



INNOVATIVE LEARNING: CROSSWORD PUZZLE AS A LEARNING TOOL FOR UNDERGRADUATES

Pediatrics

Ekansh Rathoria*	M.D. Paediatrics, Associate professor, Department of Paediatrics, Hind Institute of Medical Sciences, Safedabad, Barabanki, Uttar Pradesh, India. *Corresponding Author
Richa Rathoria	M.S. Obstetrics and Gynaecology, Associate professor, Department of Obstetrics and Gynaecology, Hind Institute of Medical Sciences, Safedabad, Barabanki, Uttar Pradesh, India.
Utkarsh Bansal	M.D. Paediatrics, Professor and Head, Department of Paediatrics, Hind Institute of Medical Sciences, Safedabad, Barabanki, Uttar Pradesh, India.
Anjana Agarwal	M.S. Obstetrics and Gynaecology, Professor and Head, Department of Obstetrics and Gynaecology, Hind Institute of Medical Sciences, Safedabad, Barabanki, Uttar Pradesh, India.

ABSTRACT

Background: Medical education is excogitating every day from traditional learning to innovative learning methods.

Objective: The aim of this study was to evaluate the usefulness of Crossword Puzzle as an innovative learning tool and its acceptance by medical undergraduate students.

Methods: This Cross-sectional Observational study was conducted on a purposive sample in Hind Institute of Medical Sciences, Barabanki over a period of 3 months from August to October 2020. Four crossword puzzles including 20 questions each on different topics in Paediatrics, Obstetrics and Gynaecology were made after ensuring content validity. Small groups of four students each were made and allowed group discussion to solve crossword puzzle in 10 minutes which was given as Pre-test and Post-test before and after the Lecture respectively. After obtaining informed consent, students were given a questionnaire identifying cognitive, affective and applied aspects of learning domains and asked to respond on a 5-point Likert scale.

Results: Total 26 groups of 4 students each participated (n=104). Total Mean (standard deviation) of four Pre-test and Post-test scores were 8.47(1.44) and 16.18(1.95) respectively (p-value < 0.00001). The merits of crossword puzzle listed by students: identifying key concepts (91.35%), enhanced knowledge (91.35%), promoted cognitive/mental skills and attitude (92.31%), satisfactory (87.5%), recommended to incorporate in teaching curriculum (87.5%), and promoted active learning by collaborative and competitive aspects (91.35%).

Conclusions: Student's perceptions indicate the usefulness of crossword puzzles to endorse positive learning in an interactive environment and advocates their use as an adjunct to lecture thereby allowing easy recall of the content.

KEYWORDS

Crossword puzzle, Innovative learning tool, Medical Education

INTRODUCTION

Medical undergraduate students have to go through a vast syllabus and learn various concepts in a short time period. Passive lectures deliver basic theoretical knowledge and is one-way communication thus providing the lowest knowledge retention rate and the lowest level of cognitive function.¹ Thus, it's the need of the hour to discover and indoctrinate new creative ideas and innovations in our education system to complement the traditional lectures and augment learning by utilizing active strategies like small group discussion, debates, role-play, multiple choice questions, quiz, and puzzle solving.^{2,3}

Students' interest and retention of knowledge in the subject may be increased by educational games.⁴ The benefits of active learning strategies like interactive puzzles and games are manifold as they help in involvement of different skills like attitude, concept building, cognition, communication, critical thinking, learning, and motivation among students.⁵

Using Crossword puzzle game during didactic lectures not only breaks the monotony but also helps in active involvement of students thus improving critical thinking and boosting their cognitive skills.^{6,7} Small group discussion to solve crossword puzzles by making teams promotes team work and also complements the traditional method of teaching.⁸ Small group discussion helps students to discuss key concepts and ideas thus improving their critical thinking and problem-solving skills.⁹

The aim of our study was to evaluate the usefulness of Crossword Puzzle as an innovative learning tool and its acceptance by medical undergraduate students.

METHODS

This Cross-sectional Observational study was conducted in Hind Institute of Medical Sciences, Safedabad, Barabanki over a period of 3 months from August to October 2020 after obtaining approval from

institute's ethical committee. A sample size of 104 medical students of IIIrd Professional Part II were included in study by purposive sample method after obtaining informed consent from them.

We conducted four crossword puzzles exercises in Paediatrics, Obstetrics and Gynaecology on the topics Protein energy malnutrition, Immunization, Neonatal resuscitation and Normal delivery. It took around 4-5 hours to prepare a moderate difficulty level crossword puzzle with relevant content and around 25 minutes to complete this exercise with answer discussion in class.

Crossword puzzle were created using 20 horizontal and 20 vertical spaces and total 20 questions with clues were designed in this framework which were divided into 10 horizontal and 10 vertical space questions and a final draft was created after going through multiple drafts [Annexure 1]. The final draft was reviewed and approved by respective departmental faculty after authentication that the format, content and concept of the crossword puzzle was adequate for that topic under study. After faculty approval, a pilot testing was done on peers and assuring that puzzle could be used as a learning tool and for validation of the answers. To avoid bias, a faculty member other than who prepared the crossword puzzle took the formal lecture.

Before the formal lecture of the topic, students were randomized to make groups of 4 students each and the crossword puzzle was given to these small groups as a Pre-test. There were 20 clues, which ranged from easy to difficult, to be solved in 10 min. Students in a group were allowed to discuss among themselves regarding the questions. Next, the formal teaching of the topic was done by a faculty in the form of a lecture class or demonstration. Following that, the same crossword puzzle was given to be solved in 10 minutes as a post-test allowing group discussion to finish this exercise in a synergetic manner. After student groups completed the Post-test, the answers were discussed to clarify any doubts. Scoring for each group was done with 1 mark for each correct answer with maximum 20 marks.

Outcome measures - After completion of all the four exercises, they were given a questionnaire regarding the experience with the exercise. The students were asked to respond anonymously on a 5-point Likert scale where 1,2,3,4,5 was strongly disagreed, disagree, neutral, agree and strongly agree respectively. Following questions were framed to assess the cognitive, affective and applied aspects of learning domains.

Cognitive learning domain: -

1. The Crossword puzzles were useful in identifying key concepts in studied topics.
2. The Crossword puzzles enhanced my knowledge in studied topics.
3. The Crossword puzzles promotes cognitive/mental skill as well as attitude.
4. Crossword puzzle exercise was Satisfactory.
5. Crossword Puzzles like this should be given after each topic class and should be included in our teaching curriculum.

Affective learning Domain: -

1. The material on the crossword puzzles was pertinent to the topic studied.
2. Duration of time provided for solving the puzzles was sufficient.
3. Solving crossword puzzle was as an enjoyable experience.
4. Solving crossword puzzle was a waste of time.
5. Crossword Puzzles were easy.
6. Crossword Puzzles were difficult.

Applied Aspect: -

1. Group discussion while solving crossword puzzle helped in building concepts on studied topics.
2. The crossword puzzles promote active learning by collaborative and competitive aspects.
3. Crossword puzzle is an overall useful learning tool and promotes self-learning.

Data Analysis

Mean, standard deviation, Paired Student's "t" test for comparing pre-test and post-test scores and p-value were calculated using SPSS software version 17, ($P < 0.05$ being statistically significant). Descriptive statistics were used for individual question analysis from Likert's scale data.

RESULTS

Total 26 groups of 4 students each participated in this exercise ($n=104$) on four topics. Total Mean (standard deviation) of four Pre-test and Post-test scores were 8.47 (1.44) and 16.18 (1.95) respectively (t -value 40.66, p -value < 0.00001) [Table 1].

TABLE 1: - PRE-TEST AND POST-TEST SCORE COMPARISON REPRESENTING ENHANCEMENT IN LEARNING (N=104)

Topics	Pre-test Mean (SD)	Post-test Mean (SD)	t-value	p-value*
Protein Energy Malnutrition	7.61 (1.11)	15.07 (1.79)	15.83	$< .00001$
Neonatal resuscitation	8.42 (1.27)	16.53 (1.84)	21.04	$< .00001$
Immunization	9.38 (1.07)	17.03 (1.58)	22.11	$< .00001$
Normal delivery	8.46 (1.66)	16.07 (2.01)	25.03	$< .00001$
Total	8.47 (1.44)	16.18 (1.95)	40.66	$< .00001$

* Statistically significant (p -value < 0.05)

Total 104 medical undergraduate students responded on Crossword puzzle feedback form. The 14 question-based feedback form covered numerous aspects of the new learning tool as adjunct to traditional lecture. Responses to the enhanced cognitive, affective and applied aspects of learning domains are shown in Table 2, Table 3, Table 4 respectively.

TABLE 2: - STUDENTS RESPONSES REPRESENTING COGNITIVE LEARNING DOMAIN (N=104) *

Questions	SD No. (%)	D No. (%)	N No. (%)	A No. (%)	SA No. (%)
Useful in identifying key concepts	3 (2.89)	0 (0)	6 (5.77)	35 (33.65)	60 (57.69)
Enhanced knowledge	2 (1.92)	1 (0.96)	6 (5.77)	30 (28.85)	65 (62.5)
Promotes cognitive/ mental skill as well as attitude.	1 (0.96)	1 (0.96)	6 (5.77)	21 (20.19)	75 (72.12)
Satisfactory	1 (0.96)	2 (1.92)	10 (9.62)	32 (30.77)	59 (56.73)
Recommended Crossword Puzzles exercise to be included in the teaching curriculum	2 (1.92)	2 (1.92)	9 (8.65)	41 (39.43)	50 (48.08)

*SD = Strongly disagree, D = Disagree, N = Neutral, A = Agree, SA = Strongly agree

TABLE 3: - STUDENTS RESPONSES REPRESENTING AFFECTIVE LEARNING DOMAIN (N=104) *

Questions	SD No. (%)	D No. (%)	N No. (%)	A No. (%)	SA No. (%)
The material was pertinent to the topic studied.	1 (0.96)	1 (0.96)	9 (8.65)	30 (28.85)	63 (60.58)
Duration of time provided was sufficient.	1 (0.96)	2 (1.92)	12 (11.54)	38 (36.54)	51 (49.04)
Easy	5 (4.81)	15 (14.42)	51 (49.04)	21 (20.19)	12 (11.54)
Difficult.	1 (0.96)	8 (7.7)	57 (54.8)	26 (25)	12 (11.54)
Solving crossword puzzle was a waste of time	70 (67.31)	12 (11.54)	6 (5.77)	9 (8.65)	7 (6.73)
Enjoyable experience.	1 (0.96)	1 (0.96)	8 (7.7)	22 (21.15)	72 (69.23)

*SD = Strongly disagree, D = Disagree, N = Neutral, A = Agree, SA = Strongly agree

TABLE 4: - STUDENTS RESPONSES REPRESENTING APPLIED ASPECTS OF LEARNING DOMAIN (N=104) *

Questions	SD No. (%)	D No. (%)	N No. (%)	A No. (%)	SA No. (%)
Promote active learning by collaborative and competitive aspects	2 (1.92)	1 (0.96)	6 (5.77)	28 (26.93)	67 (64.42)
Group discussion helped in building concepts on studied topics.	2 (1.92)	4 (3.85)	7 (6.73)	24 (23.08)	67 (64.42)
Overall useful learning tool and promotes self-learning.	1 (0.96)	1 (0.96)	9 (8.65)	32 (30.77)	61 (58.66)

*SD = Strongly disagree, D = Disagree, N = Neutral, A = Agree, SA = Strongly agree

DISCUSSION

In present study, there was a significant improvement in post-test scores as compared to pre-test scores indicating improvement in learning which was akin to study done by Malini M et al who found

