

ORIGINAL ARTICLE

Systematic Evaluation of Published Research Studies Conducted Among Medical Undergraduate Students on Learning Environment in Medical Colleges of India Using the DREEM Inventory Tool

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Abstract

Objective: To evaluate original studies conducted among medical undergraduate students to assess education and learning environment in India using DREEM (Dundee Ready Educational Environment Measure) tool. **Material & Methods:** The online search engine PUBMED and Google scholar were utilized to short list original published research studies on learning environment. The eligibility criteria included: study conducted in India upon medical students using DREEM tool; information on sample size, total, and sub-domain DREEM score available. Fourteen original research publications with a total sample size of 4215 medical students were considered. **Results:** Total DREEM score (range, 0-200) was 119.5 that indicated that there was more positive education environment in selected medical colleges of country. The average score of different sub domains of DREEM also supported the positive environment. Sub-domain DREEM mean scores derived through this analysis was SPL-28.7 (range, 0-48); SPA-28.4 (range, 0-48); SPT-25.8 (range, 0-44); SASP-20.2 (range, 0-32); and SSSP-16.4 (range, 0-28). The scores of all the studies were in the similar range except two. Mean score of most (80%) of the items (40/50) lied between 2 and 3 (range, 0-4) indicating that these areas were 'neither strong nor weak' but could be 'enhanced'. Some aspect of the learning and education environment with average score of less than 2 include inherent challenges of the extensive medical course; the teaching over-emphasizes factual learning (item-25); students are able to memorize all the matter (item-27); and rarely feel bored (item-14) require attention. However, issues like teaching is too teacher centered (item-48); the teachers are authoritarian (item-9); and the teachers get angry in class (item-39) requires sensitization and introspection by the esteem faculty members. **Conclusion:** Overall students perceived progressive and positive developmental milieu in the learning environment in the selected medical colleges of India

Keywords

Academics; DREEM instrument; Medical Education

Introduction

Medical education in India is based on globally acknowledged evidence based best practices. It is no surprise that India is one of the popular destinations of medical, transplant, reproductive and health tourism in the world and substantial proportion of renowned doctors working in developed country have roots in this great nation. (1,2) The duration of MBBS course in medical college of India is of four-and half years followed by one-year internship. The students are systematically and in structured way exposed to different subject (pre-clinical, para-clinical and clinical) streams and skills under quality assurance and processes prescribed under the national regulatory body i.e. Medical Council of India. However, in recent year's deterioration in quality of medical education was noticed due to rampant commercialization, corruption, and callus approach leading to concomitant adverse media reports and poor perception of learning environment.

Evaluation of medical education would encompass four dimensions of quality of teaching: structure, processes (teaching formats), learning outcome (e.g., competencies) and individual teachers (multiple roles in teaching and patient care). (3) In addition, student's perspective of learning environment encompasses the educational, physical, social, and psychological context in which trainees are immersed and is thought to play a significant role in their professional and moral development thus necessitating a critical appraisal of the use of student ratings with a specific focus on medical education. (4,5,6)

The perception of learning environment from student's perspective is a useful basis for modifying and improving the quality of educational environment in an institution. As student is an important and critical stakeholder in the education environment, their ratings are a popular data source for course evaluation in higher education. It has been aptly stated that 'A working environment that is conducive to learning is critically important to successful training'. To measure such an environment, Roff et al. (1997) developed the Dundee Ready Education Environment Measure (DREEM) inventory tool. (7)

Many studies (8,9,10) have been undertaken across the globe including India where researchers have captured the student's perception of their learning

environment in medical colleges using DREEM inventory tool. With this background a systematic evaluation of original published studies that have used DREEM instruments was undertaken.

Aims & Objectives

To assess medical student's perceptions of the education environment in selected medical colleges of India

Material & Methods

Background of study tool: The Dundee Ready Educational Environment Measure (DREEM) instrument: This tool was designed to measure the educational environment, specifically for medical colleges and other health professions. It is a widely used tool with 50-items (questions) relating to a range of topics directly relevant to medical education climate at the undergraduate (MBBS) level. Overall score of the instrument ranges between 0-200. The instrument is culturally non-specific, allows quality assurance comparison and identifies specific problem areas within an institution for different component of educational environment.

The DREEM instrument is divided into 5 sub-domains which are

1. Students' Perceptions of Learning (SPL) - 12 items (score range 0-48);
2. Students' Perceptions of Atmosphere (SPA) - 12 items (score range 0-48);
3. Students' Perceptions of Teachers (SPT) - 11 items (score range 0-44);
4. Students' Academic Self- Perceptions (SASP) - 08 items (score range 0-32);
5. Students' Social Self-Perceptions (SSSP) - 07 items (score range 0-28).

Data Collection: The online search engine PUBMED and Google Scholar were utilized to short list published research studies assessing the perception of medical education and learning environment in medical colleges/institutions of India using DREEM instrument. The keywords used for search strategy included [Medical students] OR [Medical undergraduates] OR [MBBS students] OR [university health students] AND (DREEM OR Dundee Ready Educational Environment Measure OR Education Environment OR Learning Environment) AND [India OR Indian]. Eligibility criteria for short-listing of original research included: (1) study conducted in

India upon Indian medical students using DREEM tool; (2) information on sample size, total, and sub-domain DREEM score available. Search and screening was independently taken by two authors (SS and ND) and moderated by NT and decision was based on mutual discussion and consensus by all the authors. This study excluded DREEM carried upon paramedical course, post-graduate course and any subject specialty (pediatric etc) specific DREEM usage at MBBS level, dental students or other type of publications like editorial/commentaries/perspective and full manuscript not available in public domain other than abstract. (Figure 1)

We were able to identify 17 published research studies conducted in India till date using DREEM inventory tool. However, 3 studies were excluded since the information on sample size (number of medical students) not given (one-study), sub-domain score of DREEM not given (one-study); and study undertaken on foreign students in India (one-study).

Thus, all the remaining 14 publications were included and geographical distribution of published studies were as follows: three studies were from Delhi, four from Karnataka (Belgaum, Mangalore, Manipal, and Mysore), four from Maharashtra (Mumbai, Nagpur, Pune and Wardha), and one study each from Rajasthan (Udaipur), Gujarat (Bhavnagar) and Bihar (Darbhanga). (11-24) The ownership status of these medical colleges was ascertain from website of medical council of India (MCI) and status was as follows- 04 government and rest 14 colleges were under management of trust (\approx private). (25)

Analysis: The data from published research was extracted on Excel sheet and analysis undertaken using statistical software (SPSS ver.20) to depict total and sub-domain scores (mean values) of DREEM inventory and considered significant at $p < 0.05$ using t-test. Item wise (50 questions) DREEM inventory score (mean) is depicted according to management (government or private) of selected medical colleges in India.

The DREEM questionnaire consists of five-point Likert-scale questions; scored according to standard guidelines as follows: strongly agree (4), agree (3), neutral (2), disagree (1), and strongly disagree (0) with the item score ranging from 0-4. The score is reversed for negatively oriented questions and for the purpose of statistical analysis the total score corresponding to all 50 statements is counted as the

overall DREEM score, which ranges from 0 to 200. The total DREEM score is then divided into four categories for interpretation: very poor (0-50), problematic (51-100), more positive than negative (101-150), and excellent (151-200). (Table 1) shows approximate guide to interpret DREEM score.

The individual items with a mean score of 3 and above reflect a positive educational climate and are considered areas of strength for a college; and items with a mean score below 2 are considered areas of weaknesses for a medical college. Items with a mean score between 2 and 3 reflect areas that are neither strengths nor weaknesses but potential areas that could be improved

Results

A total sample size of 4215 medical students was analyzed to provide the snapshot of learning and education environment in selected medical colleges in India. Total DREEM score (range, 0-200) was 119.5 that indicated that there was more positive environment in selected medical colleges of India. The average score of different sub domain of DREEM also supported the positive environment. Sub-domain DREEM mean scores derived through this analysis was SPL-28.7 (range, 0-48); SPA-28.4 (range, 0-48); SPT-25.8 (range, 0-44); SASP-20.2 (range, 0-32); and SSSP-16.4 (range, 0-28). Details are given in (Table 2). For visual simplicity, (Figure-2) depicts total and sub-domain DREEM score amongst all the medical students out of 100 points.

Mean score of SPL and SPT is 28.7 and 25.8, suggesting that there was positive perception of learning and teachers that is moving in the right direction. Mean score of SASP is 20.2 that indicated academic self-perception is also on positive side. Perception of atmosphere is also moving in right direction with mean score of 28.4 whereas social self-perception of medical students is 'not too bad' as the mean score was 16.4 but this issue needs appropriate attention and support. The scores of all the studies were in the similar range (Figure 3) except Bihar (Darbhanga) and Delhi (UCMS) with very low scores.

(Table 3) shows item wise comparison of learning environment between medical colleges according to management status. Mean score of most (80%) of the items (40/50) lied between 2 and 3 that indicates that these areas are 'neither strong nor weak' but can be 'enhanced'. Mean score of item no. 9, 14, 25, 27, 39, and 48 were having average less than 2 that

showed that these areas are 'weak' and need appropriate attention. For item no. 48, 9 and 27 the value is less than 2 for both government and private medical college whereas for item 25, 39 and 3, it is low for private and government medical college respectively. Strength includes knowledgeable teacher (item-3) and students having good friends (item-15) with score of (3)

Discussion

The synthesis of this study based on cross-sectional descriptive assessment of learning and education environment as perceived by medical students (n=4215) enrolled in different medical colleges (n=14) of India indicated an overall positive environment and moving in right direction with a total DREEM score (range, 0-200) of 119.5. Some of the most consistent finding across all published studies relates to student's characteristics such as self-drive, better ability to cope with syllabus, satisfaction with college, body image, exams and life; females being more motivated students and high-achievers tend to provide more positive course ratings. Any selection procedure favoring these groups might inflate positive ratings. Given these limitations, the results of the systematic evaluation must be interpreted with caution.

Some aspect of the learning and education environment with average score of less than 2 i.e. the teaching over-emphasizes factual learning (item-25); students are able to memorize all they need (item-27); and students are rarely bored in this course (item-14) are the inherent challenges of the extensive medical course. However, issues like teaching is too teacher-centered (item-48); the teachers are authoritarian (item-9); and the teachers get angry in class (item-39). This requires direct, focused involvement and introspection by faculty members. Sensitization of teachers is needed to act as role model, change agent, facilitator, in making the environment more congenial and also in better managing the students in changing socio-political and information technology dynamics in India without losing temper. Meaningful involvement of student in hostel, personal space, and spare time is other area that needs improvement. Environment of self-directed learning may be stimulating and helpful. A dress code for students needs to be assigned to instill discipline and professionalism. Medical colleges need to establish counseling and support system for students who are affected by

psychological distress or addicted to substance abuse (smoking, alcohol, drugs) or emerging risks like mobile and internet addiction. (26,27,28)

The near similarity of findings could perhaps be because these medical colleges have been able to maintain satisfactorily the minimum standards, processes and the operational guidelines prescribed by Medical Council of India (MCI). In addition to this, length (years) of running an institution did not unduly influenced such results. As none of the medical college in the country can operate outside the ambit and scope of the regulatory body (MCI), it can be safely concluded that overall educational environment appears to be a 'positive'. The current number (as of year 2019) of medical colleges in India stood at 532 with annual MBBS seats of 60,000 plus. Thus, present analysis infers the status of 7.0% (4215/60000) medical students enrolled in 2.6% (14/532) medical colleges spread across primarily northern, western and southern regions of country. Indirectly it also points out that MCI has been able to achieve its mandate despite various challenges and issues of maintaining minimum essential quality standards in the country.

Teaching, learning dynamics and evaluation process forms the core-activity of student teacher interaction in any institution and motivated faculties are constantly engaged in building, transforming knowledge, attitude, and practices; implementing innovating methods from a large bouquet of training methods and evaluation.(29,30,31) The development and growth potential of an individual is directly correlated with the depth of knowledge, positive attitude, and diverse skills s/he possesses and demonstrates whether at undergraduate or higher level of functioning.(32) The stimulating, and involving education environment created in medical institutions by some of the esteem faculties makes learning active, interesting and life-long. Inter-alia, need for cramming of the subjects becomes less critical. Inquisitive, novice and innocent curious questions of the students can be best handled by understanding and matured faculties. Such practice needs to be nurtured with tender care. Many institutions in India have introduced innovative training methods based on integrated teaching or problem/investigation report/field-based learning, evidence-based medicine and some of them are equipped with high end research, clinical, simulation and communication skill labs.

Medical education environment in the country is evolving for better yet it needs a time-bound overhaul to overcome diverse uninspiring challenges and also to be in sync with newer competencies, digital technology and changing time.(33,34,35) Stakeholders be it student, faculty or administrator are constantly engaged in discussion, debate and meetings for overcoming the crises situation and suggest way forward.(36) Common entrance examination at undergraduate and postgraduate level in the country is a positive step in this direction. Non-transparent interactions, lack of resources, favouritism, commercialization of medical education and corruption have been the main stumbling blocks in its road to recovery. For last couples of years, thrust of medical education in country has been to increase the production of doctors and allied health staff. Albeit, increasing quantity is having a toll in terms of poor quality of doctor training including inadequate knowledge and skill transfer.

Medical education is an encompassing term that considers various factors such as curriculum, learning and teaching methodologies, outcome and assessment, skill transfer, group dynamics, teacher student relationship, self and peer development etc. Student perception of their environment has shown to have a significant impact on their behavior and academic progress. (37) Student's perception would depend upon their personality, emotional factors, aspirations, challenging exposures in childhood, and socio-economic-cultural upbringing etc. We found that there was no statistically significant ($p>0.05$) difference in quality of learning and education environment as perceived by medical students enrolled in selected government or private (\approx trust) medical colleges of India in spite of differences in geographical location and medical student characteristics between these institutions especially self-drive and motivation.

Conclusion

In conclusion, overall students perceived progressive and positive developmental milieu in the learning and education environment in the selected medical colleges of India but some aspects need attention, introspection, strengthening, including establishment of personalized counseling and support system for students

Recommendation

Overall students perceived progressive and positive developmental milieu in the learning environment in

the selected medical colleges of India. The minimum standards prescribed by Medical Council of India for quality assurance of medical education in India needs to be preserved, promoted and adhered in letter and spirits.

Limitation of the study

DREEM inventory tool provides an opportunity for evaluation and feedback of education environment in a health institution from student's perspective only therefore it has its own set of inherent limitations. (25) The instrument does not capture providers and other stakeholders perspective but provides an insight for improvement and introspection.

Relevance of the study

The study provides a comprehensive insight on the learning and education environment in the selected medical colleges of India from student's perspective and a scope for introspection and improvement.

Authors Contribution

The first author conceptualized the study and all authors contributed equally.

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Tables

TABLE 1 THE GUIDE TO INTERPRET DREEM SCORE

Score	Total DREEM score	Score	Students Perception of Teachers (SPA)	Score	Students Perception of Atmosphere (SPA)
0-50	Very poor	0-11	Very poor	0-12	Very poor
51-100	Plenty of problems	12-22	In need of some retraining	13-24	In need of some retraining
101-150	More positive than negative	23-33	Moving in right direction	25-36	Moving in right direction
151-200	Excellent	34-44	Model teachers	37-48	Model teachers
Score	Student Perception of learning (SPL)	Score	Student Academic Self Perception (SASP)	Score	Students Social Self-Perception (SSSP)
0-12	Very poor	0-8	Feeling of total failure	0-7	Miserable
13-24	Teaching viewed negatively	9-16	Many negative aspects	8-14	Not a nice place
25-36	More positive than negative	17-24	Feeling more on positive side	15-21	Not too bad
37-48	Teaching highly thought of	25-32	Confident	22-28	Very good socially

TABLE 2 STUDIES CONDUCTED IN INDIA TO ASSESS LEARNING AND EDUCATION ENVIRONMENT AS PERCEIVED BY MEDICAL STUDENTS USING THE DREEM INVENTORY TOOL

SN	Place of study in India; and publication year	*Year of inception of college and type of management	Sample size of medical student covered	DREEM sub-domain (mean score values)				
				SPL (0-48)	SPA (0-48)	SPT (0-44)	SASP (0-32)	SSSP (0-28)
1	Manipal;2008	1953 (T)	226	28.4	27.7	25.8	18	15.5
2	Delhi (ACMS); 2013	2008 (T)	156	31.5	28.4	27.1	20.9	16.9
3	Delhi (UCMS)2013	1971 (G)	348	22.7	24.6	23	16.7	14.2
4	Bihar; 2013	1971 (G)	170	23.2	24.2	23.7	19.05	14.5
5	Mysore;2013	1984 (T)	224	29.6	28.2	25.4	20.2	16.6
6	Mangalore;2014	1955 (T)	692	29.5	29.3	27.1	20.3	17.1
7	Nagpur;2014	1990 (T)	152	27.9	27.5	26.5	20.4	16
8	Pune;2015	1989 (T)	347	29.8	30.2	26.4	21.8	17
9	Belgaum;2015	1963 (T)	914	29.1	28.5	24.9	20.7	17
10	Bhavnagar2015	1995 (G)	86	31.4	31.0	28.6	21.9	17.5
11	Mumbai;2016	1991 (T)	322	29.1	29.2	26.8	21.4	17.5
12	Wardha;2016	1969 (T)	267	30.9	29.9	25.7	20.6	16.1
13	Udaipur; 2016	2008 (T)	194	29.3	28.02	26.57	20.32	14.2
14	Delhi (NDMC); 2018	2013 (G)	117	31.5	31.6	29	21.2	17
	Total	-	4215	28.7	28.4	25.8	20.2	16.4

*Source: MCI 2017; G=government; T=trust; Students' Perceptions of Learning (SPL); Students' Perceptions of Atmosphere (SPA); Students' Perceptions of Teachers (SPT); Students' Academic Self- Perceptions (SASP); Students' Social Self-Perceptions (SSSP)

TABLE 3 ITEM (QUESTION) WISE DREEM SCORE ACCORDING TO MANAGEMENT OF MEDICAL COLLEGES IN INDIA

Item No	Domains	Average (mean score)			p value
		Total	Govt.	Private	
Students' perception of learning (SPL)					
1	I am encouraged to participate in class	2.6	2.4	2.7	0.4
7	The teaching is often stimulating	2.4	2.3	1.3	0.7
13	The teaching is student-centered	2.4	2.3	2.1	0.4
16	The teaching is sufficiently concerned to develop my competence	2.6	2.5	2.6	0.7
20	The teaching is well focused	2.6	2.5	2.7	0.4
21	The teaching is sufficiently concerned to develop my confidence	2.5	2.4	2.6	0.7
24	The teaching time is put to good use	2.5	2.3	2.5	0.7

25	The teaching over-emphasizes factual learning	1.8	2.0	1.6	0.7
38	I am clear about the learning objectives of the course	2.7	2.6	2.7	0.4
44	The teaching encourages me to be an active learner	2.5	2.3	2.5	0.7
47	Long-term learning is emphasized over short-term	2.5	2.4	2.5	0.7
48	The teaching is too teacher-centered	1.8	1.8	1.8	0.7
Students' perception of teachers (SPT)					
2	The teachers are knowledgeable	3.0	3.1	3.1	0.7
6	The teachers are patient with patients	2.5	2.4	2.4	1.0
8	The teachers ridicule the students	2.1	2.0	2.1	0.4
9	The teachers are authoritarian	1.7	1.7	1.7	0.4
18	The teachers have good communications skills with patients.	2.8	2.8	2.7	0.7
29	The teachers are good at providing feedback to students	2.3	2.1	2.4	0.9
32	The teachers provide constructive criticism here	2.4	2.3	2.4	1.0
37	The teachers give clear examples	2.6	2.4	2.7	0.1
39	The teachers get angry in class	1.9	1.8	2.1	0.9
40	The teachers are well prepared for their class	2.8	2.7	2.8	0.4
50	The students irritate the teachers	2.2	2.0	2.4	0.7
Students' academic self-perception (SASP)					
5	Learning strategies which worked for me before continuing to work for me now	2.3	2.2	2.3	1.0
10	I am confident about my passing this year	3.0	2.9	3.1	0.7
22	I feel I am being well prepared for my profession	2.5	2.4	2.6	0.7
26	Last year's work has been a good preparation for this year's work	2.5	2.4	2.5	1.0
27	I am able to memorize all I need	1.9	1.8	1.9	0.7
31	I have learned a lot about empathy in my profession	2.7	2.5	2.7	0.7
41	My problem-solving skills are being well developed here	2.4	2.2	2.4	0.7
45	Much of what I have to learn seems relevant to a career in medicine	2.7	2.7	2.8	0.4
Students' perception of atmosphere (SPA)					
11	The atmosphere is relaxed during the ward teaching	2.5	2.4	2.6	0.7
12	This school is well time-tabled	2.5	2.4	2.5	0.7
17	Cheating is a problem in this school	2.1	2.0	2.0	1.0
23	The atmosphere is relaxed during the lectures	2.5	2.4	2.6	1.0
30	There are opportunities for me to develop inter-personal skills	2.5	2.4	2.6	1.0
33	I feel comfortable in class socially	2.7	2.7	2.6	0.7
34	The atmosphere is relaxed during seminars/tutorials	2.5	2.4	2.5	1.0
35	I find the experience disappointing	2.2	2.1	2.3	0.7
36	I am able to concentrate well	2.4	2.3	2.4	0.4
42	The enjoyment outweighs the stress of studying medicine	2.1	2.0	2.1	0.7
43	The atmosphere motivates me as a learner	2.4	2.2	2.4	1.0
50	I feel able to ask the questions I want	2.2	2.3	2.1	1.0
Students' social self-perception (SSSP)					
3	There is a good support system for students who get stressed	1.9	1.6	2.1	0.4
4	I am too tired to enjoy this course	2.0	1.8	1.9	0.7
14	I am rarely bored on this course	1.9	1.8	1.9	0.7
15	I have good friends in this school	3.1	3.0	3.1	0.7
19	My social life is good	2.8	2.7	2.8	0.7
28	I seldom feel lonely	2.2	2.2	2.2	0.7
46	My accommodation is pleasant	2.6	2.5	2.6	0.4

Figures

FIGURE 1 FLOW DIAGRAM

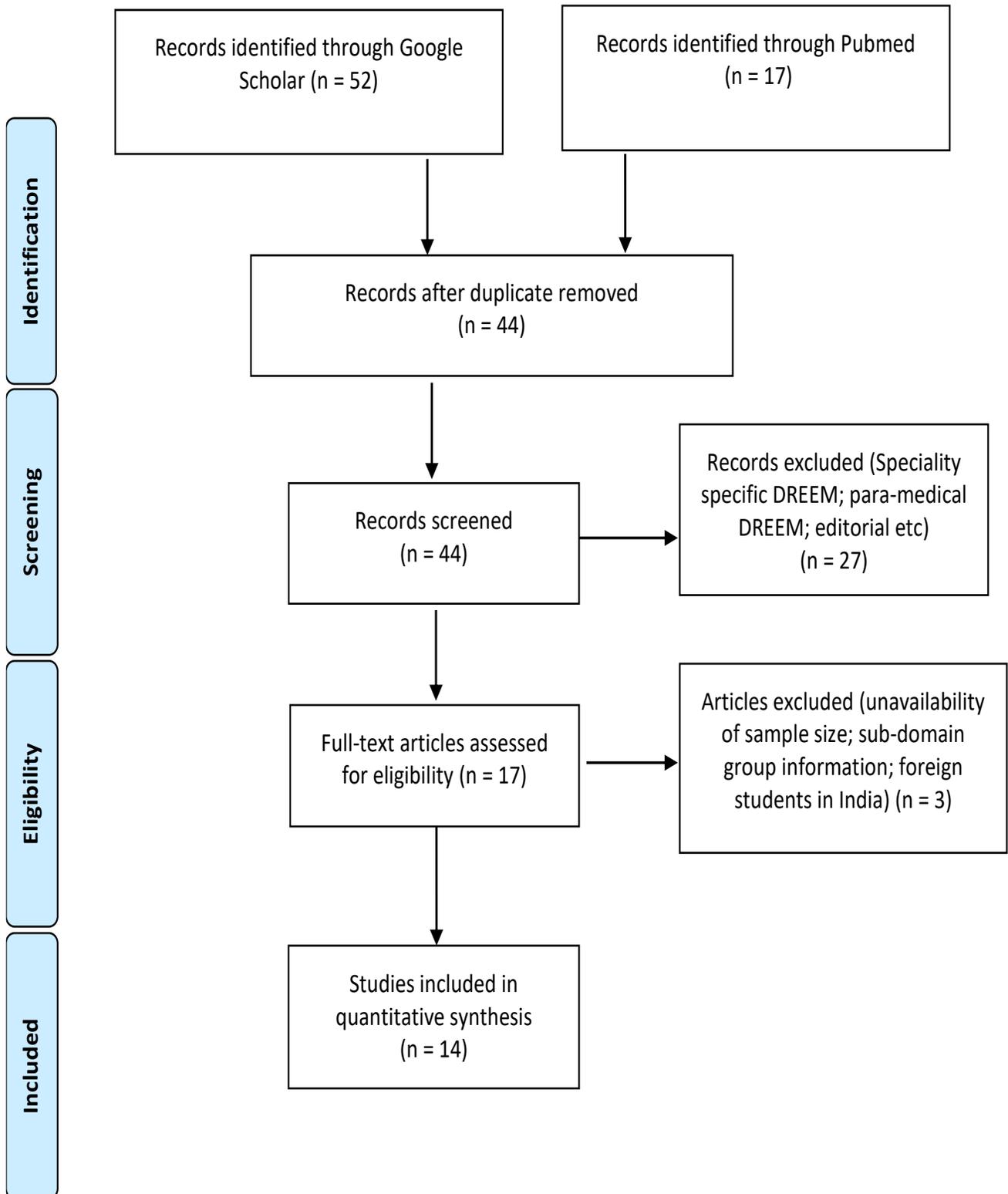
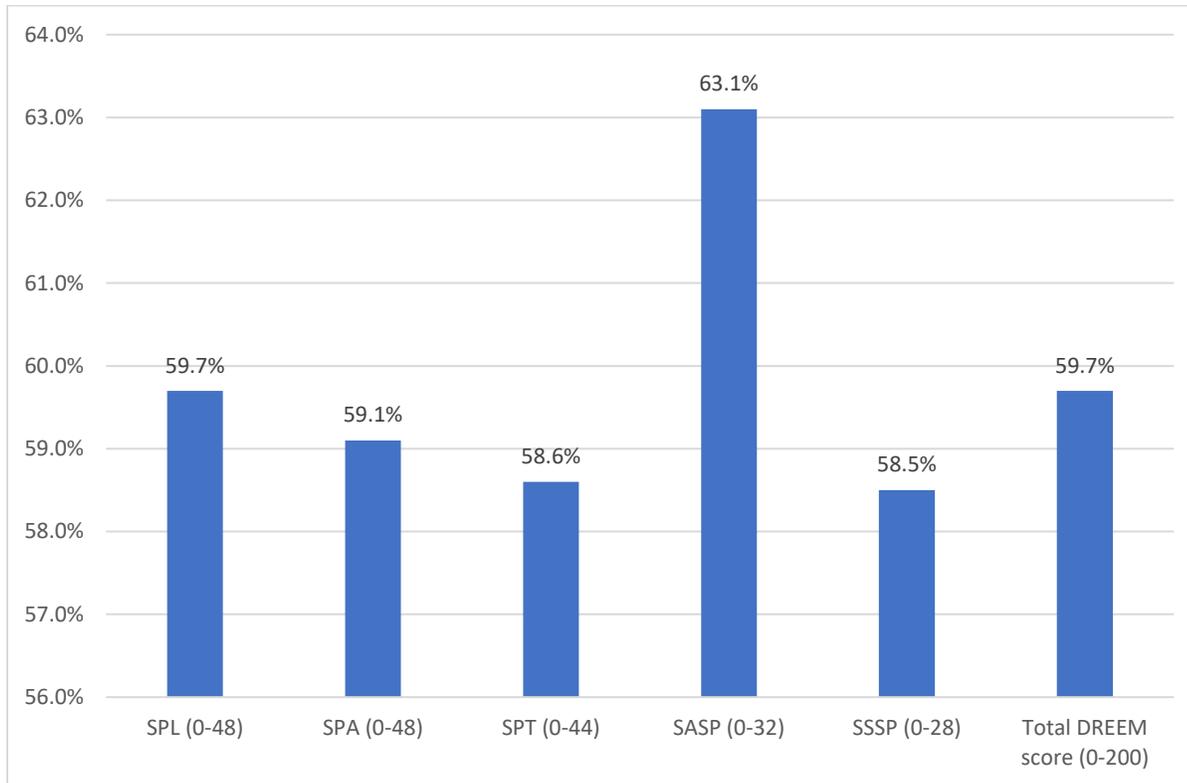


FIGURE 2 TOTAL AND SUB-DOMAIN DREEM SCORE OF ALL THE STUDENTS OUT OF 100 POINTS



Students' Perceptions of Learning (SPL); Students' Perceptions of Atmosphere (SPA); Students' Perceptions of Teachers (SPT); Students' Academic Self- Perceptions (SASP); Students' Social Self-Perceptions (SSSP); Dundee Ready Education Environment Measure (DREEM)

FIGURE 3 DREEM SUB-DOMAIN SCORE (MEAN) OF DIFFERENT RESEARCH STUDIES CONDUCTED IN INDIA

