.819                            | 0.687                       | Q34        | 0.604                            | 0.824                            | 0.630                       |
| Q8         | 0.233                            | 0.846                            | 0.166                       | Q35        | 0.591                            | 0.823                            | 0.662                       |
| Q9         | 0.247                            | 0.845                            | 0.194                       | Q36        | 0.531                            | 0.828                            | 0.642                       |
| Q6         | 0.634                            | 0.814                            | 0.734                       | Q42        | 0.569                            | 0.826                            | 0.688                       |
| Q18        | 0.634                            | 0.813                            | 0.725                       | Q43        | 0.685                            | 0.816                            | 0.768                       |
| Q29        | 0.674                            | 0.810                            | 0.756                       | Q50        | 0.174                            | 0.854                            | 0.178                       |
| Q32        | 0.530                            | 0.823                            | 0.568                       | Q3         | 0.398                            | 0.541                            | 0.634                       |
| Q37        | 0.646                            | 0.813                            | 0.735                       | Q4         | 0.297                            | 0.577                            | 0.488                       |
| Q39        | 0.368                            | 0.837                            | 0.336                       | Q14        | 0.426                            | 0.533                            | 0.569                       |
| Q49        | 0.480                            | 0.828                            | 0.558                       | Q15        | 0.420                            | 0.535                            | 0.406                       |
| Q40        | 0.617                            | 0.816                            | 0.649                       | Q19        | 0.432                            | 0.528                            | 0.484                       |
| Q5         | 0.394                            | 0.811                            | 0.410                       | Q28        | 0.015                            | 0.673                            | 0.034                       |
| Q10        | 0.214                            | 0.832                            | 0.241                       | Q46        | 0.315                            | 0.571                            | 0.372                       |
Q16. The teaching helps to develop my competence I.
Q20. The teaching is well focused I.
Q21. I feel I am being well prepared for my profession I.
Q22. The teaching helps to develop my confidence III.
Q24. The teaching time is put to good use I.
Q25. The teaching over emphasizes factual learning I.
Q26. Last year’s work has been good preparation for this year’s work III.
Q27. I can memorize all I need III.
Q29. The teachers are good at providing feedback to students II.
Q31. I have learned a lot about empathy in my profession III.
Q35. I find the experience disappointing IV.
Q36. I am able to concentrate well IV.
Q37. The teachers give clear examples II.
Q38. I am clear about the learning objectives of the program I.
Q41. My problem-solving skills are being well developed here III.
Q42. The enjoyment outweighs the stress of the program IV.
Q43. The atmosphere motivates me as a learner IV.
Q44. The teaching encourages me to be an active learner I.
Q45. Much of what I have to learn seems relevant to a career in the society III.
Q47. Long term learning is emphasized over short term learning I.

**Factor 2: students’ perception of academics**

Q 2. The program organizers are knowledgeable II.
Q7. The teaching is often stimulating I.
Q11. The atmosphere is relaxed during teaching session IV.
Q13. The teaching is student centered I.
Q18. The teachers have good communication skills with the students II.
Q23. The atmosphere is relaxed during lectures IV.
Q32. The teachers provide constructive criticism here II.
Q40. The teachers are well prepared for their teaching sessions II.

**Factor 3: students’ perception of social self-perception**

Q15. I have good friends on this program V.
Q30. There are opportunities for me to develop interpersonal skills IV.
Q33. I feel comfortable in class socially IV.

**Factor 4: students’ perception of atmosphere**

Q10. I am confident about my passing this year III.
Q34. The atmosphere is relaxed during seminars / tutorials IV.
Q46. My accommodation is pleasant V.
Q49. I feel able to ask the questions I want II.

**Factor 5: Students’ perception of teachers.**

Q8. The teachers ridicule the registrars II.
Q9. The teachers are authoritarian II.
Q39. The teachers get angry in teaching sessions II.
Q48. The teaching is too teacher centered I.

To summarize, the updated first domain of student perceptions of learning now comprises 25 items with a Cronbach alpha of 0.955 and a variance of 20.19%. It becomes the most dependable DREEM item due to its high Cronbach alpha value. Item 44, “Teaching increases me to become a more active learner,” has the largest factor loading, followed by items 45 and 47, respectively [“Much of what I have to learn seems relevant to a career in society,” says one student and “long-term learning is prioritized above short-term learning”]. Item 26 “Last year’s work has been a good preparation for this year’s work” received the lowest score (Table 7). In the redesigned second domain of student perceptions of academics, 8 items had a variance value of 10.337% and a Cronbach alpha value of 0.867. With a loading value of 0.651, the item “The teachers provide constructive criticism” received the most votes. Q18 was the item with the second-highest score. The teachers have good student communication skills, and the lowest score was Q23. The atmosphere is relaxed during lectures.

The updated third domain, which has three items, exhibited 6.119% variance and the Cronbach alpha value of the second domain is 0.677 when factor 3 related to Students’ view of social self-perception was examined. ‘Q15’ was the first item to be altered. With a loading rating of 0.767, I have wonderful buddies on this application.“ With a loading value of 0.746, the second-highest item is I feel socially at ease in class. The revised fourth domain
### Table 10 Principal component analysis with varimax rotation for the DREEM questionnaire

| DREEM item | Loadings for revised DREEM factors based on loading values | | | | | |
| --- | --- | --- | --- | --- | --- |
| | Students’ perception of learning | Students’ perception of academic | Students’ perception of social self-perception | Students’ perception of atmosphere | Students’ perception of teachers | Communality |
| Q44 | 0.766 | | | | | 0.467 |
| Q45 | 0.754 | | | | | 0.555 |
| Q47 | 0.725 | | | | | 0.608 |
| Q43 | 0.677 | | | | | 0.453 |
| Q16 | 0.659 | | | | | 0.422 |
| Q41 | 0.655 | | | | | 0.636 |
| Q21 | 0.650 | | | | | 0.574 |
| Q20 | 0.635 | | | | | 0.640 |
| Q38 | 0.625 | | | | | 0.663 |
| Q35 | 0.571 | | | | | 0.489 |
| Q3 | 0.563 | | | | | 0.704 |
| Q29 | 0.561 | | | | | 0.359 |
| Q42 | 0.552 | | | | | 0.626 |
| Q1 | 0.540 | | | | | 0.504 |
| Q31 | 0.539 | | | | | 0.682 |
| Q36 | 0.536 | | | | | 0.632 |
| Q22 | 0.527 | | | | | 0.676 |
| Q25 | 0.526 | | | | | 0.656 |
| Q4 | 0.525 | | | | | 0.577 |
| Q14 | 0.525 | | | | | 0.721 |
| Q6 | 0.514 | | | | | 0.763 |
| Q24 | 0.479 | | | | | 0.643 |
| Q37 | 0.477 | | | | | 0.656 |
| Q32 | | 0.651 | | | | 0.717 |
| Q18 | | 0.585 | | | | 0.664 |
| Q13 | | 0.570 | | | | 0.523 |
| Q40 | | 0.553 | | | | 0.665 |
| Q11 | | 0.531 | | | | 0.589 |
| Q2 | | 0.528 | | | | 0.769 |
| Q7 | | 0.522 | | | | 0.604 |
| Q23 | | 0.511 | | | | 0.515 |
| Q15 | 0.767 | | | | | 0.767 |
| Q33 | | 0.746 | | | | 0.575 |
| Q30 | | 0.420 | | | | 0.603 |
| Q10 | | 0.620 | | | | 0.582 |
| Q49 | | 0.572 | | | | 0.600 |
| Q46 | | 0.570 | | | | 0.547 |
| Q34 | | 0.509 | | | | 0.515 |
| Q9 | | | 0.722 | | | 0.702 |
| Q8 | | | 0.692 | | | 0.671 |
| Q39 | | | 0.526 | | | 0.650 |
| Q48 | | | 0.507 | | | 0.643 |
| Q27 | 0.409 | | | | | 0.546 |
| Q26 | 0.401 | | | | | 0.578 |
| Alpha | 0.955 | 0.867 | 0.677 | 0.666 | 0.630 | |
of Student perception to social self-perception now contains 4 items that showed a 5.53% variance and the Cronbach alpha value of the second domain is 0.666. The first highest contributing item is Q10. I am confident about my passing this year with a 0.62 loading value. The second highest item is Q49. I feel able to ask the questions I want with a 0.572 loading value. The last factor 5, Student perception to social self-perception containing 4 items showed 4.364% variance and the Cronbach alpha value of second domain is 0.63. The first revised item was ‘Q9. The teachers are authoritarian” with 0.722 loading value. The second highest item Q8. The teachers ridicule the registrars with 0.692 loading value. The lowest one is Q48. The teaching is too teacher-centered with a 0.507 loading value.

Discussion

Based on the primary sections of the two research questions, we interpret our findings regarding students’ impressions of the educational environment. The diversity of the student population, workload, educational facilities, teacher-student connections, and students’ expectations of the school were all thought to influence our educational environment results (Sahu et al., 2020). Students from all throughout the country attended the model university chosen for this research. The study was initially conducted to determine how undergraduate university students perceive learning in an educational setting, using the validated DREEM original set questions for all five domains on all undergraduate students, regardless of their background, socio-economic status, prior field of study, financial status, or other factors.
Both male and female students had similar perceptions of learning, teachers, academic self-perception, environment, and social self-perception, the DREEM domains. In 2014, Vaughan and colleagues found that, while there were no gender differences in the DREEM domain factors, there were disparities between male and female DREEM items in some cases. On the other hand, Bakhshialilabad et al. (2019) identified substantial gender disparities in overall DREEM scores. Although we conducted a study of all different fields of science, arts, business, law, and engineering in our case, we found no differences between male and female respondents.

In their study of nursing students at an Iranian university, Hamid et al. (2013) found that the differences in overall DREEM scores were due to differences in goals, whereas Barcelo in 2016 found that the differences were due to differences in curricula of medical laboratory science and nursing students at a Philippine University.

When a comparison analysis employing data from the Indian University was done on the basis of accommodation, no differences in opinion were found between oncampu and off-campus students. Shanghai University of Traditional Medicine (Mao et al., 2021) published a study that looked at the impact of the environment (surrounding/place of stay) during the COVID-19 pandemic.

This component was a key focus of DREEM investigation during the pandemic (Lin et al., 2021). We all had to acclimatize to the new normal online system after leaving our native environment of the classroom. In this study, the score of the five components of the Dundee Ready Educational Environment Measure (DREEM) was compared to the undergraduate students’ discipline (arts/science/management/engineering) and level of study (first/2nd/3rd/4th). Our investigation revealed that when students were assessed on the entire DREEM domain, their opinions did not change. Whittle and his colleagues (2007) tested the DREEM elements on students at all levels of study (1–5 years) in a medical school undergraduate program.

They discovered that using open-ended questions elicited more negative answers and unhappiness with their studies. However, a large percentage of them (40%) did not complete the survey. This was our first realization of the students’ lack of understanding and lack of feedback. There were discrepancies in perception among students studying different professional health courses in Brazil in another reported example by Costa and his coworkers (2021), which led to more negative consequences and problems in the educational environment. As a result of the DREEM research, we find that a diagnostic reform can be implemented to correct the current situation. However, based on our examination of the whole DREEM domains,

There were no significant differences found. Moreover, despite the lengthy search, no non-medical institutional case study using the original DREEM domains and items was uncovered.

The data acquired from our survey were analyzed for reliability and factor analysis in the second stage of the research. Internal consistency was found in the psychometric assessments for the factor analysis, with a reliability of 0.954. The mismatches in the items to the DREEM domains were highlighted in this response. All of the methods of factor analysis and exploratory factor analysis of 0.954 proposed solutions for nine factors, raising more doubts about the trustworthiness of using the original DREEM set. However, after further consideration, only five amended variables were found to be acceptable, as explained in Sect.3.2.
DREEM entries in the five domains were reshuffled as part of the revision. Thus, instead of 50 items, only 44 items were determined to be significant in the revised DREEM questionnaire, based on a study conducted at an Indian university, with a Cumulative explained variance of 46.539%. With a sample of Ghanaian medical students, Mogre & Amalba (2016) reported internal consistency of 0.92 in health professions education programs and interpreted a four-factor structure in the revised DREEM instrument. The five-factor framework of the DREEM was also rejected in their research.

Khan et al. (2011) cited a similar inconsistency, citing a Cronbach alpha value of 0.91 for consistency and 10 subscales (DREEM domains) instead of 5 as shown by Roff et al. (1997). The DREEM inventory is now under investigation, according to Roff et al. (2005), and continuous study can help to validate and adapt this sensitive tool.

Item 5, Learning strategies which worked for me before continuing to work for me now; item 19, My social life is good; item 12, This program is well timetabled; item 17, Cheating is a problem on this program; and item 28, I seldom feel lonely was removed from the study because they had a low loading value. The removal of item 28, was similarly recommended by Vaughan et al., (2014), and their score improved from 0.923 to 0.925. They also recommended that item 17 be taken out of the equation. They also suggested the removal of item 17 Cheating is a problem in this program and in Item 50, The students irritate the teachers.

To reduce the reliability of the subscales they present, Mogre & Amalba (2016) recommend removing the negatively worded DREEM item (item 50). They also took away item 17” Cheating is a problem on this program”, due to the low correlation and factor loading. Negatively stated DREEM items were also removed, according to Steward and Fry (2004). All of these questions plainly show that the students were humiliated at some point during the response process owing to the incomprehensible English language. The questions with the highest factor loading were basic and straightforward. During the study, the majority of students agreed that the 50-item standard questionnaire was too long. In today’s fast-paced world, kids do not have the patience to complete this inquiry honestly. A small percentage of the 300 students in the sample did not finish the questionnaire. Although a blank questionnaire was not received by anyone, the response rate was around 85%. All of this research indicate that item rearrangement can be neglected or eliminated.

Limitations

The current research can be divided into two parts. The validity and reliability of our DREEM-generated data were examined in two stages: the first on the original DREEM questionnaire, and the second on a nonmedical university, as in the example mentioned in this work. The usage of one batch of currently enrolled students is one of the initial study question’s constraints. As a result, this research cannot be applied to freshly enrolled or graduated students. Another drawback of this study is the use of a predefined standard questionnaire that has been verified for medical universities. As a result, this may not be feasible for a university that offers higher education in all fields. Furthermore, in comparison to a qualitative interview, a google form survey may not collect all of the information. According to student opinion, the usual DREEM questionnaire was somewhat lengthy. As a result, a systematic overhaul of in-person interviews could yield a more realistic outcome. Because this study is unique and the method DREEM is not commonly used to analyze the educa-
tional environment of non-medical colleges in higher education, there were few comparable studies to compare.

**Conclusion**

Using the DREEM generic questionnaire, we hoped to gain a better knowledge of the educational environment of a non-medical Indian University. Out of the total 50 items using the original DREEM questionnaire, our research found more positive and constructive feedback than negative input. As a result, a higher number of positive items in the current sample university may imply and promise a better educational environment. However, when all the DREEM components were factored together, the general internal consistency of the DREEM score was discovered. This study employs this widely used tool for assessing student perception of the learning environment that can be served as a baseline to monitor the impact of curricular change over a period in a non-medical Indian university. Though there is evidence that the learning environment influences students’ perception, more study is required to link environmental perceptions to academic success. Simultaneously, there is always an opportunity to improve the teaching-learning sessions. Based on the component analysis, the revised DREEM questionnaire was designed consisting of only 44 items as they were found to be significant in the study conducted at an Indian University, with a Cumulative explained variance of 46.539%. The learning environment of any educational institute is very complex and specific institute is affected by specific domains of DREEM. It is worthwhile to mention that a routine investigation of the periodical assessment of students’ perceptions can help in improving the student’s educational environment. The authors are currently planning to conduct a follow-up study using the revised DREEM questionnaire to examine its potential and rectify any bias during the process of the analysis.

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