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Inventory development to assess perceptions and metacognition of dental students toward learning in colleges in Pune, India

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Abstract:

BACKGROUND: Dental education is considered a challenging and taxing program as on successful completion one is required to attain unique and diverse competencies. There is an established perception that students do not enjoy their experiences in the dental institution and they always demand for certain amendments. Therefore, a dental education perceptions and metacognition assessment tool (DEPMAT) was developed for Indian undergraduate and postgraduate dental students for assessing their learning in Deemed University versus Maharashtra University of Health Sciences in Pune, Maharashtra.

MATERIALS AND METHODS: This cross-sectional study was conducted among students of four dental colleges of two types of universities in Pune, India, using a 31-item DEPMAT based on Dundee Ready Education Environment Measure and metacognition awareness inventory using five subscales. Psychometric properties were also tested for this new tool. Data were analyzed using the SPSS software.

RESULTS: Of 512 participants, 498 (96.88%) students had duly returned the questionnaire. Cronbach's alpha coefficient value for reliability was found to be 0.87 which indicated good internal consistency and test-retest reliability was found to be $k_w = 0.76$, which indicated substantial agreement. Significant difference was found among undergraduates in domains regarding their perception toward academics, infrastructure and learning environment, and health and stress.

CONCLUSION: This study suggested that the general perception toward learning among final year postgraduate students was positive in both the universities. However, the perception of final year undergraduates toward learning was negative and students have suggested certain amendments in both the universities. This study also suggested the new tool was effective in assessing the attitude of practice of both undergraduate and postgraduate students.

Keywords:

Dental education, dental student, learning, metacognition, perception, questionnaire

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Introduction

The learning environment, quality of teachers, infrastructure, facilities, and administration of a university influence the way a student learns. Same concept is applicable for dental education. Dental education is considered a challenging and taxing program and may lead into burnout

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among undergraduate and postgraduate students.^[1] Completion of dental education program should instill sense of achieving goals of higher education and obtaining necessary conditions for successful social life.^[2] Dental educational programs should be acceptable and pleasing to those involved in the academic process including students, faculty, and patients. There is an established perception that students do not enjoy their

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experiences in the dental institution and they always demand for certain amendments.^[3]

The study conducted by Arash *et al.*^[2] and Mohammad *et al.*^[4] suggested that dental curricula should ideally be conducive to the students and an ideal learning environment should be provided to the students. However, a number of factors ranging from class size, spare time, teaching methodologies, peer influence, and ethical climate drastically influence student's milieu. Therefore, an instrument used to evaluate the educational environment must be sensitive to a host of issues that may affect the educational experiences of dental students.^[5] The tool developed in the present study is based on globally used inventories for health professionals, i.e. Dundee Ready Education Environment Measure (DREEM) and metacognition awareness inventory (MAI). DREEM was developed by Roff *et al.*^[6] using a standard methodology utilizing grounded theory and a Delphi panel of nearly 100 health profession's educators from around the world. However, this tool was not culturally specific and generic to dentistry. This tool has also incorporated the concept of metacognition using MAI. MAI was developed by Schraw and Dennison, 1994.^[7]

The present study was undertaken to assess the attitude and practice of 4 years undergraduate and 3 years postgraduate dental students toward learning in dentistry in two different learning environments. A dental education perceptions and metacognition assessment tool (DEPMAT) was developed for Indian undergraduate and postgraduate dental students for assessing their needs.

Materials and Methods

Study design

A cross-sectional study was carried out using 31 item DEPMAT among 514 students of final year M. D. S and final year B. D. S across four dental colleges of Pune, Maharashtra. Of these, two colleges were affiliated to Deemed University and the other two colleges were affiliated to Maharashtra University of Health Sciences (MUHS, Nashik). The ethical clearance (Dated October 13, 2014 Ref No: IEC/DYPDCH/PHD-TD/02) was obtained from the institutional review and ethical committee of Dr. D. Y. Patil Dental College and Hospital, Pimpri. Permission letters were obtained from all the institutions and verbal consent was obtained from students.

Tool development

Questionnaire development of this study was based on focus group discussion with interns and face to face interview with teaching faculty of Dr. DY Patil

Dental College and Hospital, Pune. This tool had two main domains, i.e., attitude (20 questions) and practice (11 questions), and six subdomains, i.e., perception toward teaching, academics, infrastructure and learning environment, health and stress, general practice and metacognition [Appendix 1]. Responses were coded on 4.0 Likert scale. Scores were given for each of the responses 0 = strongly disagree-3 = strongly agree.

Face and content validation was done by 11 panelists (Content validation ratio = 0.59). Internal consistency was checked for this tool for which Cronbach's alpha value was 0.87 for 31 items which indicated good internal consistency as proposed by Kline^[8] and Walop *et al.*^[9] The test-retest reliability was also performed for which the score was ($k_w = 0.76$), which indicated substantial agreement according to Landis and Koch.^[10]

The inventory was pretested on 10 each of undergraduate and postgraduate students. The demographic details such as age, sex, name of college, year of education, and the questions based on attitude and practice among final year undergraduate and postgraduate students were analyzed using the descriptive statistics, i.e., frequency and percentage. Reverse scoring was applied for seven negative items (5, 10, 11, 20, 22, 23, and 25). Mann-Whitney U test was used to compare within the undergraduate and postgraduate groups of both the universities. Statistical Package for the Social Sciences software version 21 (SPSS inc., IBM, and Chicago, IL, USA) was used for the data analysis.

Results

A self-administered questionnaire was given to 514 respondents, out of which 498 (96.88%) respondents returned their proformas. Three hundred and seventy-one participants were from final year B. D. S, out of which 48% were from MUHS and 52% were from deemed universities. 127 postgraduates also participated, out of which 53.54% were from MUHS while 46.46% were from deemed universities. The age range of the participants ranged from 20 to 23 for 4th B. D. S and 24-32 for 3rd M. D. S students. Majority of the respondents were females 346 (69.4%), whereas 152 (30.52%) were male.

Attitude

Student's perception towards teaching

Six items were part of this domain. For four items, i.e., if teachers were well prepared for the training sessions and help in developing interest, if they were open to criticism for their academic improvement, if their teaching was exam oriented and if teachers have good communication skills with students. Most of the students (>60%) had a positive attitude about teaching and no significant difference was found between MUHS and deemed

university students. However, significant difference was found in the responses between undergraduates in two items, i.e., “if teachers helped them in clearing doubts and “if teaching method encouraged them to be an active learner”. More undergraduate deemed university students agreed to this view (average 72% for the two items) than MUHS undergraduate students (average 58% for the two items). No significant difference was found among postgraduates for these items.

Overall, when the entire domain, i.e., perception toward teaching among undergraduates (P value = 0.14) and postgraduate students (P = 0.80) between the two universities was compared no significant difference was noted [Tables 1 and 2].

Student’s perception towards academics

There were eight items in this domain. Statistical difference was noted for two items, i.e., “if students focused more on understanding the concepts than memorizing” and “changed study strategies or asked experts if they failed to understand the actual concept.” Most of the undergraduates from deemed universities (average for both the items 65%) had a positive perception compared to MUHS (i.e., 55%). No significant difference was observed among postgraduates for any of the items. No significant difference was observed for remaining six items of this domain among undergraduates and postgraduates from both the universities.

Overall score for the entire domain revealed that the perceptions of undergraduate students towards academics was more positive among MUHS compared to deemed universities. Significant difference was observed among undergraduates (<0.001) while no significant difference was observed among postgraduate students [Tables 1 and 2].

Student’s perception toward infrastructure and learning environment

No significant difference was noted among two items i.e., “if they were satisfied with the library facilities in the college and if friends influenced their study routine and study environment”. No significant difference was found among undergraduate students or postgraduate students for both the items. Significant difference was observed for items related to pleasant learning environment and support and guidance from teaching and nonteaching staff. 64.8% undergraduate students from deemed universities felt more positive about their learning environment compared to MUHS (53.4%). Most of the undergraduates from deemed universities (63.2%) enjoyed the support and guidance from staff when compared with MUHS (57.3%).

Although students from deemed universities felt more positive about learning atmosphere and infrastructure,

overall when the entire domain was considered, students perception was better among undergraduate students from MUHS when compared to deemed universities (P = <0.001) [Table 1]. No significant difference was found among postgraduate students [Table 2].

Student’s perception regarding health and stress

Significant difference was found among undergraduate students when asked if they received support from friends, seniors and juniors, and no significant difference was observed between postgraduates. Majority undergraduates (i.e., 73.1%) from deemed universities agreed that they had better support compared to MUHS (i.e., 57.3%). No remarkable difference was observed among postgraduate students from both the universities. Finally, when they were asked if they suffered from anxiety during university exams majority students from both the years and universities strongly agreed that they experienced anxiety and stress during examinations. No significant difference was noted among postgraduates for this item.

Overall score of the domain indicated that the undergraduate students from deemed universities had more health and stress-related issues compared to MUHS. Significant difference was noted among undergraduates, whereas no difference was highlighted among postgraduates [Tables 1 and 2].

Practice

Practice of undergraduates and postgraduates was assessed using two domains:

Table 1: Comparison between two colleges based on the responses of undergraduate students

Domains	College	n	Mean rank	Mann–Whitney U	P
Perception toward teaching	1	178	194.12	15,731.000	0.143
	2	193	178.51		
	Total	371			
Perception toward academics	1	178	216.81	11,514.000	<0.001
	2	192	156.47		
	Total	370			
Perception toward infrastructure and learning environment	1	178	212.94	12,381.000	<0.001
	2	193	161.15		
	Total	371			
Perception toward health and stress	1	178	168.60	14,080.000	0.002
	2	193	202.05		
	Total	371			
General practice	1	178	174.65	15,157.500	0.058
	2	192	195.55		
	Total	370			
Metacognition	1	178	187.35	16,937.000	0.810
	2	193	184.76		
	Total	371			

Group 1= MUHS, Group 2=Deemed University. $P<0.05$ statistically significant. MUHS=Maharashtra University of Health Sciences

Table 2: Comparison of domains based on the responses of postgraduate students between two colleges

Domains	College	n	Mean rank	Mann–whitney U test	P
Perception towards teaching	1	68	63.28	1957.000	0.808
	2	59	64.83		
	Total	127			
Perception towards academics	1	68	66.96	1805.000	0.328
	2	59	60.59		
	Total	127			
Perception towards infrastructure and learning environment	1	68	62.31	1891.000	0.571
	2	59	65.95		
	Total	127			
Perception towards health and stress	1	68	60.05	1737.500	0.174
	2	59	68.55		
	Total	127			
General practice	1	68	63.48	1970.500	0.862
	2	59	64.60		
	Total	127			
Metacognition	1	68	63.52	1973.500	0.871
	2	59	64.55		
	Total	127			

Group 1=MUHS, Group 2=Deemed University. $P < 0.05$ statistically significant. MUHS=Maharashtra University of Health Sciences

1. General practice
2. Metacognition.

General practice

This domain comprised of six items such as attendance in college and cheating in examination to score well. No significant difference was noted among the undergraduate and postgraduate students from any of the items.

Overall score of the entire domain indicated that there was no significant difference between the practice of undergraduate and postgraduate students of both the universities [Tables 1 and 2].

Metacognition

Five items based on metacognition were devised in this domain. Significant difference was observed among undergraduates in one item i.e., “If students openly admitted and accepted their mistakes while learning” to which majority of the students from deemed universities (81.3%) agreed compared to MUHS students (75.3%). No significant difference was noted among undergraduates and postgraduates of both the universities for the remaining items.

The overall score for this domain indicated that there was no statistical difference among the undergraduate and postgraduate students of both the universities [Tables 1 and 2].

Discussion

The dental educational environment is increasingly gaining attention in the field of research globally. There has been a growing interest among the educational experts, dental experts, teachers, students, and administrators regarding the role of dental milieu in dental educational system. Various studies^[11-13] globally have highlighted the need of student’s perception of their learning environment for assessing the strengths and weaknesses of their institution. Instruments such as DSLES (Dental School Learning environment Survey) as suggested by Batra *et al.*^[14] and DECLEI (Dental Clinical Learning Environment Instrument) developed by Kossioni *et al.*^[13] have gained popularity and are used for assessment of student’s perception of their learning environment and were specifically designed for dentistry. Conversely a scale like DREEM proposed by Roff *et al.*^[6] was not generic to dentistry. In order to overcome these shortcomings of the previous inventories, this study was undertaken and a tool was developed (DEPMAT) with items which were applicable for both undergraduate and postgraduate dental students based on the feedback and needs of dental students.

The response rate in this study was 96.88% which suggested that students were interested in participating. The percentage of female students (69.48%) in the study was higher than that of Jain *et al.*^[11] 56.5%, Al-Nagger *et al.*^[15] 68.7%, and Khurseed *et al.*^[16] 63%. The gender distribution in the study highlighted a striking majority of female students since most female students opt for dentistry as their career choice.

Student’s perception toward teaching

In this study, no significant intradomain difference was observed within the undergraduates and postgraduates of deemed and MUHS universities reiterating the fact, that students from both the universities had similar perception toward their teachers and teaching methodology.

The findings for both the universities for this domain of the study were not in agreement with the study conducted by Ali *et al.*^[5] among 4th year B. D. S students between private and public sector dental institutions toward perception of teachers where perception was better among private institutions. Significant difference was also observed in the study conducted by Kohli *et al.*^[17] among eighth semester medical undergraduate students highlighting the learning environment as unpleasant. They suggested that their teachers had poor feedback skills and they also lacked in giving constructive criticism. This study was also not in accordance with the present study. Another study conducted by Pales *et al.*^[12] indicated that the general perception of the 4th year

medical students toward teaching was negative. This study was conducted among 4th year medical students of five medical schools, of which four were public and 1 was private using DREEM inventory. This is in disagreement with the present study.

Deemed universities may have National Assessment and Accreditation Council and international organization for standardization inspections which makes them invest in good teaching aids which in turn may help in developing students' interest. The reason for exam oriented teaching in MUHS and deemed university could be due to their similar curriculum and examination pattern.

Student's perception toward academics

This domain aimed at assessing student's satisfaction and commitment toward profession. Significant difference was observed in this domain among undergraduate students of both the universities which was in accordance to the study conducted by Al-Nagger *et al.*^[15] among the first 3 years of medical college students. The findings of this study were also similar to a study conducted by Ali *et al.*^[5] in Pakistan.

Items like "Confident that my problem solving skills are being well developed here" and "Being well developed for my profession" were similar to that of original DREEM items, but no significant difference was noted in the present study while in a study conducted by Kang I *et al.*^[18] Significant negative shift was observed between the expected perception and actual perception of dental students from 1st year to final year regarding their development as dental professionals.

Student's perception of infrastructure and learning environment

Significant difference was found between the undergraduates of deemed and MUHS for this domain. However, in a study conducted in Pakistan, no significant difference was noted amongst final year B. D. S students of private and public dental institutions where perception of atmosphere was concerned. Undergraduate students from MUHS have reported that overall they had a better learning environment and infrastructure compared to deemed universities. This could be due to a strict learning environment and better academic atmosphere as they had reported.

Significant difference was noted for an item related to pleasant learning environment where most of the undergraduate students from deemed universities agreed compared to MUHS. Similar findings were observed by Sunkad *et al.*^[19] This could be due to the fact that the deemed institutions have the benefit of complete administrative and financial autonomy and could be free from bureaucratic requirements which is usually seen

in health sciences institutions. In the present study, we also found insignificant results for items related to peer influence and library facilities among undergraduates and postgraduates of both the universities. A possible reason for this could be that most of the students from both the universities were probably hostelites and were dependent on their friends for support which could have directly influenced their study routine. Although no significant difference was found between undergraduate students of both the universities regarding library facilities, students from deemed universities have suggested that they need better library facility.

Student's perceptions of health and stress

This domain measured the level of confidence of the dental students and support from fellow students. Since this domain was not a part of DREEM inventory no comparisons could be facilitated. Significant difference was observed in this domain among final year B. D. S students. However, no remarkable difference was observed among postgraduates. The possible reason for this could be due to student centered teaching in deemed universities when compared to MUHS.

Significant difference was observed among undergraduate students for item related to support from colleagues, seniors, and juniors. Most of the students from deemed universities have suggested that they received support compared to MUHS. Professional support can help students in various ways. It can help in stress reduction which is highly prevalent among dental students. Professional support can also facilitate team work and moral support. Students learn a lot of professional work from their seniors, juniors, and fellow students. Hence, it is highly recommended that students support each other.

Practice

General practice

This domain comprised of items which could measure their practice during examinations and factors on which their attendance depended. Since no questionnaire had similar questions, we could not compare it with any study. No significant difference was observed in the practices of both the institutions based on their type of universities or year of education. Students from deemed universities reported that they sincerely attended clinical postings and lectures; however, they also suggested that they did not attend college if their assignments were not complete. On the other hand, this study suggested that students from health sciences university attended college to cope with the fear of getting detained. The possible reason for this could have been exam fear and fear of getting scolded for incomplete assignments. However, in this study, we found that students from both 4th B. D. S and 3rd M. D. S from both the universities were involved in cheating practices.

Metacognition

Metacognition is essential for successful learning as it enhances the cognitive skills of an individual and helps them in self-evaluation of their strengths and weaknesses. MAI developed by Schraw and Dennison^[7] is one of the standard inventory which helps in assessing the cognitive skills of an individual. Items like “I often look back and think about how well I am learning”, “I often make adjustments in my study method to facilitate new learning” aimed at assessing their cognitive knowledge. Significant difference was noted for the item related to admitting mistakes. Most of the students from deemed universities admitted their mistakes while learning compared to MUHS. The practice can help them convert their weakness into strengths.^[20]

Strength and limitation

DEPMAT was developed to assess the attitude and practice toward learning among Indian undergraduate and postgraduate students. Social desirability bias may have been incorporated in the study.

Conclusion

This study suggested that the general perception of the learning environment and metacognition in colleges affiliated to Deemed universities and MUHS was more positive amongst postgraduate students, although the perception regarding learning was significantly more negative amongst the undergraduate students. The problems are more prevalent amongst the undergraduates where the students from deemed universities had overall problems with their academics and learning environment while students from MUHS had issues related to health and stress. This study also indicated that the new tool DEPMAT was effective in measuring the attitude and practice of both undergraduate and postgraduate dental students. It was essential to develop a new tool and use such tool.

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Conflicts of interest

There are no conflicts of interest.

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Appendix 1: Dental education perception and metacognition awareness tool

Questions

Attitude

- The teachers are well prepared for the training sessions and help in developing interest towards the lectures and clinical demonstrations
- My teachers provide constructive criticism which helps me improve academically
- The teachers have good communication skills with students
- The teachers help me in clearing my doubts
- The teaching is too exam oriented
- The teaching encourages me to be an active learner

Students' self perception towards academics

- I organize my study schedule well so that I score well in examination
- I focus more on understanding the concepts than memorizing the whole subject matter
- I change my study strategies or ask experts when I fail to understand the actual concept
- I only concentrate on exam-oriented questions to score well in exams
- I have opted for this course only due to parental pressure
- I am confident that my problem solving skills are being well developed here
- I have realized that I am being well prepared for my profession
- I am confident to set up a general dental practice/speciality practice

Students' Perception toward infrastructure and learning environment

- I am satisfied with the library facility of my college
- My friends influence my study routine and study environment
- I receive a very pleasant learning atmosphere in my institution
- I receive adequate support and guidance from my teaching and nonteaching staff

Health and stress

- My friends and seniors and juniors are very supportive and help me with my academics
- I have suffered from lack of confidence and anxiety during my university examinations

General practice

- My attendance in college depends upon the quality of lectures
- I attend my college only to cope with the fear of getting detained
- I cheat in examination to score well
- I sincerely attend all my lectures and clinical postings
- I don't attend college if my assignment is not complete
- I feel I can make effective contribution in the classes which I attend

Metacognition

- I often look back and think about how well I am learning
- I often make adjustments in my study method to facilitate new learning
- I openly admit and accept my mistakes while learning
- I often seek feedback from faculty to evaluate my quality of work
- I often motivate myself to learn better

Multiple choice to all questions are, a=Strongly agree, b=agree, c=disagree, d=strongly disagree