

CATERING WHAT THEY NEED – A SELF-REPORTED PERCIPIENCE OF THE TEACHING-LEARNING METHODOLOGIES IN ANATOMY BY FIRST YEAR MEDICAL STUDENTS

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ABSTRACT

Introduction: Anatomy, being a vast subject, has its own language and it demands a herculean work from a student's side to master these terminologies at the first stroke. In an attempt to consolidate and enhance learning, it is necessary to assess the benefits and pitfalls of various available teaching methodologies. Here, we analyze the self-perceived opinion of the students regarding curriculum, teaching methodology & assessment techniques in anatomy.

Materials and methods: This study explored the perceptions of 122 medical students who had just completed their first year at Pondicherry Institute of Medical Sciences, Puducherry. They were given a questionnaire, comprising of questions regarding the teaching-learning methodologies in anatomy. The results were analyzed quantitatively.

Results: Lecture classes still remain as most common knowledge -delivery mode despite arrival of new innovations. The best method of teaching in lecture class is Multimedia for 45% of students. Combining different methodologies such as multimedia and chalk and board interspersed is beneficial for 67.2% of students. 69.6% of the students conveyed that dissection enhances the critical thinking in a logical manner. 64.8% of the students preferred spotters kept in prosected specimens as the preferred way of assessment for the knowledge gained during dissection. 37.7% of the students learnt histology the most from pre-focused demonstration slides and the major hindering factors in learning embryology were inability to comprehend the sequence of events for 39.3% of the students.

Conclusion: With learners being made more centric in the present situation, this study may be helpful in throwing the shade on the intricacies of the present day learners and thereby helps us to frame a better model, with multiple resources where learners find their most appropriate way of gaining knowledge and clinical thinking abilities.

KEY WORDS: Teaching Anatomy, Teaching-Learning Methodologies, Lecture, Dissection, Histology, Embryology.

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INTRODUCTION

The first year of medical school is a crucial phase where students face their transformation from school to college. The students are also diverse with respect to their boards of education, methodology of learning, competencies and

intellect. At the outset of medical curriculum, teaching anatomy poses an innate challenge. Anatomy, being a vast subject, has its own language and it demands a herculean work from a student's side to master these terminologies at the first stroke. Those who are accustomed,

to 'rote' learning at the school level need to drift to a conceptual and deep learning as well. These challenges coupled with new environment, newer methodologies of teaching learning, compounding of lectures, peer issues put them in great distress.

The existing curriculum set by Medical Council of India has increased the stress on foundation courses and owing to various other causes as well, the time available exclusively for teaching anatomy has reduced. Hence it remains a challenge to find and assess methods to teach all students anatomy more effectively, in less time, and often with limited resources [1]. The present era of information over flooding, not only demands the students, but also the teachers to discover new modalities to impart quality education.

The past decade has witnessed a major paradigm shift in medical education which moved from passive, didactic and teacher – centered approach to active, clinical based student – centered approach [2]. "Vision 2015" document [3] of Medical Council of India recommends imbibing blended modalities of teaching and to promote learner-centric approach owing to the exuberant availability of technologies in education. In this situation, leaving behind the debate amidst the teachers regarding which approach has to be followed, we made an attempt to perceive the preferentiality of the students in teaching methodologies of anatomy.

According to Rokade SA et al.,[4] the efficacy of any teaching session or teaching method for anatomy should be assessed under three domains - understanding the concept, retention of lecture information in memory and reproducibility. The views obtained from the students might provide us a cross- sectional view on the efficacy of teaching – learning program and act as a tool to make necessary repairs in the future. Education never has any hard and fast set rules and it is to a large extent, the plasticity of the curriculum framing that can "facilitate" the learning process.

MATERIALS AND METHODS

The present study was conducted in the department of anatomy, Pondicherry Institute of Medical Sciences, Puducherry. It involved 122

students who had just completed their university theory examinations and before their practical examinations. A predesigned questionnaire which comprised of questions involving various domains such as learning style, lecture, dissection, histology and other miscellaneous topics was given to all students. The questionnaire spanned over all domains of curriculum and aimed at bringing in the picture of a student's preferences. They were briefed about the process and asked to respond genuinely. It was also informed to them that, the information is solely for academic research purpose and their identity won't be revealed out at any point of time. Thereby confidentiality of the process was maintained. The collected information was then analyzed, processed and tabulated meticulously. Descriptive statistics was done in possible domains.

RESULTS AND DISCUSSION

There can't be a second thought in the fact that learning Anatomy is the integral and quintessential part of medical curriculum. The primary purpose of learning anatomy is to recognize the body's normal structure and function so that when structures are altered by defect, trauma, or disease, knowledge of these deviations can be utilized in making clinical decisions [5].

According to Woods et al., [6] students who learn basic science in a clinically relevant manner are able to remember clinical conditions better after a delayed period.

With the advent of internet and its availability in laptops and smart phones, teachers and textbooks aren't the sole caterers of knowledge. Much emphasis is laid on self directed learning (SDL). Medical curriculum, which is developed suiting the requirements of students, can also be tailored or customized according to their preferences. Feedbacks play a major role for this purpose and it in turn helps the service – providers i.e., the teachers to identify the areas of strength and weakness. Thus, a continuous appraisal of teaching-learning methodologies can help us to reach the intended goal.

According to Bergman et al., [7] students' opinions may have a far reaching effect on medical curriculum development and future studies that evaluate their perceptions of the

factors affecting their learning in anatomy is critical. According to Azer et al., (8) student perceptions provide a vision to medical educators to understand the needs of the students, sources of their worries and best approaches for teaching anatomy. In the present study, we made an attempt to explore the preferentiality of the students towards teaching-learning methodologies, taking into account the ongoing debates about the best way to teach anatomy.

Table 1: Overall perception of students regarding lectures (n=122).

S.No	Questions	Options	No. of students	%
1	Best suited study material?	Notes from lecture class	26	21.3
		Text books per se	73	59.8
		Self-prepared notes	22	18
		Internet	1	0.8
2	Best method of teaching lectures	Chalk and board	11	9
		Problem solving or case based	18	14.8
		Multimedia	55	45.1
		Educational videos	38	31.2
3	Concentration is better in	chalk and board	30	24.6
		multimedia	92	75.4
4	Take notes better with	chalk and board	25	20.5
		multimedia	97	79.5
5	Retrieving from memory is better	chalk and board	38	31.2
		multimedia	84	68.9
6	Relationship between structures is better learnt	Drawn in the board and observing	4	3.3
		Drawn in the board and copying it	40	32.8
		Shown in pictures and observing	29	23.8
		Shown schematic pictures and copying	49	40.2
7	Combining two different methodologies is	Beneficial	82	67.2
		Deleterious	4	3.3
		Partly works out	36	29.5
8	Key factor hindering attentiveness in lecture	Odd timings of lecture class	39	32
		Lack of prior orientation to topic	32	26.2
		Lack of interest in listening	5	4.1
		Rushing through the topic	46	37.7
9	Best assessment tool for theoretical knowledge	Weekly test	38	31.2
		Part completion test	39	32
		Monthly test	25	20.5
		Others - 20 (viva, practicals etc.)	20	16.4

In the first domain, we elucidated the effectiveness of lecture methodologies. Lecture classes still remain as most common knowledge-delivery mode despite arrival of new innovations. Traditional lecture classes, though being passive, have advantages of disseminating many facts to a large group of learners in a small time, synthesizing information from multiple sources and clarifying complex concepts [9,10]. The best method of teaching in lecture class is Multimedia (includes PowerPoint and Transparency with Over Head Projector (TOHP)) for 55 students (45.1%). This is followed by educational videos

downloaded from YouTube in case of embryology and dissection videos in gross anatomy for 38(31.2%) students. Problem solving approach {18 students (14.8%)} or chalk and board {11 students (9%)} as sole modalities didn't get an attractive preferentiality. Medical educationists continue to debate on the advantages and disadvantages of multimedia teaching. Past classrooms had less than 100 students at a time and thereby visibility, interaction and student-centric approach were feasible. The present day classroom poses a challenge for all the above-mentioned factors. Our results are in concordance with the findings of Reenu Kumari et al., [11] who had stated that majority of students preferred multimedia teaching methods as the best anatomy teaching methodology and does not cause lack of attention. High-contrast colors and easy-to-read text, graphs, and graphics used in multimedia increase learning [12]. Since, in a PowerPoint presentation, topics are presented in a hierarchical fashion with graphics, color, and animation, students could "use a mental image of that outline to study, to retrieve the information on a test, to organize their answer for an essay question, and to perform other educational tasks [13]. In the present study, students felt that concentration was better if lecture was taught via multimedia for 92(75.4%) over chalk and board 30(24.6%). Also 97 (79.5%) students feel that they can take down notes better and 84(68.9%) retrieve the information better when classes are taught using multimedia.

In anatomy, understanding the relationship between different structures is important from surgical perspective. 49 (40.2%) students feel that this can be done better when animated/schematic pictures are shown and they copy them. 40(32.8%) students felt drawing the pictures using chalk and board and copying them side by side helped them the most. This might be because multimedia provides visual input and auditory (narrative) input with temporal contiguity and spatial contiguity [14].

Combining different methodologies such as multimedia and chalk and board interspersed is beneficial for 82(67.2%) students. This might be attributed to the pauses and breaks it provides, which serve as a distracter. On the other hand,

rushing through the syllabus or topic hinders the attentiveness of 46(37.7%) students followed by odd timings of anatomy lectures in 39(32%). Regarding internal assessment, weekly and part completion tests were preferred equally over monthly test for theoretical knowledge. This finding is in concordance with the study conducted by Rashmi Jaiswal et al., [15]. Overall, multimedia based teaching interspersed with chalk and board based teaching is well received provided the teacher makes it more student – centric, interactive and promoting critical thinking. The use of multimedia-supported teaching will open new horizons to shift to more independent learning and integrative learning or even distance learning [16].

Dissection is a unique teaching modality by which students can sense the structures they had witnessed in lectures using tactile sense which promotes kinesthetic way of learning as well. Hands – on dissection is necessary for appreciating the complexity and multidimensionality of the human body, for demonstrating the breadth of anatomical variation, and for learning the basic language of medicine [17,18]. In the present study, 85 (69.7%) of the students conveyed that dissection enhances the critical thinking in a logical manner and 101 (82.8%) felt that dissecting individually and feeling the structures help them understand better than seeing the structures in prosected specimens. For re-enforcement and memorization students preferred seeing the structures in the cadaver / specimen repeatedly (63.9%). This finding is in concordance with the study conducted by Agnihotri G et al., [19] where majority of students (83.66%) agreed that actual hands on training on cadaver dissection gave better results than demonstration of prosected specimen and also enhanced learning and confidence in the subject matter. Nnodim et al., [20] reported a higher level of attrition in the knowledge of anatomy for the students who learnt from prosection over the span of 5 years.

79 (64.8%) students preferred spotters kept in prosected specimens as the preferred way of assessment for the knowledge gained during dissection. This might be because, all practical examinations are based on prosected specimens and students find it hard to perceive the

Table 2: Self –perceived report of the students for the questions regarding dissection (n=122).

S.no	Questions	Options	No of students	%
1	Dissection enhance the skill of logical thinking	Yes	85	69.7
		No	7	5.7
		Sometimes	30	24.6
2	Dissection by self is better than seeing in prosected	Yes	101	82.8
		No	21	17.2
3	What makes you learn better during dissection hours?	Seeing the structures repeatedly	78	63.9
		Comparing it with diagrams in manual	25	20.5
		Drawing diagrams	2	1.6
		Comparing it with prosected specimen	17	13.9
4	Best assessment tool for knowledge acquired in dissection	Spotters in prosected specimens	79	64.8
		Viva in prosected specimens	25	20.5
		Spotters using flash cards	7	5.7
		spotters & viva in specimen	11	9

orientation of the structures in those at the stipulated time. Adequate revision in the prosected specimens after completing the dissection curriculum might alleviate this drift in adaptation. As far as reducing the emotional disgust on seeing the cadavers, we, in our college have a "cadaver disrobing" program where meticulous measures are made to make the students treat cadavers as their "first patient". This program had received a great response among students.

Histology learning requires the transforming things learnt in 2- dimensional photomicrographs to 3 dimensional images, so as to get the cohesive micro anatomical knowledge of the organ. A well versed knowledge in histology helps the students to excel in the interpretation of histo-pathological slides in the future. In the present study, 46(37.7%) students learnt histology the most from pre-focused demonstration slides and 38(31.2%) on drawing schematic diagrams on records. Despite different modalities of teaching, 82(67.2%) students were not able to get the three dimensional orientation from focused slides. This is in concordance with Jaiswal R et al., [15] where majority students (77.51%) had stated their difficulty in identifying structures on slide. Other perceived problems were difficult and confusing concepts (21.5%), badly structured lectures (18%) and insufficient time, particularly for practical (10%) [21]. 98(80.3%) students prefer revising from captured images of slides as the ideal way of re-enforcement before exams. The best assessment method for histological acumen is spotters for 60(49.2%) students and viva involving

Table 3: Retrospection on histology teaching (n=122).

S.no	Questions	Options	No. of students	%
1	Learning histology was mostly from?	Lecture classes	18	14.8
		seeing pre-focused demo slides	46	37.7
		From histology atlas	20	16.4
		drawing schematic diagrams in records	38	31.2
2	Getting 3D orientation of structures from 2D	Yes	40	32.8
		No	82	67.2
3	Preferred way of repeated re-enforcement	Captured images of slides	98	80.3
		Histology atlas	7	5.7
		Schematic diagrams from the record	14	11.5
		Internet	3	2.5
4	Best assessment tool for histological knowledge	Histology spotters	60	49.2
		Diagrams test	10	8.2
		Quiz in histology	20	16.4
		Viva involving histology slides	32	26.2

histology slides for 32(26.2%). New modalities in histology teaching need to be tried to impart the best in that domain.

Embryology is one of the domains of anatomy, which jolts for importance both among students and also in the curriculum. Inadequate representation in practical examinations and wide paced lectures make students neglect it. As birth defects occur in 3% of infants and represent the main cause of early infant mortality, making up approximately 21% of infant deaths, an appreciation of their significance remains paramount [22]. As the development and anomalies are not emphasized anywhere else in the curriculum, embryology has its own relevance in the later part of professional course. In the present study, the major hindering factors in learning embryology were inability to comprehend the sequence of events for 48(39.3%) students and inability to visualize for 34 (27.9%). As embryology demands constant attention and imagination as well, absence on a particular class may cost a lot for that particular student. We tried a method of re-enforcement by providing the best available videos in YouTube on a particular topic for students and this had a positive effect in 75 (61.5%). The best method of assessment is viva using artificially made models following practical examination pattern for 58 (47.5%) students. The shrinkage in the duration of first MBBS course has its own strain on embryology teaching. Further, the students who get to see the congenital diseases in their later years of clinical posting find it difficult to recollect the first year embryology teaching. Our suggestion for this is to make embryology teaching more clinical oriented (i.e., case based

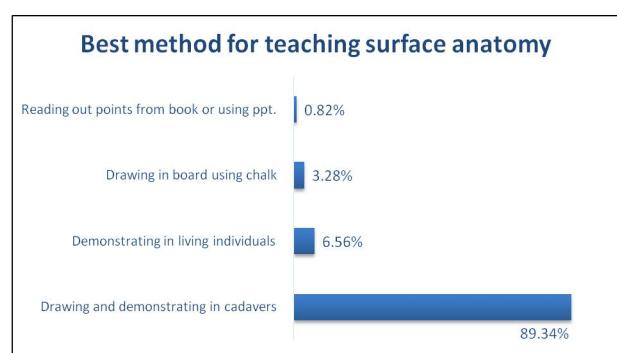
teaching) spread out over various years. This can be materialized in the form of vertical integrated teaching modules.

One domain of gross anatomy which gets easily neglected is surface anatomy teaching. Most universities weigh this domain less both in the form of teaching and assessment. As documented by Boon et al., 2002 [23], anatomical landmarks and clinically relevant structural outlines defined in surface anatomy are directly applicable to patient care. In routine teaching, surface anatomy is taught by topographical representation of organs, vessels and nerves by chalks. The scarcity of cadavers and poor implementation often curbs effective teaching. Body painting, 3-D images and even radiological representation of organs can be tried out, which may be helpful for the students when they enter clinical postings. Powerful visual registration of images of the organs *in vivo* should be the desired objective of surface anatomy teaching sessions. In an integrated PBL curriculum, learning by drawing surface anatomy of abdominal organs was found to significantly improve the conceptualization [24].

Table 4: Perception on issues pertaining to embryology teaching (n=122).

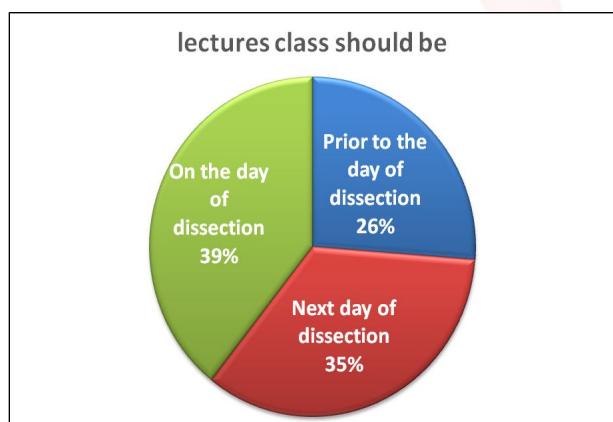
S.no	Questions	Options	No. of students	%
1	Hindering factor in learning embryology is	Inability to comprehend the sequence of events	48	39.3
		Inability to visualize	34	27.9
		Lack of motivation to read	33	27.1
		Others if any	7	5.7
2	Best method for re-enforcement of embryology?	Visualizing in the models	28	23
		Seeing sequence of pictures in the book	18	14.8
		Seeing videos from the internet	75	61.5
		Drawing with chalk in board	1	0.8
3	Best assessment tool for embryological knowledge	Descriptive questions	28	23
		Viva using models	58	47.5
		Flash cards	11	9
		Quiz in embryology	25	20.5

Fig.1: Bar diagram showing the preferentiality of students on surface anatomy teaching (n=122).



The learning pattern and also the attention span of the students has to be viewed as "millennial" generation trends. The yesteryear students relied on lecture classes, notes given over there and books for their knowledge. Eventually the students who are good at their aural / reading / writing benefited out of it. Today, we have an armamentarium of educational resources ranging from digital pedagogy to e-learning platforms which can be used properly by visual learners as well. Anatomy, owing to its legacy among basic sciences, also uses kinesthetic sense in the form of dissection. This spectrum of learning styles usage can be judiciously incorporated in the curriculum. On the other hand, the "dedicated" time available for students to learn anatomy has also reduced. This is partly due to the shrinkage in the number of months available for teaching anatomy in most curricula and partly due to the "digitalized" lifestyle of the students, which encroaches the study hours. Eminent professors who frame the curriculum should keep these practical issues in mind, which helps to reach the desired objectives in a much better way. In our study, 48(39%) students has expressed that the lecture class should be on the same day of dissection and for 42(35%) students, it should be after the dissection schedule. This fact, though simple, is often ignored at the time of scheduling a particular region. If not rectified, this may end up with lecture classes being a bored out recitation of technical jargons.

Fig. 2: Pie chart showing the preferences in scheduling lecture class (n=122).

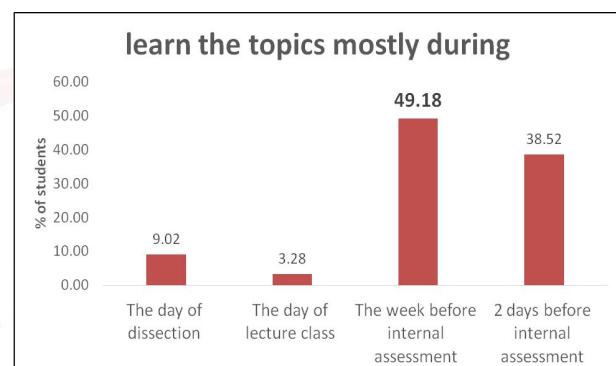


Assessment drives learning for a subject. Many students aim only for superficial learning as they often leave the learning until assessment time is approaching: deep learning is a style adopted by a smaller minority of students [25]. But it is

the aim for any educator to lead his or her students to just such an appreciation of their subject, and in any event this leads to a lifelong acquaintance with the subject and therefore a repository equipping for clinical practice [25].

In our study, 60 students (49.18%) has reported by themselves that they had learnt most topics on the week before internal assessment. This eventually implies a vast majority prefers surface learning. We intend to correct this by incorporating more student-centric didactic activities in dissection hall and implementing formative assessments in various patterns.

Fig. 3: Bar diagram showing the preferentiality of students on learning the topics (n=122).



Adoption of problem based curricula may be of great help to drift the learning style. Anatomy, being a subject, where students spend a good amount of time with demonstrators in small groups is easily one of the ideal places to stimulate this. In problem-based (PBL) curricula, students use a variety of learning styles (26) where more self-regulation of learning content is observed and hence development of greater self-confidence can be expected. To implement PBL in a working model, the objectives of anatomy curriculum for 21st century doctor should be revisited. The core learning outcomes from the process should include the fundamental knowledge of the human body, the spatial organization of organs and tissues, anatomical basis of diseases, background for clinical disciplines, and the affective elements of undergraduate medical education [27,28]. Also, the PBL involving clinical vignettes prunes the clinical reasoning ability of the student and demands higher cognitive abilities compared to the traditional "steeple-chase" method of practical examinations which only tests factual recall along with identification of structures. PBL has

a potential disadvantage of omission of certain important components of the subject [29].

For example, the entire junk of superior and inferior extremities are narrowed down to musculo-skeletal system in PBL based teaching. But this disadvantage is not unsurmountable, provided the framework has right proportions of yielding traits of traditional curriculum as well.

CONCLUSION

Teaching-learning process in basic sciences is undergoing the phase of metamorphosis. Shrinkage of the time devoted for teaching and also for learning coupled with rapid advances in information technology pushes us to be more dynamic in strategizing our curriculum. In the present scenario, we need to customize the medical education incorporating the positives of various teaching methodologies available. The spectrum of resources could suffice students with varying learning styles. The gained knowledge also should be made applicable in different contexts simulating the real world. In our self-reported questionnaire based study, we had tried to explore the different dimensions of the present curriculum, its benefits and pitfalls. Days are gone where the pedagogy aimed only at transmitting the knowledge, irrespective of the outcome. With learners being made more centric in the present situation, this study may be helpful in throwing the shade on the intricacies of the present day learners and thereby helps us to frame a better model, with multiple resources where learners find their most appropriate way of gaining knowledge and clinical thinking abilities.

Conflicts of Interests: None

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