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## Suitability And Reliability and Validity Analysis of DREEM Scale Based on a Sample of College Medical Students in Henan Province, China

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**Abstract:** *This study focused on college medical students in Henan Province, China, aiming to explore the suitability, reliability, and validity of the DREEM scale in this sample. With the help of Questionnaire Star, 326 valid sample data were collected, and SPSS software was used to carry out comprehensive statistical analysis. The results showed that the DREEM scale had good reliability in this sample, with Cronbach  $\alpha = 0.972$ . In terms of validity,  $KMO = 0.968$ , Bartlett sphericity test  $p < 0.001$ , and each dimension presents characteristics consistent with the theoretical framework in the structural validity analysis. This indicates that DREEM scale can effectively evaluate the learning environment of college medical students in Henan Province, China, and provide a scientific basis for optimizing the teaching quality and learning environment.*

**Keywords:** *DREEM scale; college medical students; suitability; reliability; validity*

### 1. Introduction

In the medical education system, high-quality learning environment is undoubtedly one of the core elements of training high-quality medical and health professionals. Learning environment is a complex and diverse concept, which includes not only the hardware conditions such as teaching facilities and curriculum Settings, but also the software factors such as teacher-student interaction and teaching methods. Key curriculum elements include providing students with authentic and career-relevant tasks that allow them to actively participate in and share their learning responsibilities. Other important factors include teachers tailoring training to individual circumstances, communicating positive expectations for student performance, helping students set and achieve realistic goals, and providing regular feedback. Similarly, teaching about practice, and teachers work closely with trainers in workplaces that offer apprenticeships, all of which have an impact on the learning environment(Wahlgren & Aarkrog, 2024).

These hardware and software factors interweave and interact with each other, and together have a profound impact on students' learning effect, career development and physical and mental health (Av et al., n.d.).

Accurately evaluating the learning environment of medical students is of great significance for promoting the reform of medical education and improving the teaching quality. On the one hand, it can provide objective data support for educational policy makers, so that they can formulate education policies more in line with the actual needs. On the other hand, it can also help educators better understand the learning needs of students and optimize the teaching process(Alblooshi et al., 2024).

The Dundee Ready Education Environment Measure (DREEM) is a widely used learning environment assessment tool in the field of medical education. Carefully developed by Roff et al. The scale contains 50 items, which comprehensively and meticulously involve students' perception of learning, teachers, academic self-perception, atmosphere, and social interaction. With its good reliability and validity, the DREEM scale has been fully verified and widely applied in medical education research in many countries and regions around the world. Its advantage is that it covers comprehensive content, can comprehensively reflect the multi-dimensional situation of learning environment, and has good reliability and validity(Almansour et al., n.d.; Namnik et al., 2022).

However, due to the significant differences in cultural background, education system and learning needs among medical students in different regions and at different levels, the suitability of DREEM scale in specific groups may be affected(Syeda Hanaa Fatima n.d., 2023). For example, in areas where cultures emphasize collectivism, students' perception of the social dimension of the learning environment may differ from areas where cultures emphasize individualism; In regions with large differences in education systems, students' evaluation of teachers' teaching methods and curriculum Settings may also be different(Av et al., n.d.).

As a populous province in China, tertiary medical education plays an important role in the training of local medical and health personnel. However, the current research on the learning environment of college medical students in Henan Province is relatively scarce, and there is a lack of in-depth systematic analysis on the suitability of DREEM scale in this group. The purpose of this study is to fill this research gap. Through a large-scale survey of samples of junior college medical students in Henan Province, this study uses scientific data analysis methods to deeply analyze the suitability, reliability, and validity of the DREEM scale, to provide a solid scientific basis for the reform and development of junior college medical education in Henan Province and the optimization of learning environment. It is expected to

promote the improvement of the quality of tertiary medical education in Henan Province and cultivate more high-quality medical and health talents to meet the needs of society(Zhanghaichao, n.d.2023).

## **2. Literature review**

In recent years, the application of DREEM scale has been expanding in the world, and new research results have been emerging. The Dundee Ready Educational Environment Measurement (DREEM) is widely used to assess the educational environment of the Faculty of Medicine, Dentistry and Applied Medicine in Saudi Arabia, with an overall score indicating "more positive experiences than negative ones". They used the DREEM scale to assess students' perception of the learning environment and verified the reliability and validity of the scale by analyzing many sample data. In terms of reliability, the calculated Cronbach's  $\alpha$  coefficient shows that the scale has good internal consistency, which is consistent with the reliability evaluation theory proposed by Cronbach (1951), indicating that the correlation between items of the scale is stable, and students' views on the learning environment can be reliably measured. Validity analysis was carried out through exploratory factor analysis and confirmatory factor analysis, and the results showed that the scale could effectively reflect students' perceptions of learning, teachers, academic self-cognition, and other dimensions, which was consistent with the theoretical framework of scale design, and also in line with Kaiser's (1974) theory on the validity verification of factor analysis. (Al-Ahmari et al., 2022).

In India, Mann et al. (2023) used the DREEM scale to survey students from different medical schools. In the reliability test, the reliability coefficient of the scale as a whole and all dimensions reached a high level, ensuring the stability and reliability of the measurement results. In terms of validity, through comparison and analysis with other relevant educational environment measurement tools, it was found that the DREEM scale had a high discriminative validity in evaluating the Indian medical education environment. It can accurately distinguish the differences of learning environments among different institutions, which is consistent with the concept of discriminative validity proposed by Campbell and Fiske (1959)(Mann et al., 2023).

The Dundee Ready Educational Environment Measurement (DREEM) tool employed by Alfakhry G et al., Syria, for the first time assessed the educational environment of the Bachelor of Pharmacy program at the University of Damascus (DU) in Syria and compared it to other pharmacy schools around the world. The Cronbach's alpha of the DREEM questionnaire was 0.94. The research results showed that the educational environment needed to be greatly improved, especially in the fields related to teaching practice and general social environment. Failure to address existing issues in the learning environment could hinder the learning and

clinical practice of future generations of pharmacists. This study provides a quality improvement map that can be used to address areas that need the most attention at the University of Denver School of Pharmacy(Alfakhry et al., 2023).

Korean scholars, Sejin Kim et al., in Students' perceptions of the learning environment at a medical school in Korea: comparisons of the most recent 4 years' results using the Dundee Ready Education Environment Measure (DREEM), Student environments such as physical environment, social relationships and counseling are crucial to the improvement of students' learning(Kim, 2022).

Chinese scholar Fan Jiali et al. applied the DREEM scale to evaluate the application of appreciative inquiry in clinical nursing teachers. Through strict data analysis process, both internal consistency reliability and retest reliability perform well in reliability, which proves that the stability of the scale under different time and measurement conditions meets the requirements of Nunnally and Bernstein (1994) for reliability stability. In validity verification, the structural equation model was used to test the structural validity of the scale. The results showed that the five dimensions of the scale fit well with the actual measurement data, and the content validity was also recognized by the expert evaluation, ensuring that the scale covered the key elements of the medical education learning environment. This is consistent with Carmines and Zeller's (1979) assessment of content validity and structure validity(Fan et al., 2022).

These studies show that despite the differences in cultural background and educational system, the DREEM scale performs well in reliability and validity in different countries, which can provide valuable information for medical educators and help optimize and improve the educational environment. However, it is still necessary to properly adjust and verify the scale according to the actual local situation in the specific application to ensure the accuracy and effectiveness of the evaluation results.

### **3. Research object and method**

#### **3.1 Research object**

In this study, medical students from all medical colleges and universities (6 in total) in Henan Province were studied. To ensure a broad representation of the sample, it covers a number of different majors such as clinical medicine, nursing and pharmacy in each school, as well as different grades from freshmen to juniors. A total of 343 questionnaires were collected through the questionnaire star platform using a simple random sampling method.

After strict screening and review, 17 invalid questionnaires such as incomplete answers and logic confusion were eliminated, and 326 valid questionnaires were finally obtained, with an effective recovery rate of 95.04%.

### **3.2 Research Tools**

Data were collected using DREEM scale. The scale contains 50 items, each item is scored using Likert 5 scale, from "very inconsistent" to "very consistent" score of 1-5 points respectively, the higher the score is, the better the students' perception of the learning environment. In addition, the questionnaire also collected the basic information of students, including gender, age, ethnicity, grade, etc., for further data analysis and comparison.

### **3.3 Data analysis method**

SPSS 25.0 software was used to conduct a comprehensive statistical analysis of the collected data. The main analysis methods include:

#### **3.3.1 Descriptive statistical analysis**

Detailed statistical description of students' basic information and scores of each item on the DREEM scale, such as frequency, percentage, mean value and standard difference, is carried out to intuitively understand the basic characteristics of samples and students' evaluation of all aspects of the learning environment.

#### **3.3.2 Reliability analysis:**

Cronbach  $\alpha$  coefficient was used to strictly evaluate the internal consistency reliability of the scale. It is generally believed that when Cronbach  $\alpha > 0.7$ , the scale has good reliability. Cronbach  $\alpha > 0.9$  indicates excellent reliability.

#### **3.3.3 Validity analysis**

**Structural validity:** Exploratory factor analysis (EFA) was used to test the structural validity of the scale. Principal component analysis was used to extract common factors, the number of factors was determined according to the feature root greater than 1 and the gravel map, and the maximum variance method was used to perform factor rotation, and the load of each project on the corresponding factors was analyzed in detail. At the same time, KMO value and Bartlett sphericity test are calculated. When KMO  $> 0.9$ , it indicates that the data is very suitable for factor analysis. When Bartlett sphericity test  $P < 0.05$ , it indicates that the data have significant correlation and are suitable for factor analysis.

Content validity: Senior experts in the field of medical education were invited to conduct a comprehensive evaluation of the correlation between the scale items and the measured content, and the content validity was evaluated by accurately calculating the content validity index (CVI).

## 4. Survey results

### 4.1 Basic information of the research object

Among the 326 valid samples, 165 were male, accounting for 48.1%; There were 178 female students, accounting for 51.9%. The age group is mainly 18 and 25 years old, accounting for 97.96%. Han students accounted for 98.83% (339 students), and other minority students accounted for 1.17% (4 students). The grade distribution is as follows: freshman 99 students, accounting for 28.86%; There were 191 students in sophomore year, accounting for 55.69%; 53 students, accounting for 15.45%.

### 4.2 Scores of each dimension of DREEM scale

**Table 1: Scores of each dimension of DREEM scale**

Dimension	The number of problems	Score range	Average	Scoring Average	Reflect the situation
Student Perception of Learning (SPL)	14	14 - 70	52.36	74.80%	Students have a good experience in classroom participation and ability training
Student Perception of Teachers (SPT)	11	11 - 55	40.23	73.15%	Students highly recognize teachers' professional quality and teaching attitude
Student Academic Self-perception (SASP)	5	5 - 25	18.37	73.48%	Students have a positive perception of their academic confidence
Student Perception of the atmosphere (SPA)	7	7 - 35	26.12	74.63%	Students are positive about the overall classroom atmosphere

Student Social Self-Recognition (SSSP)	13	13 - 65	48.29	74.29%	Students have better opportunities for social experience and development
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#### 4.2.1 Students' Perception of Learning (SPL)

This dimension contains 14 items, the score range is 14 to 70 points, the average score is 52.36 points, the scoring rate is 74.80%. Among them, the items such as "I am encouraged to participate in classroom teaching" and "the class pays attention to cultivating and developing my ability" scored higher, with average scores of 4.35 and 4.41 respectively, indicating that students had a good experience in classroom participation and ability cultivation. The score of "teachers overemphasize rote memorization" is low, only 3.14 points, reflecting that there may be some problems in the learning style, and students are less satisfied with the teaching method that emphasizes rote memorization.

#### 4.2.2 Students' Perception of Teachers (SPT)

There are 11 items in this dimension, the score range is 11 to 55 points, the average score is 40.23 points, the scoring rate is 73.15%. The scores of "teachers are knowledgeable" and "teachers are always fully prepared for lessons" are high, with average scores of 4.47 and 4.47 respectively, which reflects students' high recognition of teachers' professional quality and teaching attitude. The low score of "teachers laugh at students" and "teachers lose their temper in class" indicates that students have some negative perception of teachers' teaching attitude, but the overall score is still in the upper middle level.

#### 4.2.3 Students' Academic Self-Perception (SASP)

Contains 5 items, the score range is 5 to 25 points, the average score is 18.37 points, the scoring rate is 73.48%. The average score of "I am confident of passing this exam" is 4.32, indicating that students have some positive cognition in academic confidence. The score of "I can remember what I need" is relatively low, with an average of 3.86, reflecting that students may have some difficulty in memorizing knowledge.

#### 4.2.4 Students' perception of atmosphere (SPA)

There are 7 items in this dimension, the score range is 7 to 35 points, the average score is 26.12 points, the scoring rate is 74.63%. The scores of "relaxed atmosphere in class" and "I feel very happy in class" are higher, with average scores of 4.26 and 4.24 respectively, indicating that students have a positive feeling about the overall atmosphere in class. The average score of "I am disappointed in my study and life experience at school" is 2.89, indicating that some students have certain disappointment in their study and life experience.

#### 4.2.5 Students' Social Self-Perception (SSSP)

Contains 13 items, the score range is 13 to 65 points, the average score is 48.29 points, the scoring rate is 74.29%. The scores of "I have good friends here" and "I have many opportunities to develop interpersonal skills" are higher, with average scores of 4.23 and 4.18 respectively, indicating that students have better social experience and development opportunities; The "I rarely feel lonely" score was relatively low, with an average score of 3.98, which may reflect that some students have further to improve in terms of social belonging.

### 4.3 Reliability analysis results

**Table 2: Cronbach  $\alpha$  coefficient of each dimension of Dream scale**

Variable	Cronbach $\alpha$
Entirety	0.972
Student Perception of Learning (SPL)	0.934
Student Perception of Teachers (SPT)	0.912
Student Academic Self-perception (SASP)	0.867
Student Perception of the atmosphere (SPA)	0.895
Student Social Self-Recognition (SSSP)	0.926

The Cronbach  $\alpha$  coefficient of the DREEM scale was 0.972, indicating that the scale has excellent internal consistency reliability in a sample of junior college medical students in Henan Province. The Cronbach  $\alpha$  coefficients of each dimension are SPL Cronbach  $\alpha$  was 0.934, SPT Cronbach  $\alpha$  was 0.912, SASP Cronbach  $\alpha$  was 0.867, SPA Cronbach  $\alpha$  was 0.895, SSSP Cronbach  $\alpha$  was 0.926, all greater than 0.7, indicating that the dimensions of the scale have high correlation, which can steadily measure students' perception of each dimension of the learning environment.

#### **4.4 Validity analysis results**

##### **4.4.1 Structural Validity**

The KMO value is 0.968, indicating that the data is very suitable for factor analysis. The  $\chi^2$  value of Bartlett sphericity test was 22697.225 (df = 1431),  $p < 0.001$ , indicating that there is a significant correlation between the variables, suitable for factor analysis. Six common factors were extracted by principal component analysis, and the cumulative variance interpretation rate was 75.89%. The items and factor load contained in each factor are basically consistent with the theoretical dimension of the scale, which further verifies the structural validity of the scale. Specifically, Factor 1 mainly includes items related to teachers' teaching ability and attitude, factor 2 mainly involves teaching methods, factor 3 is related to teachers' knowledge level and case teaching, factor 4 is related to students' learning effect and ability development, and factor 5 is related to students' age and overall perception of the learning environment. Factor 6 mainly reflects the information about students' ethnic composition and social life.

##### **4.4.2 Content validity**

Three experts in the field of medical education were invited to evaluate the scale items, and the calculated content validity index (CVI) was 0.92, indicating that the scale has good content validity and can comprehensively and accurately cover all aspects of the learning environment of medical students, and the measured content is highly relevant to the research purpose.

## **5. Research conclusions**

### **5.1 Suitability of DREEM scale among junior college medical students in Henan Province**

The results of this study fully indicate that the DREEM scale has good adaptability in the sample of college medical students in Henan province. From the perspective of reliability analysis, Cronbach's  $\alpha$  coefficient of the scale as a whole and of all dimensions is at a high level, which means that there is strong consistency among items in the scale and students' evaluation of learning environment can be stably measured. Whether it is students' perception of learning and teachers, or academic self-cognition, atmosphere and social self-cognition, the scale can reflect students' real feelings and opinions more accurately, which is basically consistent with the results of previous studies in other regions and groups, indicating that the scale has good stability and reliability in different backgrounds.

In terms of validity, KMO value is as high as 0.968, Bartlett spherical test  $p < 0.001$ , and the common factor extracted by factor analysis has a high degree of fit with the theoretical dimension of the scale, and the cumulative variance explanation rate reaches 75.89%, which strongly proves that the scale has good structural validity. At the same time, the content validity index is 0.92, indicating that the scale items have a high correlation with the measured content, and can fully and accurately cover the key elements of the learning environment of medical students. This indicates that DREEM scale can be applied to the assessment of learning environment of college medical students in Henan Province and provides a scientific and reliable basis for further understanding of students' learning needs, optimizing the teaching process, and improving the learning environment.

### **5.2 Current situation of learning environment of junior college medical students in Henan Province**

#### **5.2.1 Students' perception of learning**

Students have a good experience in class participation and ability development, but they are dissatisfied with the way of teaching that emphasizes rote memorization. This suggests that educators should actively explore a variety of teaching methods, pay attention to cultivating students' independent learning ability and critical thinking, reduce the reliance on rote learning, to meet the needs of students for high-quality learning. For example, advanced teaching models such as problem-oriented learning (PBL) and case teaching can be introduced to stimulate students' learning interest and initiative and improve learning results.

### **5.2.2 Students' perception of teachers**

Students give high evaluation to teachers' professional quality and teaching attitude, but there are still some negative perceptions of teachers' teaching attitude. Schools and teachers should further strengthen the construction of teachers' ethics, build a harmonious and respectful relationship between teachers and students, and improve teachers' teaching affinity and humanistic care awareness. At the same time, teachers should constantly improve their teaching ability and level, and adopt more flexible and diverse teaching methods to better meet the learning needs of students.

### **5.2.3 Students' academic self-cognition**

Students have some positive cognition in academic confidence but have some trouble in knowledge memory. Educators should pay attention to training students' learning methods and memory strategies to help students improve their learning efficiency and knowledge mastery. In addition, the academic guidance and career planning education for students should also be strengthened to help students clarify their learning goals, enhance their learning motivation, and fully prepare for their future career development.

### **5.2.4 Students' perception of atmosphere**

The overall feeling of students to the classroom atmosphere is more positive, but some students in the learning and life experience there is a certain disappointment. Schools should pay attention to students' mental health and learning pressure, create a relaxed and pleasant learning atmosphere, provide more support and help to relieve students' pressure and improve students' learning satisfaction and happiness. For example, psychological counseling courses and colorful campus cultural activities can be set up to help students release pressure and enhance the fun of learning.

### **5.2.5 Students' social self-cognition**

Students have better social experience and development opportunities, but some students need to further improve their social sense of belonging. Schools should strengthen the construction of campus culture, organize all kinds of club activities and social activities, provide students with more opportunities for communication and interaction, promote friendship and cooperation among students, and enhance students' social belonging and teamwork spirit.

## **5.3 Implications for medical education reform**

Based on the results of this study, to further optimize the learning environment of college medical students in Henan Province and promote the reform of medical education, the following targeted suggestions are put forward:

### **5.3.1 Innovative teaching methods**

Teachers should actively change their teaching concepts and adopt diversified teaching methods, such as problem-based learning (PBL), case teaching method, group discussion, etc., to stimulate students' learning interest and initiative, and cultivate students' ability of independent learning, critical thinking and solving practical problems. At the same time, pay attention to the personalized teaching methods, according to the characteristics and needs of different majors, different students, flexible adjustment of teaching strategies to improve the teaching effect.

### **5.3.2 Strengthen the construction of teaching staff**

Schools should strengthen training and support for teachers to improve their professional quality and teaching ability. Encourage teachers to carry out teaching research and teaching reform, and constantly update teaching content and teaching methods. At the same time, strengthen the construction of teachers' ethics, improve teachers' professional ethics and humanistic care awareness, and create a good relationship between teachers and students.

### **5.3.3 Optimize the curriculum**

According to the development trend of medical education and the actual needs of students, the curriculum should be rationally adjusted, the teaching content should be simplified, and the repetition and redundancy of the course content should be avoided. Pay attention to the combination of theory and practice, increase practical teaching links, improve students' practical operation ability and clinical thinking ability. At the same time, strengthen professional quality and humanistic quality education, cultivate students' professional ethics and social responsibility.

### **5.3.4 Pay attention to students' mental health**

Establish and improve the students' mental health service system and strengthen the mental health education and counseling for students. Set up psychological counseling courses, hold mental health lectures, etc., to help students understand mental health knowledge, improve psychological quality. At the same time, the establishment of students' mental health files, timely discovery, and solution of students' psychological problems, to provide good

psychological support for students' study and life.

### **5.3.5 Create a good campus cultural atmosphere**

Strengthen the construction of campus culture and create a positive and harmonious campus cultural atmosphere. Organize all kinds of club activities, academic competitions and cultural and artistic activities to enrich students' after-school life and cultivate students' comprehensive quality and innovation ability. At the same time, strengthen the construction of campus environment, improve teaching facilities and learning conditions, and provide students with a good learning and living environment.

## **6. Summary**

Through in-depth investigation and analysis of the sample of college medical students in Henan Province, China, this study comprehensively verified the suitability, reliability, and validity of the DREEM scale in this group. The results show that DREEM scale can effectively evaluate the learning environment of college medical students in Henan province and provide a reliable tool and scientific basis for medical education reform. At the same time, the study also revealed the problems in the learning environment of college medical students in Henan province, such as the need to further innovate teaching methods and strengthen the construction of teachers, which pointed out the direction for further optimizing the learning environment and improving the quality of medical education. Future studies can further expand the sample size to include more post-secondary medical students from more regions and institutions, and further explore the relationship between learning environment and students' learning effects and career development, to provide more in-depth theoretical support and practical guidance for the sustainable development of medical education.

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