

## Original article

### The effects of question generation on learning in neurology courses students

Mahmoud Gholamreza Mirzaee<sup>1</sup>, Mojtaba Azimian<sup>2\*</sup>

*1 Assistant professor of Shahr-e-Kord University of Medical Sciences*

*2 Associated professor of Tehran university of social welfare and rehabilitation*

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#### Abstract

**Introduction:** Nowadays, a variety of different methods are employed to improve learning particularly in teaching to medical students. One of the factors affecting in learning is making the students active in teaching activities. Preparation of question through students is one of these ways to make the students active in learning, which was the main aim of this study.

**Methods:** In this experimental study, 96 medical students taking part in a one month neurology course, included in this trial. Students were randomly designated into two groups. Students in group one were asked to prepare at least four multiple questions for each even session and students in group two were asked to prepare as least four multiple questions for each odd session. Therefore, each student had prepared questions from half of the sessions. The exam questions were prepared through the lecturer. The scores of the students, from the sessions which they had prepared question were compared with the scores of the sessions that they had not prepared question.

**Results:** The scores of the students from the sessions that they had prepared question (84.7%) were higher than the ones that they had not prepared question (61.5%) ( $P < 0.05$ ). In global, however, the students' scores were not significantly different in two groups. 75% of students believed that question preparation was effective in learning and 58.4% of them agreed with question preparation.

**Conclusion:** It seems that students study the course more carefully when they prepare question and question preparation should be an effective method in active learning

**Key word:** Active learning, Question generation, Neurology course, Teaching Method

*\*Correspondence: Shahr-e-Kord University of Medical Sciences E-mail mazimian@yahoo.com, Tel: +982122180140*

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#### Introduction

**T**raining physicians in medical schools, while being extremely important task, is complicated and imposes costs. Each year substantial human and monetary resources are allotted for training doctors. Several methods has been developed and implemented to improve medical education. Some methods have been added to traditional training systems which are generally known as active education. These

methods included, but restricted to problem-based education, electronic learning, and group education (1). It is noteworthy that content of education and related research methods have been ever changing. Fortunately these changes have been appreciated by policy-makers working on medical education (2). The most currently implemented education methods used to be traditional education in which the teacher delivers a lecture and students make some notes. Students may also be provided with some slides

or videos. This method is cost-effective in that teachers can simultaneously deliver their lectures to as many as 50 students (3). The method, however, has been criticized extensively. Students may possibly be physically present at class while failing to maintain their attention to what is presented by teachers hoping use notes made by other students later (4). The students play a passive role in learning and are not actively involved in learning process. In order to shift from teacher-centered stratagem to a more student-centered one it has been suggested to persuade students to conceive questions. As such the student will have to dig into education contents more deeply, concentrate on key concepts, and to be more focused on the contents of lectures while the lessons are being delivered. Several methods have been suggested to be followed by trainees for improvising questions. For example some students are to ask questions while other students are expected to answer the questions under the supervision of the teacher. This method has been shown to be able to make the learning process an active one and make all students involved in the learning process (3). It also possible that when a student ask a question the teacher help her with some explanation regarding the level of the question, the possible paths that if are taken can help resolving the problem, and how to reach answers. The teacher can also help her students in process of drawing conclusions, process of making inferences through logical thinking as well as reasoning methods in which a conclusion is reached by methodically analyzing the facts (5, 6). There would be also an opportunity for a teacher to instruct the appropriate methods of learning. Data regarding the effectiveness of deriving multi-choice questions (MCQ) are lacking, we thus conducted this study to investigate the effect of deriving MCQs from contents on lectures on neurology on the score of students that represent their achievement in learning.

## Materials and Methods

The study sample consisted of 96 students of the Shahr-e-KordUniversity of Medical Sciences who spend their course of neurology during 2008-2009. Each course 17-24 students were provided with a one-month training program

consisting of a 16-session theoretical lesson. At the end of courses students participated in a MCQ examination. Participants were divided into two groups based on whether their rank in the list of education office (which is usually alphabetically sorted) was odd or even. In each session student from one group were asked to design MCQs derived from the theoretical neurology lessons they were just provided with. We promised no award for questions. Questions were not supposed to follow any particular model and filed with no modification. The study was aimed at examining the effects of MCQs on the theoretic aspect of learning and clinical skills were not considered. Students were also asked to express their attitude towards MCQs and effectiveness of this system on learning. Students were not aware that the results of their work were designed to be analyzed and studied. Two score were assigned to each student: one for questions from the chapters (session contents) he/she derived MCQs from and the other for the other for remaining chapters. In the assessment of the learning ability (achieved score) we used a 2\*2 factorial design in an analysis of variance (ANOVA). One factor was chapters from which MCQs were derived and the other was denotes methods of learning i.e. using and not using MCQs. Mean scores in each level of factors were compared using LSD test. The significance of differences was tested at type 1 error of 0.05.

## Findings

As shown in figures 1 and 2, our findings showed that mean scores from chapters with and without MCQs were statistically significantly different (P- values >0.05). However, mean scores were significantly different between those who designed MCQs (84.7%) and those who did not (61.5%)( P- Values <0.05).Interaction between chapters and methods were not statistically significant (P- value >0.05).

Among students 75, 16.6, and 8.4% believed that MCQs, respectively, positively, neutrally, and negatively affected their learning. Positive, neutral, and negative attitude towards designing MCQs were observed among 58.4, 20.8, and 20.8% of students, respectively.

## Discussion

To the best of our knowledge for the first time we compared the effectiveness on learning of the designing MCQs from education contents with traditional education system and observed that the learning performance of the students who designed MCQs was higher than those who did not. We demonstrated that students are interested in designing MCQs and that they look at this methods as an effective learning method.

In an educational system, the most fundamental components are: (1) what the teacher should know, (2) what the student is expected to know, and (3) how the information should be transferred from teacher to the student. The first two components have been extensively studied (4). The point that deserves to be revised and more focused on is the way to make passive students to be more active in learning as well as the way the teacher should communicate with students so that the information are transferred more efficiently. Considering the ever-changing atmosphere of educational systems in universities, some initiatives could be launched to make students more actively involved in learning process. Our finding showed that using MCQs is an effective solution. Designing MCQs mandates deeply studying the text and deeply dig the information given and as such learning could be more ingrained and memorizing could more deep-rooted. Although, none of the MCQs designed by students were (directly or intentionally) used in examinations, those who designed MCQs scored higher than those who did not. This could be possibly explained by students being more involved in learning the texts from which they were asked to derive MCQs. Meanwhile, the finding that students were interested in designing MCQs could explicitly indicate that student might have found this method effective in their learning.

We are aware of no other study conducted to investigate the effectiveness of designing MCQs on learning performance. It is, however, generally accepted that traditional education system has several short-comes (1). It has been shown that problem-based education can outperform traditional system while being easier to impl-

ement (7, 8). Computer-based learning has also been shown to provide more ingrained learning and to be emotionally encouraging (9). Investigators started to believe that a combination of traditional and modern methods should be implemented (1).

## Conclusion

In conclusion, the findings of the current study showed that designing MCQs based on neurology lessons can improve learning performance of the students. Future studies will be required to examine if the effectiveness of the method could be generalized to other areas and levels of education.

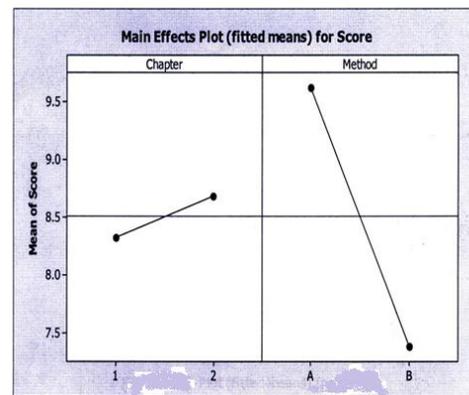


Figure 1. Comparison of correct answers across chapters and methods.

Two chapter types denote chapters from which students did (1) and did not (2) derived MCQs. Methods reflect designing (A) and not designing (B) MCQs.

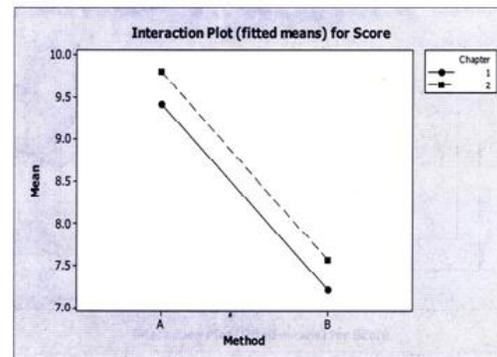


Figure 2. The interaction between the effect of chapter type and learning method on the learning performance.

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