Original Article

Evaluation of interactive teaching for undergraduate medical students using a classroom interactive response system in India

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ABSTRACT

Background: The classical didactic lecture has been the cornerstone of the theoretical undergraduate medical education. Their efficacy however reduces due to reduced interaction and short attention span of the students. It is hypothesized that the interactive response pad obviates some of these drawbacks. The aim of this study was to evaluate the effectiveness of an interactive response system by comparing it with conventional classroom teaching.

Methods: A prospective comparative longitudinal study was conducted on 192 students who were exposed to either conventional or interactive teaching over 20 classes. Pre-test, Post-test and retentions test (post 8—12 weeks) scores were collated and statistically analysed. An independent observer measured number of student interactions in each class.

Results: Pre-test scores from both groups were similar (p = 0.71). There was significant improvement in both post test scores when compared to pre-test scores in either method (p < 0.001). The interactive post-test score was better than conventional post test score (p < 0.001) by 8—10% (95% CI-difference of means − 8.2%—9.24%—10.3%). The interactive retention test score was better than conventional retention test score (p < 0.001) by 15—18% (95% CI-difference of means − 15.0%—16.64%—18.2%). There were 51 participative events in the interactive group vs 25 in the conventional group.

Conclusions: The Interactive Response Pad method was efficacious in teaching. Students taught with the interactive method were likely to score 8—10% higher (statistically significant) in the immediate post class time and 15—18% higher (statistically significant) after 8—12 weeks. The number of student—teacher interactions increases when using the interactive response pads.

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Introduction

In a classical study by Stuart et al, the attention span of a medical student was found to be optimal till 20 min following which it rapidly faded off.[1] In order to improve the classic lecture, interactivity between participants is a must. This promotes active learning, heightens attention and motivation, gives feedback to the teacher and student, and increases satisfaction for both.[2] Interaction in teaching has been attempted by numerous methods. The interactive response system is one such tool which aims at improving the conventional lecture. It is a handheld device which has the ability to transmit and receive data from the teacher's computer during the class.[3] In this way it promotes interaction and gives immediate anonymous feedback to the teacher. The ability of these tools to engage passive listeners and 'back-benchers' in a classroom has been aptly demonstrated.[4,5] Newer research suggests that such a tool significantly impacts the learning process and improves retention rates of factual information when compared to a conventional didactic lectures.[6] However, there are some reports of this new tool failing to deliver expected results and demonstrating no significant benefit.[7,8] Such techniques have not been evaluated before in the Indian medical education setting and studies are needed to establish the efficacy of the method. The present study aims to compare the effectiveness of an interactive response system with conventional classroom teaching in the Indian classroom of a medical school.

Material and methods

The present study was carried out at a medical college which offers a homogenous mix of students fairly representative from across the country. The study was done on 192 undergraduate students pursuing the MBBS course in subjects of ENT and Physiology. Students of each discipline were divided into equal groups of 48 students each using alphabetically generated roll numbers (ENT-1, ENT-2, PHY-1 and PHY-2). The study was designed to be a prospective longitudinal comparative study (Experimental design). An informed consent was taken from the subjects and institutional ethical clearance taken.

The intervention was the conduct of theory teaching using either conventional classroom method or interactive method in the groups. It is imperative to explain the interactive method further to understand the intervention.

The device used for interactive teaching was a commercially available teaching tool known as Interactive™ PRS by M/S eInstruction. It consisted of a hand-held battery powered interactive response pad called clicker issued to each student (Fig. 1). Each clicker has a unique ID which identifies it distinctively and linked to a student database. The clicker has an alphanumeric keypad and screen for input and output. It transmits and receives information wirelessly to the teacher's computer. Multiple type/true false/other type of objective questions are inserted into a conventional PowerPoint presentation which is being used for teaching.

Usually one question is placed after 7–8 min or on completion of one learning objective. During the class, as the interactive question comes up, students respond using the clickers within a stipulated time frame (Fig. 2). The answers are then available with the teacher who may choose to display these aggregate results to the students in an anonymous way. The correct answer is subsequently displayed and the teacher can discuss it. It also offers a teacher the feedback about the pace of class and understanding of learning objectives.

In the present study, the study material was especially chosen to include topics of study from the 'desirable to know' area of the syllabus. Each topic constituted a class and taught in a conventional classroom method using a Microsoft PowerPoint presentation (Classroom Method) or using the interactive response pad method by the same teacher (Interactive Method). The classes were designed to be of 30–40 min duration each and it was ensured that there was no difference in the content. Ten such classes were prepared and internally peer reviewed (Table 1).

The class began with the pre designed pre-test of ten questions each. Each correct response carried one mark and there was no negative marking. This was followed by the conduct of the class and then a post class test (post-test) immediately after. At the end of approximately 8–12 weeks duration the entire class was administered a combined 'retention test'. The answers of the retention test were separated based on type of class exposed to i.e. interactive vs conventional and averaged. Only those data observations where all three scores (pre-test, post-test and retention test) were valid and available were used for the statistical analysis. All the assessments were based on MCQs and designed by the teachers themselves.

Additionally each class was observed by an independent observer and student–teacher interaction events were counted based on number of clarifications sought and questions asked by the students. This total score in a 40 min class was averaged for interactive method and conventional method. This measure was labelled the student participative index and used to compare the two methods.

The average results of the pre, post and retention test was obtained and used to compare the differences. The pre-test results were compared to see if there was parity in the pre-existing knowledge in the two groups. To demonstrate the efficacy of the teaching methodology, comparison of pre and post test scores was done using a paired t test for both groups separately. Similarly comparisons between pre-test and retention test scores were compared using a paired t test.

To demonstrate the difference in two teaching methods, the unpaired t-test was used to compare the post test and retention test scores of interactive and conventional groups. Additionally to estimate the magnitude of benefit, 95% confidence Intervals were calculated for difference between two means.

Results

The study was conducted in a reputed medical college from 2008 to 2009. A total of 192 students took part in the study. This