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A study on the evolving facet of anatomy education based on the learners' perspective of medical students in Kolkata, India

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ABSTRACT

Background: Anatomy education is dealing with tribulations and challenges, especially in the post-COVID period. Erosion of basic knowledge and time allocated to anatomy has caused great concern. As appraisal is an integral part of Medical Education, student evaluations can highlight divergent perspectives for the identification of existing lacunae and propose amendments. **Aims and Objectives**: This study was undertaken to reorganize the academic schedule and frame relevant recommendations for the enhancement of teaching standards in anatomy based on the learner's perspective. **Materials and Methods:** A descriptive cross-sectional study was conducted among 876 MBBS students in Kolkata, India. A feedback response structured questionnaire was distributed to the students at the end of the 1st Professional MBBS for data collection. The template was generated in Microsoft Excel sheet and the results were analyzed to find out the possible solutions and actions required at regulatory levels including institutions, faculty, and medical students. **Results:** Anatomy was paradoxically perceived as the most interesting yet the most difficult curriculum. Complicated anatomical terms as well as rationed study specimens were significant impediments to understand anatomy. Dissection and demonstration with 10–20 students were optimal, while histology and lectures were considered redundant. The study underlined the need of reforms in the course module and academic schedule toward an integrated syllabus extended for 18 months. **Conclusion:** Conventional theoretical and experimental teaching should be blended with innovative inclusions based on scholar responses, in which the learner's perspective is also emphasized, principally in the present online approach of education.

Key words: Anatomy; Curriculum; Evaluation; Medical education; Undergraduate students

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INTRODUCTION

The Indian Medical Education System has 606 Medical colleges producing 92,065 MBBS doctors each year.[1] Presently, medical education in anatomy needs minute scrutiny and immediate evaluation, especially after several lacunae exposed by the COVID-19 pandemic. Despite wide use of various evaluation tools, little is known about student perceptions regarding the purpose and desired consequences of evaluation.[2]

Although student feedback studies[2,3] with limited cohort similar to the semester questionnaire by University Medical Center, Bonn,[3] have also been conducted in anatomy to evaluate the quality of teaching, the existing knowledge does not reflect on the objectivity, uniformity, and effectiveness of the curriculum and assessment with "Learners objective" in mind.

Anatomy curriculum is undergoing international reformation, though it lacks uniformity among institutions. The challenges are to reinstate more effective teaching and learning tools of multimodal teaching while maintaining the beneficial values of traditional approach.[4] This study is an attempt to formulate relevant recommendations to (i) enhance and standardize the present teaching principles

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and (ii) reorient and restructure the present academic schedule in anatomy, based on the appraisal and critical evaluation of 876 medical students from three major Medical Colleges in Kolkata, India.

Aims and objectives

A. Recommendations for improvement of teaching and Teacher's Training Programme based on the evaluation of students.
B. Reorient and restructure academics with "Learners objective" in mind.

MATERIALS AND METHODS

A descriptive cross-sectional study was conducted under the aegis of the Department of Anatomy, R.G Kar Medical College as a questionnaire-based qualitative survey among 876 respondents from medical undergraduate students of 1st Professional MBBS class of three consecutive academic years (2016–2019) at three esteemed Medical Colleges in Kolkata, India, namely, Calcutta National Medical College, NRS Medical College, and R.G Kar Medical College.

A self-administered pre-designed and pre-tested structured closed ended questionnaire was distributed to the students at the end of the 1st professional course and used for data collection. This study did not involve any laboratory investigations, parameters, and procedures. As the study was based on anonymous and classified feedback, the confidentiality of individual responses was maintained after proper informed consent of the respondents with due explanation of the procedure and purpose of the study.

Ethical clearance

Ethical clearance was obtained from the Institutional Ethics Committee of R.G Kar Medical College. IEC memo no: RKC/250 dt 4.12.2020.

Inclusion and exclusion criteria

Questionnaires were distributed to 1,050 students of three academic sessions at the end of the 1st professional MBBS course. MBBS students who consented to participate in the study were included in the study irrespective of age, gender or social, academic, and economic background. Students who declined to participate were excluded from the study. Accordingly, 876 respondents finally participated in the study.

Statistical analysis plan

The collected data were compiled and tabulated in Microsoft Excel 2016. Template was generated in Microsoft Excel sheet and according to the type of data, pertinent results were represented using Frequency Distribution Tables Graphs, and Diagrams as applicable.

RESULTS

The essential aim for the use of student evaluations is to contribute to excellence, though they singularly may not provide adequate or appropriate information to judge departmental performance in all dimensions of teaching. In an analysis of teaching and learning, it is necessary to scrutinize the curriculum, the quality and manner of teaching, and the available resources within which it is delivered.

The major themes which emerged after appropriate analysis of the student responses were as follows:

A. Establish objectivity, uniformity, and effectiveness of the curriculum (Tables 1-3)
B. Restructure the academic course content with "Learners objective" in mind (Tables 4-6)
C. Reorient training and assessment based on the critical evaluation of the students (Table 7).

Dissection was mainly preferred over prosection across all colleges. The need of dissection videos is an important reflection of the present circumstances in the context of online teaching. Small batches were considered model cohorts for ideal learning practices.

DISCUSSION

The medical education system is suffering from misdistribution, traditional curriculum, poor assessment, neglected research, and non-uniform faculty development programs. Evaluation is an integral part of medical education. In the entire teaching learning process, the concept of the student as a customer is still to be internalized. The perception of the students may provide invaluable insights in the preparation of an innovative curriculum as well as underscoring the areas of interest in Teachers Training Programs.

The reduction in undergraduate knowledge of anatomy has caused great concern, not only for undergraduates but also to surgical postgraduate students. This, coupled with a change in basic surgical training, change in examination standards, has set up a system that is allowing young men and women with a poor knowledge of anatomy to become surgeons.[5]

A teacher of anatomy also needs to present the subject in the context within which it will be utilized by the student and to employ the learning tool of technology, in their teaching and assessment of the subject.[6] This has been an area of concern and institutional weakness in many countries including India.[7] The National Medical Commission (NMC) comes at a crucial phase, where reforms unsettled over the last few decades need distinctive and decisive realization.

Table 1: Anatomy was paradoxically perceived as the most interesting yet complicated subject. Although the learning value of the present course was satisfactory prima facie, anatomists must introspect to deliver a course content that is uniform and comprehensible to the students and minimize intercollege variations

Topic	Observation across all the colleges
Learning value of the present course (In terms of knowledge, concepts, dissection skills, and clinical correlation)	The learning value was perceived as excellent by 22% and satisfactory by 66% of students. Only 12% of students were not satisfied with the course
Most difficult subject in the 1st year	Overall, anatomy was perceived as the most difficult subject by 53% of the total students across all the colleges. In R.G Kar MC, 57% of the students considered biochemistry as the most difficult subject
Most interesting subject in the 1st year	Anatomy was perceived as the most interesting subject in 50% of the total students across all the colleges. In NRS MC, physiology was the most interesting subject

Table 2: Apart from restoration of the departmental infrastructure and resources, linguistic and academic background of the students must also be considered to make the course more comprehensible

Topic	Observation across all the colleges
Most problematic factor to understand anatomy in the initial phase	Complicated and unfamiliar anatomical terms were the main hindrance to comprehend anatomy for 79% of the students
Most deficient area in the department	Lack of infrastructure was considered by 55% of the student as the most deficient area in the department However, absence of cadavers, osteology specimens, and viscera were also a major concern

Table 3: Overwhelming students across all colleges opined that the present academic calendar must be suitably restructured to 18 months with vertical and horizontal integration of the syllabus under an appropriately revised, practical, and relevant curriculum. Intercollege variation in the class schedule as well as in the extent and depth of the syllabus covered in the class must be suitably identified in future studies to improve the learning outcome

Topic	Observation across all the colleges
Syllabus in anatomy in the context of the MBBS curriculum	Students were almost equally divided on the relevance of the present curriculum. 36% of the students felt the need to revise the curriculum
Anatomy course schedule in the context of the MBBS curriculum	Overwhelming students (83%) at all the colleges felt the need of an integrated syllabus to be taught throughout the 1st and final year
Ideal duration of the anatomy course	Most students (60%) felt that the anatomy syllabus should be extended for 18 months. Only 18% of students felt that the present calendar was adequate
Extent and depth of the anatomy syllabus	Overwhelmingly, 89% of students across all the colleges felt the anatomy syllabus was extremely elaborate and unmanageable to certain extent Only 11% of students found the course easily manageable
Extent of the syllabus covered in class	47% of students felt that 80–100% part of the anatomy syllabus was covered in the class
Class schedule for the completion of the syllabus	Majority of students (60%) felt extremely pressurized due to disorganized class schedule Only 40% of students were comfortable under the schedule

Review of the curriculum

Most students felt the need to revise the curriculum toward an integrated syllabus extended for 18 months similar to the study among London medical students, where 99% of the students agreed that more curricula time was needed to understand the subject.[8] Integration of syllabus is an essential component of restructured curriculum. The present academic calendar and course must be suitably realigned with a new improved syllabus inclusive of horizontal and vertical integration of different disciplines enhancing the integration of students' knowledge.[9] Early clinical exposure as advocated in the curriculum is therefore an essential step for integration of basic knowledge. A study by Takkunen et al., showed that the introduction of a real patient in a preclinical 1st-year anatomy curriculum, in addition to paper cases, did enhance motivation, understanding of learning objectives, and confidence for future patient encounters, but failed to improve learning outcomes.[10]

Dissection and demonstration

Overwhelming number of students considered dissection and demonstration as the most effective mode of learning anatomy related to maximum clinical importance. According to majority of students, an ideal dissection batch should consist of 10–20 students. Therefore the present

Table 4: An interesting contradiction to the result shows that lecture has least impact on learning anatomy, though students were ready to absorb as many as six lectures per week indicating that the mode of delivery is more important than the hours involved

Topic	Observation across all the colleges
Most effective mode of learning anatomy	Dissection and Demonstration was considered as the most effective mode of learning by 75% of students, while 23% of students favored group discussions Only 2% of students appreciated Lecture classes
Frequency of lecture classes	Most students (47%) were comfortable with 4 lecture classes, though fair number (44%) of students were ready to accommodate 6 lectures per week
Mode of lecture presentation	Overall, 38% of the total students across all the colleges opined that chalk and board was the most effective mode of lecture presentation. However, other modes of lectures were also equally acceptable. Two-third (67%) of students at RG Kar MC favored overhead projector slides and PowerPoint presentations
Ideal way to learn dissection	44% of students considered that ideally students should themselves perform dissection and study in small batches in contrast to 28% students who favored the practiced mode of demonstration by the teachers 28% of students strongly felt that step-wise video dissection of each part should be available to the students
An ideal dissection/demonstration class	79.2% of students opined that an ideal dissection batch should consist of 10–20 students

Table 5: Overwhelming students regrettably perceive dissection more relevant than histology. The mode of teaching of classical histology must be reoriented to be clinically relevant and comprehensible to the undergraduate students

Topic	Observation across all the colleges
Maximum clinical importance is related to	77% of students felt that maximum clinical importance was related to dissection of the Human cadaver
Least clinical importance is related to	74% of students felt that histology was least important in clinical practice

Table 6: Early clinical exposure as advocated in the curriculum is an essential step for integration of basic knowledge. Recent advances must be included in the curriculum to keep students abreast of medical technologies and developments. The course content and mode of teaching of surface marking must be reoriented to include relevant clinical procedures to emphasize the importance of surface marking to the undergraduate students

Topic	Observation across all the colleges
Clinical anatomy is best studied as	Majority (55%) of the students felt clinical anatomy is best studied by attending clinical and surgical wards in comparison to clinical videos or clinical problems
The chapter of radiology in the present course	Majority students (70%) were interested in CT and MRI imaging studies
The ideal way to learn important surface landmarks	Conventional surface marking on attendants or cadavers was the preferred learning mode for 62% of students. Only 27% of the students wanted to follow a clinical procedure related to the landmark

undergraduate student teacher ratio must be effectively revised by NMC to impart quality education in anatomy.

This has been the established traditional approach across the globe as documented by earlier studies.[11] Dissection was mainly preferred over prosection across all colleges. In a recent survey, 93% of students preferred that both students and the faculty should be involved at the same time.[12] However, Collins suggests that prosections are sufficient to aid anatomy learning of university students.[13] The need of virtual dissection videos is an important reflection of the present day computer-assisted learning. In a recent study in Italy, the combination of virtual to traditional gross dissection resulted in a significant improvement of 2nd-year medical students' learning outcomes.[14] An earlier study in Bhopal, India also showed that 54% students preferred multimedia teaching methods as a best anatomy teaching methodology.[15] In a questionnaire-based study in Turkey, the success of the 3D Human Anatomy application group was higher than that of other practice groups.[16] On the contrary, a recent German study observed that audiovisual dissection manual did not have any significant positive effects medical students' learning experience.[17]

NMC must outline the mode of cadaver-based demonstration in the post-COVID scenario or sanction virtual dissection avenues as a suitable alternative under the present circumstances of online teaching.

Anatomy practicals

Regrettably, most students in all the colleges harbored a misconception that histology was clinically least relevant. In a previous study, respondents identified incomprehensible concepts, ill structured lectures and insufficient time in practicals as the major impediments[18] with the need of simplified information disseminated through modern audio visual aids in the form of digitization of slides and use of histology podcast.[15]

Table 7: That an introductory class on the syllabus and assessment is absolutely essential for clarity, conception, and improved performance in the subject. Part completion examinations comprising theoretical and practical components is still considered as an ideal tool for assessment. Weekly evaluations of some sections may also add value to the assessment process. The traditional essay type questions should be replaced as per the NMC guidelines with an combination of structured questions and multiple choice questions to test the cognitive domain. Although national and state level anatomy quiz competitions receive much sponsorship, ICMR projects, and anatomy seminars/ conferences are barely patronized by the authorities to motivate students

Topic	Observation across all the colleges
Outline of the university syllabus	84.5% of students felt the need of an introductory session to outline the syllabus
Summary of the marks distribution in theoretical and practical examinations	65% of students felt the need of an introductory session to explain the distribution of marks
Internal assessment examination	54% of students supported the concept of regular IA for assessment. 22% of students felt internal assessment examinations should be optional
Ideal mode of internal assessment	54% of the students considered part completion examinations as an ideal tool for assessment. Interestingly, one-third (33%) of students were interested in weekly evaluations
Part completion examinations	88% of the students opined that both theoretical and practical examinations are essential for assessment of the part. Only 7% of students felt that theoretical assessment was singularly adequate
Format of the university theory paper	56% of the students felt short answer questions were the ideal format for theory assessment. Though all competitive examinations are based on Multiple Choice Questions, only 36% of the students favored MCQs, while a minor 8% of the students still favored the traditional essay type of questions
Non-conventional ways to understand anatomy better	Project work seemed to interest 38% of the students primarily, though seminars were also welcome to 36% of the students

NMC: National medical commission

In radiology, majority students were interested in computed tomography and magnetic resonance imaging studies necessitating the inclusion and increase in use of digital methods in teaching of radiologic anatomy.[19] A relevant Dutch study suggested that both lectures and laboratory sessions in anatomy could be made more effective by providing links with radiology.[20]

Theoretical classes

Conventional didactic lecture was not favored as a teaching method, though students were ready to absorb as many as six lectures per week indicating that the mode of delivery is more important than the hours involved. The chalk and board method was more interesting than PowerPoint presentation.[21,22] It was further reported that models and plasticines were also not favored by students as teaching aids used during lecture classes while teaching gross structure and developmental anatomy.[2]

Limitations of the study

Heterogeneous feed back due to lack of student judgement,instructor's competence and online learning.

CONCLUSION

The reflections of such an overwhelming number of students, perhaps one of the largest cohorts studied till date, undoubtedly highlights the actual concerns faced by the present anatomy education system in the background of the present pandemic. The study showed that anatomy was paradoxically perceived as the most interesting yet the most difficult subject. Most students felt the need to revise the curriculum toward an integrated syllabus extended for 18 months with horizontal and vertical integration of different disciplines. Dissection and demonstration with 10–20 students were the most effective mode of learning anatomy.

Pedagogical programs should be standardized and abreast of the evolving changes in medical education. The present undergraduate student teacher ratio must also be effectively revised in order to impart quality education in anatomy. The "Learners objective" should dictate the teaching-learning tools and assessment methods in tune with contemporary pedagogic principles.

Further, student appraisal studies are needed to provide the perspectives of the students of the peripheral medical colleges and include the arguments of the online approach in medical education.

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REFERENCES

1. National Medical Commission. Information Desk. Available from: https://www.nmc.org.in [Last accessed on 2022 Mar 30].
2. Schiekirka S, Reinhardt D, Heim S, Fabry G, Pukrop T, Anders S, et al. Student perceptions of evaluation in undergraduate medical education: A qualitative study from one medical school. BMC Med Educ. 2012;12:45.
   https://doi.org/10.1186/1472-6920-12-45
3. Wittmann M, Boehm O, Thiessen N, Hoeft A, Knuefermann P and Baumgarten G. Student evaluation of anesthesiological teaching: Steering instrument of a continuous improvement process. Anesthetist. 2012;61(7):588-590, 592-596.
   https://doi.org/10.1007/s00101-012-2030-4
4. Sugand K, Abrahams P and Khurana A. The anatomy of anatomy: A review for its modernization. Anat Sci Educ. 2010;3(2):83-93.
   https://doi.org/10.1002/ase.139
5. Older J. Anatomy: A must for teaching the next generation. Surgeon. 2004;2(2):79-90.
   https://doi.org/10.1016/s1479-666x(04)80050-7
6. Inuwa IM, Taranikanti V, Al-Rawahy M, Roychoudhry S and Habbal O. Between a rock and a hard place: The discordant views among medical teachers about anatomy content in the undergraduate medical curriculum. Sultan Qaboos Univ Med J. 2012;12(1):19-24.
   https://doi.org/10.12816/0003083
7. Frenk J, Chen L, Bhutta ZA, Cohen J, Crisp N, Evans T, et al. Health professionals for a new century: Transforming education to strengthen health systems in an interdependent world. Lancet. 2010;376(9756):1923-1958.
   https://doi.org/10.1016/s0140-6736(10)61854-5
8. Gogalniceanu P, Palman J, Madani H, Sheena Y, Birch W, Paraskeva P, et al. Traditional undergraduate anatomy education a contemporary taboo? ANZ J Surg. 2010;80(1-2):6-7.
   https://doi.org/10.1111/j.1445-2197.2009.05167.x
9. Papa V and Vaccarezza M. Teaching anatomy in the XXI century: New aspects and pitfalls. Sci World J. 2013;2013:310348.
   https://doi.org/10.1155/2013/310348
10. Takkunen M, Turpeinen H, Viisanen H, Wigren HK, Aarnio M and Pitkaniemi J. Introduction of real patients into problem-based learning in preclinical first-year anatomy curriculum. Med Teach. 2011;33(10):854-856.
    https://doi.org/10.3109/0142159x.2011.576718
11. Hassanzadeh G, Hassanpoor N, Jalali A, Hassanzadeh N, Jafari M and Panahi N. Teaching anatomy: Viewpoints of Iranian anatomists. Thrita J Med Sci. 2012;1(2):62-66.
    https://doi.org/10.5812/thrita.6434
12. Reddypulluru U and Muchintala VR. 1st MBBS professional student's perception on teaching and learning methods of anatomy, before and at the time of COVID-19 pandemic. Int J Anat Res. 2021;9(2-1):7960-7964.
    https://doi.org/10.16965/ijar.2021.117
13. Collins JP. Modern approaches to teaching and learning anatomy. BMJ. 2008;337:1310.
14. Boscolo-Berto R, Tortorella C, Porzionato A, Stecco C, Picardi EE, Macchi V, et al. The additional role of virtual to traditional dissection in teaching anatomy: A randomised controlled trial. Surg Radiol Anat. 2021;43(4):469-479.
    https://doi.org/10.1007/s00276-020-02551-2
15. Biswas S, Sharma S and Chakraborty S. Students' perception of present teaching Method of histology a study from eastern part of India. Natl J Integr Res Med. 2017;8(5):61-66.
16. Ceri NG. Effect of non-cadaveric methods on the anatomy education of medical students. Meandros Med Dent J. 2021;22(1):105-115.
    https://doi.org/10.4274/meandros.galenos.2021.99815
17. Koop CF, Marschollek M, Schmied AL, Proskynitopoulos PJ and Behrends M. Does an audiovisual dissection manual improve medical students' learning in the gross anatomy dissection course? Anat Sci Educ. 2021;14(5):615-628.
    https://doi.org/10.1002/ase.2012
18. Kramer B and Soley JT. Medical students perception of problem topics in anatomy. East Afr Med J. 2002;79(8):408-414.
    https://doi.org/10.4314/eamj.v79i8.8826
19. Ganske I, Su T, Loukas M and Shaffer K. Teaching methods in anatomy courses in North American medical schools the role of radiology. Acad Radiol. 2006;13(8):1038-1046.
    https://doi.org/10.1016/j.acra.2006.03.021
20. Bergman EM, De Bruin AB, Herrler A, Verheijen IW, Scherpbier AJ and Vleuten VD. Students' perceptions of anatomy across the undergraduate problem-based learning medical curriculum: A phenomenographical study. BMC Med Educ. 2013;13:152.
    https://doi.org/10.1186/1472-6920-13-152
21. Bandopadhyay R and Biswas R. Students' perception and attitude on methods of anatomy teaching in a medical college of West Bengal, India. J Clin Diagn Res. 2017;11(9):AC10-AC14.
22. Rokade SA and Bahetee BH. Shall we teach anatomy with chalk and board or power point presentations? An analysis of Indian student's perspectives and performance. Sch J App Med Sci. 2013;1(6):837-842.

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AR- Concept and design of study, data collection, review of literature, statistical analysis and interpretation of results, preparation of manuscript; **LM-** Concept and design of study, data collection, preparation of manuscript, coordination and revision of manuscript.

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