

## Impact of alterations in teaching methodologies on learning capabilities

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### Abstract

**Objective:** To compare the role of new approaches and methods in the development of understanding and learning capabilities of undergraduate medical students in the module of respiratory physiology.

**Methods:** A comparative cross sectional study was conducted in Bahria University Medical & Dental College using a sample size of 198 students from February till May 2010. Difficulties in understanding the concepts of respiratory physiology was analyzed in groups A (Batch 2008-2013) and assessed through test performance. In group B (Batch 2009-2014) "integrated learner-and teacher-centered" approach was implemented by introduction of problem based learning, case based sessions, students seminar, quizzes and structured assignments. Response of group B students was evaluated in terms of concepts and performance by identical feedback form and assessment test. The data was analyzed using SPSS version 15.0 and applying the Chi-square test.

**Results:** The mean age of Karachi students of Groups A and B was  $20 \pm 2$  years. Statistically significant improvement in conceptual understanding of Group B (84%) was noticed compared to Group A (42%). Conceptual understanding of Group B (84%) was observed, as compared to Group A (42%)

**Conclusion:** Supplementation of teaching methodologies with augmented interaction improved significant learning, performance and satisfaction among group B students.

**Keywords:** Teaching, Methods, Respiratory, Physiology, Karachi (JPMA 61:982; 2011).

### Introduction

The subject of Physiology is considered as the basis of rational medical practice so its teaching has been a paradigm shift in recent years as emphasis is now focused on learning.<sup>1</sup> Learning is a complicated phenomenon as it involves complex mental activities such as ability to solve problems and critical thinking. The goal for the learning methodology personnel is to provide the developers with the best learning tools available, so that they in turn can have thorough understanding, knowledge and relevant skills for their career. The term "Best Evidence Medical Education" was coined to describe the implementation of methods and approaches to education based on the best

available evidence.<sup>2</sup> To evaluate the student's learning, new teaching strategies should be scientifically investigated through questionnaire, student's comments and evaluation of assessment outcome.<sup>3</sup> Once the deficiencies of teaching curriculum are identified, reinforcement can be applied by various methods which is the principle of value-added adult learning. Assessment is an educational tool that serves multiple roles; for example, it can provide feedback to learners on areas of strength or weakness and it can provide the teacher insight into the effectiveness of a given approach.<sup>4</sup> Assessment test, is an integral part of guided and thought-provoking further learning process. In this study, test was programmed to evaluate quantity and accuracy of

knowledge in recall and application of concepts of respiratory physiology. Keeping in mind the principles of adult learning<sup>5</sup> we designed a study in which learners were motivated to respond to a questionnaire framed with spotlight on the deficiencies of curriculum objectives, learning strategies, teaching methodologies and capabilities, resource accessibility, preparation time, complexity of topic and difficulty level of best choice questions and short essay questions. The students were encouraged to give suggestions and recommendations for better output. Positive reinforcement by the instructors was employed in redesigning teaching tools in view of feedback, assessment results and learning objectives. The target was achieved by brain storming and better interaction between teacher and learner with the help of problem-based, case based sessions, small group case based interactive sessions, students seminars and quizzes together with conventional teaching in the second group of students. We conducted this study to compare the role of new methods in the development of understanding and learning capabilities of undergraduate medical students in the module of respiratory physiology.

### Subjects and Methods

It was a cross sectional study for comparison of teaching methodologies carried out at Bahria University Medical & Dental College from February till May 2010. Respiratory physiology was taught to two batches of first professional MBBS students; designated as group A and group B. Group A comprised of 95 students of second year (39 boys and 56 girls) had a prior knowledge of haemodynamic and cardiovascular physiology, while group B was formed by 103 students (50 boys and 53 girls) of first year who were taught concepts of respiratory mechanics right after cell and nerve muscle physiology. The assessment test was based on 20 multiple choice questions with one best option (at different cognitive levels) and 4 descriptive type questions; 2 short essay questions and 2 modified essay questions. Students were asked to fill a feedback questionnaire after the test with reference to teaching methodologies, preparation level, difficulty level of BCQs and SEQs. They were encouraged to give their comments as well as suggestions that could help in achieving better learning. The free comments were analyzed by faculty members and new themes were incorporated in time table of respiratory physiology module for second (B) group. In this class problem based learning, case based session, case based interactive sessions, students seminar, quizzes and writing of structured assignment were included in addition to didactic lectures, interactive and skilled sessions of group A teaching curriculum. The latter group was evaluated by the identical assessment test and same feedback forms were circulated for their comments. Test

results and feedback data from both groups were coded and analyzed using SPSS version 15. Mean, Standard deviation, percentages were calculated and chi square test applied for comparison of two groups.

### Results

The mean age of students of group A and B was 20 ± 2 years. 74 students (78%) appeared in continuous assessment test of group A, 35 (36.84%) cleared in aggregate; 48 (51%) passed in BCQs and 34 (35.5%) in SEQs. Feedback evaluation forms were filled by 86 students of this group. The analysis of feedback forms revealed 40 (42%) students of group A had difficulty in conceptual understanding of the subject. In group B 95 students (92%) performed the test, 73 (71.13%) cleared in aggregate, 87 (84%) cleared BCQ while only 16 (15.5%) passed in

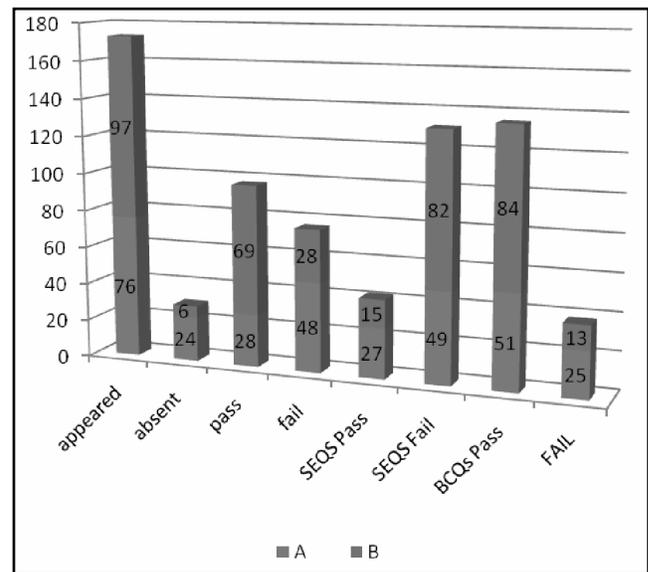


Figure-1: Performance of groups A & B in continuous assessment test.

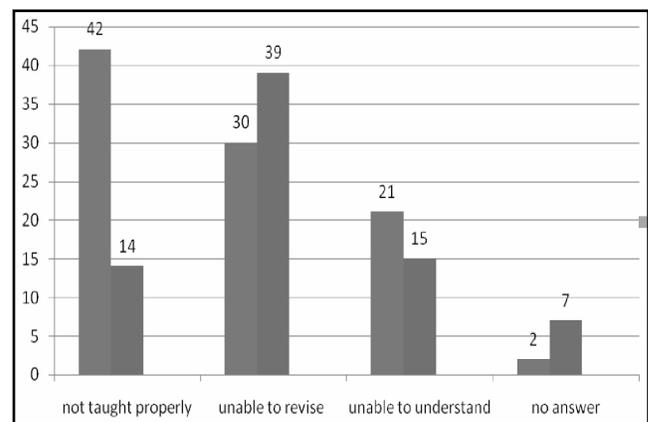


Figure-2: Comparison of student's response in conceptual understanding by change in teaching methodologies (feedback form).

**Table: Types of learning methodologies used for group A&B.**

Learning Methodologies	Group A (n)	Group B (n)
Didactic Lectures	24	23
Skilled Sessions	6	6
Interactive Sessions	6	6
PBL	0	1
Assignment	0	4
Structured Seminar	0	2

descriptive type questions. The feedback analysis of group B showed understanding of concepts in 86 (84%) students. Statistically significant improvement in conceptual understanding of Group B (84%) was noticed compared to Group A (42%).

## Discussion

Teaching methodologies embrace all measures required for tagging, imaging, activation and inactivation of neurons in brain circuits responsible for memory allocation of learners.<sup>6</sup> The tools employed are note-taking, reading textbooks or articles, organizing thoughts prior to writing, managing time, test-taking and many other skills. Undergraduate medical students endorse one or more of these methods depending on the assortment of effective studying and learning methodologies.<sup>7</sup> Medical teachers stretch their extent of information and knowledge in a logical, planned, integrated and sequential manner to the students through different approaches.<sup>8</sup> In our study, evaluation of students was employed as an educational rather than an examination tool in order to sanction learning. After the test, feedback for evaluation of teaching methodologies, gathered from students of group A was used for constructive alignment of curriculum with amendments in teaching methodologies of group B. This type of implementation was conducted for reorganization of course content in curriculum mapping of occupational medicine by Katja R and workers.<sup>9</sup> This key activity of "Empowerment through involvement" was also adopted by curriculum evaluation in Liverpool.<sup>10</sup> Mclean found that as learners experience the curriculum, their feedback on all aspects, experiences, problems, comments and suggestions improves programme for the next cohort.<sup>11</sup>

As far as comparison of teaching methodologies are concerned, didactic lectures which lay the foundation of well established, conventional teacher centered learning approach for large groups of students<sup>12</sup> were delivered in both the classes on the same topics. In addition, case based sessions (CBL) on difficult applied topics of physiology were introduced as large group discussions in group B. Clinical case scenarios were included as per requirement of learning objectives of curriculum in the small group discussions of group B. For organizations of clusters of

thoughts chronologically; its sequential presentation was made possible by Group Seminars in group B. A preparation time of three weeks was given to presenters after which scientific content was approved by faculty members. In an hour seminar session, students were given ten minutes for their presentation, rest of the time was utilized by Question and Answer session from faculty members as well as batch fellows. To sustain attentiveness of non presenters, they were randomly picked for answering few questions based on the presentations. All the queries were resolved by subject specialists. Keeping into consideration poor performance of group A in SEQ, write up of structured assignments in the form of short essay questions was introduced in group B students.

The shift of focus from teachers to students in curriculum of respiratory physiology for group B students provided a gradual switch from teacher-centered to a learner-centered approach. It was made possible with the help of interaction during didactic lectures and case based sessions, guided direction during tutorials, discussions and clarification of quiz answers during student's seminars. Facilitators not only supervised participation of all students ("learner-centered" philosophy)<sup>11</sup> but also generated and directed their learning on the discussion. The improvement justified importance of learner centered approaches in medical education as was emphasized by Spencer.<sup>13</sup> Tutors empathic attitude in second group of students encouraged students learning in an atmosphere in which comfortable exchange of ideas was facilitated. This study can be compared with Schmidt and his workers who proposed that an effective tutor can improve learning and performance of students by generating discussions with exchange of ideas in a friendly atmosphere.<sup>14</sup> Case based learning (CBL) with clinical problems as a source of stimulus was concluded to be an effective tool by Jamkar and associates.<sup>15</sup> The induction of CBL as an educational tool in curriculum of Batch B in our study has helped precisely in better understanding of clinical scenarios reflected in cognitive understanding of students.

Our research can be compared with a study done in order to evaluate "Metacognitive awareness and self-regulated learning skills in medical schools" by Turan et al.<sup>16</sup> Their results showed that students who experienced a learner-centered curriculum, such as PBL during their medical education demonstrated significant higher scores in the dimension of motivation and action to learning strategies.<sup>16</sup>

Implementation of new approaches and strategies was based on formative feedbacks acquired from students of group A in our research helped in assembly of new strategies on the basis of learner's prior knowledge, learning

styles, course objectives, available resources and system of examination. The effort resulted in better grades and understanding of students as shown by statistically significant performance of group B students in BCQ ( $p < 0.01$ ). The negative association with descriptive type questions can however be related to a lesser amount of prior knowledge and writing skills of first year students in group B. This exercise has also provoked meta cognitive processing in our students for self evaluation with the intention to analyze their learning strengths, preferences, resources and needs.<sup>16</sup> The achievement was accomplished by comparative analysis of same feedback forms given to group A students. It was calculated that understanding, clarity of concepts, confidence and command on the subject was improved from 58 % to 86% of students as compared to derived by innovations to implement learner-centred education.

### Conclusion

Introduction of novel teaching methodologies as a result of student's feedback analysis of group A, improved the overall learning capability of group B students as shown by their better performance in multiple choice questions. We believe that competency based education can be acquired by knowing prior knowledge of students, integrated teaching and use of multiple techniques and methods in teaching practice to promote confidence, understanding and test performance of students.

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