The usefulness of crossword puzzle as a self-learning tool in pharmacology

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Abstract

Introduction: Pharmacology is perceived as a volatile subject as it's difficult to recall and recite the core of the subject. Enriching the learning environment through incorporation of a variety of teaching and learning strategies and methods yields enhanced learning. Crossword puzzles provide expansion of vocabulary, stimulate thinking capacity, boost confidence, and fasten up the learning capacity; hence, the present study was conducted to investigate the usefulness of crossword puzzle as an innovative self-learning tool in pharmacology.

Methods: This prospective study was conducted among 5th semester students of the second professional MBBS course. A total of 139 students participated in this study and were evaluated with formative examination and feedback questionnaire. Permission was taken from Institutional Ethics Committee for the study. A crossword puzzle consisting of 32 questions on endocrine pharmacology was prepared and divided into two sections: the across section had 17 questions and the down section contained 15 questions. The data were analyzed, using Graph Pad Software and presented as percentage of the responses.

Results: On average, out of 32 questions, one mark each, the students scored 52.69% and all students responded correctly on questions on the topic of hormonal contraceptives. 75.5% of the students had an enjoyable experience and the majority of them agreed that it helped them enhance their knowledge of drugs, remember diseases and drug names, and overall learning about the topic. They were also of the opinion that this should be inculcated in pharmacology curriculum.

Conclusion: Incorporation of crossword puzzles, as an adjunct tool, was useful as majority of the students reported that this improved their attitude of learning, thereby improving their performance.

Keywords: Endocrine system, Pharmacology, Self-learning, Lectures, Feedback

Introduction

The purpose of adult teaching is to facilitate effective learning, but over the past few decades, instructional passive teaching in the form of lectures, case studies, or, practical tutorials served as a major source of delivering the study materials for second professional MBBS students in Indian teaching curriculum.

Students generally find it difficult to recall and recite the core of the subject, especially in pharmacology viz. names of medications, adverse drug reactions, indications, etc. because didactic lecture for one hour becomes monotonous after 15-20 minutes, as there is no or minimal involvement of students in most of the cases (1). The students often perceive pharmacology as a volatile subject. Students in the second professional MBBS are introduced to many newer terminologies and the core concepts of pharmacology, for which they might struggle to adapt (2, 3).

Pharmacology teaching is in a stage of constant reformation. According to Dee Fink, key to learning is the ability to create significant learning environments (4). Enriching the learning environment through incorporation of a variety of teaching and learning strategies and methods both in and out of the classroom rather than relying on a single isolated classroom method should yield enhanced learning (4).

Various innovations and efforts are directed towards the objective of making pharmacology teaching an interesting and significant learning experience, by formulating new educational strategies and modules for the medical students as our main aim is to instil in our students all important skills of a doctor in today's world. Various innovations are an effort directed towards meeting the learning needs at undergraduate level (5). Amongst the learner-controlled methods, self-learning methods have been proven to be important. Different types of puzzles, quiz, games, flash cards, problem-based learning, case-based learning, poems and crosswords, etc. have been practiced as a means to promote active learning. Recent studies in medical education section provide evidence and recommend incorporation of self-learning methods to enhance teaching learning purposefully and to make it more effective, efficient and interesting. Self-learning methods also directly enhance active learning, and predominantly it improves critical thinking process. These, in turn, boost the learner's confidence, intellect, cooperative learning skills and attitudes and values; promote concept formation; provide an avenue for discovering misconceptions; and increase motivation in the due process (6). Furthermore, the medical council of India has also emphasized promoting incorporation of newer teaching techniques in the courses. Indian medical education is still in its budding, flourishing and experimental stage. Medical educators have felt the need and are adopting various innovations that must aid active learning and complement lectures (6, 7).

Crossword puzzles in general are not uncommon; they are being regularly published in newspapers, journals, magazines, etc. and their existence has been documented since 300 AD. Modern day crossword puzzle was designed by Arthur Wynne (6). Studies have confirmed that crossword puzzle provides expansion of vocabulary, stimulates thinking capacity, boosts confidence, and fastens up the learning capacity and chiefly decreases undue burden of passive memorization (6). Also, crossword has helped the students to improve recalling terms, indications and enjoyable learning course content. It is presumed that active involvement in cognitive stimulating fun activities viz. crosswords may also be helpful in treating preclinical dementia by improvising cognitive reserve (8, 9).

However, the evidence of establishing their reliability as an innovative self-learning method tool in pharmacology is limited. Thus, the present study was conducted to evaluate the usefulness of crossword puzzle as an innovative self-learning tool in pharmacology.

Methods

Study setting: This prospective study for assessment of effectiveness/usefulness of newer teaching technique/module, i.e. crossword puzzle, was conducted on the 5th semester students of the second professional MBBS course of Teerthanker Mahaveer Medical College, Moradabad, West Uttar Pradesh for a period of three months from August 2016 to October 2016. A total of 139 students actively participated in this study.

Study design: All the students who participated in the study were evaluated with formative examination and feedback questionnaire. Institutional Ethics Committee approval was taken before the start of the study.

Sensitization: The first session with the faculty members of Department of Pharmacology was a sensitization session wherein the faculty was introduced to the concept of cross word puzzle and a feedback questionnaire was developed with consensus of all faculty members.

The second session was taken with students where they were described about crossword puzzle.

A crossword puzzle with 32 questions on endocrine pharmacology was prepared and divided into two sections: the across section had 17 questions and the down section had 15 questions. The crossword puzzle clues (Across and Down) were substantiated from the standard textbooks of pharmacology. A pilot study was done on students to validate the puzzle and all those students who participated in the pilot

study were not enrolled. The feedback questions administered were checked for coefficient of reliability by Cronbach's alpha, and it was found to be 0.841 with high internal consistency.

A 10 item student's feedback questionnaire was also developed by the Faculty of Pharmacology to record the students' perceptions about crossword puzzles as a self-learning instrument in pharmacology. The responses to students' feedback questionnaire were recorded on a 5-point Likert scale (1=strongly agree to 5=strongly disagree). The questionnaire was also validated on 10% of the students who were not a part of the study.

Traditional didactic teaching/lectures on endocrine pharmacology were accomplished as per the prescribed schedule from August to October 2016. Print copies of crossword puzzle questionnaires were administered. One hour time period was assigned to solve the puzzle. Feedback questionnaire was distributed among the student and their responses and comments were collected thereafter. Students were asked to comment on the 'strengths and weaknesses' of this self-learning tool. One week later, formative examination was conducted and the results of both forms were compared.

Evaluation was done by comparing the student learning in all the forms, i.e. of crossword puzzle and feedback in the form of questionnaire. Feedback was expressed as the percentage of responses. The data were analysed using Graph Pad Software and presented as the percentage of responses.

Results

On average, out of 32 questions carrying one mark each, students scored 16.22 ±2.45 (52.69%) marks ranging from 2 (6.25%) -29 (90.6%). All the students correctly responded the questions regarding hormonal contraceptives. 97%, (135 of 139) and 96% (133 of 139) of students correctly responded the questions on topics of bone mineral haemostasis and endocrine pancreas, respectively. The response of students on questions on gonadal hormones, hormonal contraceptives and thyroid hormone respectively was the same, i.e. 132 (95%) (Figure 1).

While evaluating the feedback questionnaire, we found that most of the students had an enjoyable experience. The majority of the students agreed to the statements that it helped them enhance their knowledge of drugs, remember disease and drug names and overall learning about the topic. The material on the topic was also found to be pertinent and they were of the opinion to inculcate this in pharmacology curriculum as
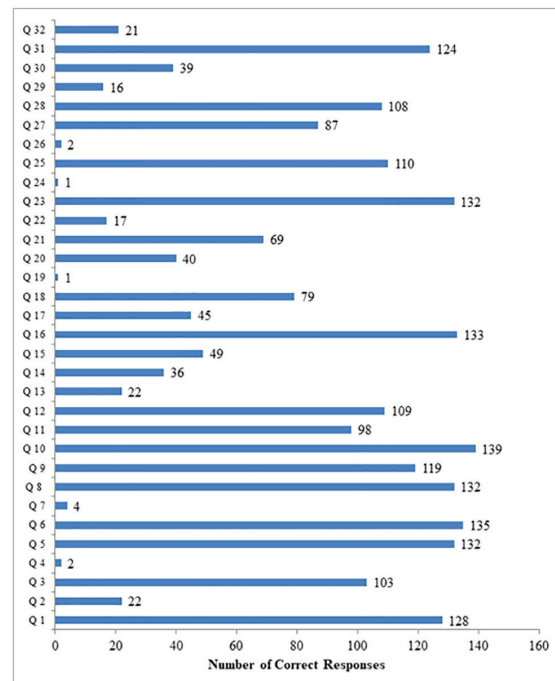

Figure 1: Students' response in each question of crossword puzzle test

self-learning tool. Most of them found it to be challenging and problem solving by reinforcing a positive outlook, thinking logically, finding similarities, and focussing on the game. The time allotted for solving the puzzle was also found to be appropriate according to the students (Table 1).

Feedback was also evaluated in terms of various aspects of learning. It was found that 77% of the study group agreed that crossword was helpful in enhancement of cognitive/mental skill as well as attitude of the learner.75% of the study group also agreed that it is helpful for the applied part of the subject (Figure 2).

Discussion

The goal of our study was to incorporate an active learning method, i.e. Crossword Puzzle, to MBBS second year students, who find it difficult to understand the concepts of pharmacology and to find out its effectiveness in the learning process.

It was observed many times that students often find it difficult to remember the drug name and recalling during the practical examination. Solving the crossword puzzles requires the students to read through the clues, recall and review the material, and engage in discussions with their colleagues to clear any misconceptions about the topic. Therefor, crossword puzzle engages students in the learning process which effectively improves their recalling capacities and also enhances their learning experiences (2, 7).

Table 1: Students' feedback on crossword puzzle test regarding various aspects of learning

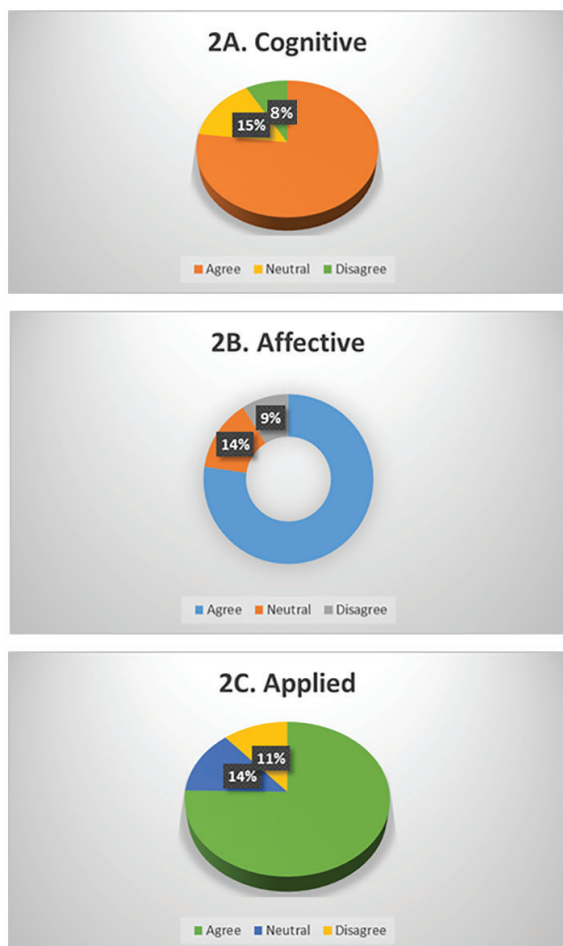|	Percentage of response		
	Strongly agree/ Agree	Neutral	Strongly disagree/ Disagree
Cognitive learning			
1. Enhanced my knowledge of drugs in endocrine	70.5	18.7	10.8
2. Crossword puzzles provided enhanced my learning	72.7	18.7	8.6
3. Should be incorporation in pharmacology curriculum as self-learning tool	87.8	7.2	5.0
Affective learning			
4. Was an enjoyable experience to solve crossword puzzle.	75.5	14.4	10.1
5. The material on the puzzles was pertinent	75.5	14.4	10.1
6. Enjoyed faculty interaction and reviewing material while solving	87.8	7.2	5.0
7. Length of time provided for solving the puzzles was sufficient	75.5	18.7	10.8
Applied aspect			
8. Helped to remember disease and drug names	87.8	7.2	5.0
9. Challenging and problem solving	70.5	18.7	10.8
10. Promotes active learning	67.6	14.4	18.0

Figure 2: Response of the study group on different aspects of learning

We used crossword puzzle in pharmacology as a tool to promote active learning. The student's feedback to 10 questions was taken and evaluated.

The majority of the students found crossword puzzle an interactive and enjoyable learning activity. The students believed crossword puzzle enhanced their learning abilities by improving recalling drug and disease names. In our study, students agreed that crossword puzzle was helpful in enhancement of cognitive/mental skill as well as their attitude towards learning. This is an indication that students strongly supported the use of crossword puzzles in the classroom teaching. Incorporation of active learning methods has been advocated by many researchers to improve understanding and learning (2).

The results of our study on examining the effectiveness and student perception of crossword puzzles (70% to 87.9%) as the study tools were found to be consistent with other studies (10). Many students indicated that the crossword puzzles helped them to focus on the important topics in the lectures and provided a good review for the examination. Others noted that the crossword puzzles made learning fun as they were interactive, enjoyable, and provided a nice change ''from the typically dry nature of certain subjects''. Some students also indicated that solving the crossword puzzles caused them to start studying sooner for the examinations and helped them learn some topics from the lecture that they might have otherwise overlooked.

Saxena et al. found that crossword puzzles contributed to the overall learning of 61 out of 80 medical students in an undergraduate pathology course (6). Crossman and Crossman in their study reports showed that students achieved higher test scores in a History of Psychology course after using crossword puzzles as the study tools (10).

Although crossword puzzle preparation is a time consuming activity, the intervention is easy to implement. Crossword puzzle activities can be implemented by using hard copies (as done in our study) or electronically. There is some software available on the internet to prepare an electronic form of crossword puzzle. The advantage of using a crossword puzzle is that it forces the students to read through the clues, recall and review the material and engage in discussion with their colleagues to clear misconceptions about the material. This activity leads to better retention of the subject and promotes the active learning process in children. The effectiveness of crossword puzzle and its acceptability by students show its usefulness as a recreational self-learning tool in pharmacology.

There were certain limitations in our study. Firstly, this method only tried to study the impact of cross-word puzzle as a source of self-learning and did not compare it with traditional method of evaluation. This could have given clear advantage of this method of evaluation. Secondly, due to the lack of appropriate time as the schedule and syllabus is tightly packed, we could not implement it to all the courses of pharmacology.

Conclusion

Crossword puzzle, as an innovative teaching module, was applied/introduced in our set up for the first time through this study. Student's perceptions of the use of crossword puzzle, as an active learning instructional tool, were gathered by using a pre-validated questionnaire. A majority of the student's found that the crossword puzzle enhanced their learning of the topic. It promotes enhancement of cognitive/mental skill as well as attitude of the learner. This tool promotes self-learning, provides a recreational

break during the traditional lecture class, and allows the students to review the lecture material as well as examination. Thus, crossword puzzles are a creative tool whose proper implementation definitely has positive impact on the student's skills and performances.

Conflict of Interest: None declared.

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