First year medical students' performance analysis in anatomy with different modes of teaching: an experience of medical school in South India

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Abstract

Background and aims: The routine method of didactic lecture followed by dissection does not help for long-term retention of the subject, anatomy amongst medical students. The impact of clinical anatomy knowledge in medical profession is large and there is an absolute lack of positive reception in this regard amongst student community. Teaching methods play an important role to create interest and to make students appreciate the subject better. Studies evaluating different modes of teaching anatomy are scarce. The objective of the study was to assess the effectiveness of different modes of anatomy teaching among medical students. Materials and methods: First year medical students were divided randomly into three groups and different modes of teaching anatomy like blackboard and chalk, audio/visual and using plastic models were compared by examination based assessment. The data of multiple groups were analyzed by one-way ANOVA, followed by the Newman-Keuls multiple comparison test (PRISM Graph pad, version 4; Graph Pad Software, Inc., San Diego, CA). A P value of <0.05 was considered as statistically significant. Results: No single method is effective in increasing the performance of both theory and practical examination across different topics and so a suitable combination of the different modes for a particular topic in anatomy teaching should be framed.

Key words: communication, blackboard, plastic models, audio / visual, chalk.

Introduction

The subject of anatomy is generally agreed to be the language of medicine and has a longest history as a discipline in formalised medical education. Traditional lecture based anatomy teaching has been shown to be less effective on students for long-term understanding. Other than the traditional lecture method, digital technology has added a new facet in teaching anatomy. Web based technology is gaining importance for teaching live anatomy and replaces the cadaver based study.

Despite having plethora of reports addressing the problem based learning in the medical curriculum, the studies on the assessment of different modes of teaching anatomy amongst the medical students are scarce.

The objective of the present study is to assess the effectiveness of different modes of anatomy teaching on medical students.

Materials and methods

The study was conducted in the Department of Anatomy, Aarupadai Veedu Medical College and Hospital, Pondicherry, South India. First year medical students from varied background were included in this study.

Experimental design

Experiment 1: 100 medical students were randomly divided into 3 groups (n1=33; n2=33 and n3=34) and each group was taught about a particular topic in anatomy by well qualified and recognised teachers with 3 modes of teaching. Using blackboard, chalk and with the help of line diagrams (n1), available plastic models (n2) and web based with audio/video effects (n3) respectively. The time duration of the lecture was about 45 minutes each day and at the end of the week, the topic was completed in all the modes of teaching. A written (theory) as well as practical examination was
conducted for testing the knowledge of students on topics taught using all the three modes. Examination scores in questions on topics using each of the three methods were evaluated by external examiners from different colleges.

In experiment 2 (n1 = audio/visual; n2 = blackboard and chalk and n3 = plastic models) and experiment 3 (n1 = plastic models; n2 = audio/visual and n3 = blackboard and chalk) same group of students were taught on two different topics respectively for the same duration and modes as represented above. The same students belonging to each group were retained for all the three experiments thus ensuring the degree of permanence. Evaluation was done in similar manner by conducting examination in both theory and practical. By these experiments each group of students have faced the different modes of teaching and evaluated. Comparison was done between the groups in each experiment and also each group performance was compared across the different experiments. This actually reduced the bias of students’ attention based on topic preference (three experiments involved different topics in anatomy) and also comparison was made for 3 individual topics in all modes of teaching.

**Statistical analysis**

The data of multiple groups were analyzed by one-way ANOVA, followed by the Newman-Keuls multiple comparison test (PRISM Graph pad, version 4; Graph Pad Software, Inc., San Diego, CA). A P value of <0.05 was considered as statistically significant.

**Results and Discussion**

**Demographics:**

The response rate was 100% in experiment 1, 99% in experiment 2 and 98% in experiment 3. The male and female distribution was 42% and 58% respectively. The mean age of the students was 18 years. There was no demonstrable relationship between student’s gender, age and their assessments as observed from our data.

**Students’ examination scores**

Examination conducted at the end of each session was evaluated by external examiners and the cut-off marks fixed was 50% to represent the data in both theory and practical. Fig. 1. illustrates the comparisons of effectiveness of teaching mode between different groups. The graph was plotted with percentage numbers in decimals rounded to the nearest large number. From the graph it can be observed that the topic I (experiment 1 labelled as I in the figure) taught with three modes, group of students taught with blackboard and chalk topped by securing above 50% marks followed by audio/video and plastic models respectively in the theory examination. In contrast to the theory examination, group of students taught with plastic models excelled in the practical examination of the same topic and other two groups were not significantly different among themselves. The difference in their performance was statistically significant (p<0.05) as represented in the fig.1.

![Figure 1. Comparisons of effectiveness of teaching mode between groups. n1, n2 and n3- different groups; I, II and III- different lecture topics ; Different alphabets (a, b and c) indicate that they are statistically different from each other (p<0.05).](image-url)
modes of teaching and it was statistically significant. In contrast, the group of students taught with audio/video aid performed well in practical examination conducted in the same topic followed by others and it was statistically significant.

In the experiment 3, each group was taught with the topic III (labelled as III in the figure). The group of students taught with audio/video aid performed well in the theory examination when compared to other groups. In contrast, the group of students taught with blackboard/chalk performed well in the practical examination followed by group taught with plastic models and audio/video respectively in the same topic.

![Graphs showing comparison of teaching modes](image)

Figure. 2. Comparisons of effectiveness of teaching mode within groups. n1, n2 and n3 are different groups; Different alphabets (a, b and c) indicate that they are statistically different from each other (p<0.05).

To further analyze the benefits of different modes, each single group was compared with different modes of teaching in both theory and practical examination from the data obtained in the above experiment in three different lecture topics. As can be observed in the fig. 2, the response of the same students of each group differed in the three modes of teaching and performance was better in different modes in both theory and practical examination of different lecture topics. Group n1 performed the best in theory examination taught with blackboard/chalk and best in practical examination of a lecture topic taught with plastic models. In the same way, the other two groups n2, n3 performed differently in the theory and practical examination of the lecture topics taught with different modes that can be observed from the fig. 2. From the above data it can be observed that there is mixed response in their performance in different modes of teaching particular lecture topic and the mode of teaching being the key determinant of their performance.

There is significant difference in the examination scores between different groups and among groups in different lecture topics.

The education of anatomy is not only the essential part of medical curriculum but also develops medical professionalism further. Medical students have been taught anatomy in the same way for many years. There should be constant reassessment of the curriculum in terms of what and how the students need to learn this subject. The concept of traditional anatomy has been regularly challenged by increasing assortment of disciplines and a considerable amount of planning is required to meet the demands. The key question that arises to meet the above objective is how best we can teach anatomy. There are various factors that determine the particular teaching method to be most effective in a particular academic setting.

Stress and anxiety are frequent health warning of medical education and so any method that promotes enjoyment without losing basic knowledge and skill is a good thing. It is therefore necessary for the teachers to create an attention-grabbing method of teaching which subsequently will enhance the understanding of the subject in a better way.

Winkelmann suggested to include sufficient sample sizes and validated assessment methodologies while evaluating the different teaching methods in anatomy. The use of cadaveric dissection for anatomical teaching was preferred by 69% of the anatomists in a study.
conducted by Patel and Moxham\textsuperscript{4}. These observations were supported by yet another recent study which concluded that teaching anatomy via dissection as the leading teaching modality\textsuperscript{5}. Fruhstorfer concluded that learning experience of medical students may be enhanced by using wet cadaveric materials than plastinated prosections\textsuperscript{6}.

**Conclusion**

No single mode of teaching is effective in the improving the performance of students in both theory and practical examination across different topics and so a suitable combination of the different modes for a particular topic in anatomy teaching should be framed.

**References**


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