

# Pathology crossword competition: an active and easy way of learning pathology in undergraduate medical education

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**INTRODUCTION** In line with the trend to engage students in active learning, it is imperative to introduce new strategies that make learning more interesting, especially in undergraduate curricula. This study aimed to determine students' performance and perception in pathology crosswords as an active way of learning and to assess their ability to memorise difficult terms in pathology.

**METHODS** A crossword competition in pathology was conducted for two batches (year 2009 and 2010) of Phase 2 medical students in Malaysia. Crossword puzzles were prepared using an online application. Two sets of puzzles were prepared, with 20 questions for the assessment of general pathology and 20 for systemic pathology. The purpose was to compare the students' recent and remote memorising abilities, as general pathology was taught a year before proceeding to systemic pathology teaching. There were 12 groups per batch, with 8–10 students in a group. Survey questionnaires were used to assess the students' perception of the competition. Descriptive analysis was performed for comparison of performance.

**RESULTS** The mean score of correctly answered questions in general pathology was 12.75 and 11.50 in batch 2009 and 2010, respectively. The mean score for systemic pathology was 14.50 in 2009 and 13.83 in 2010. Students in the 2009 batch performed better, but this was not statistically significant ( $p$ -value > 0.05). A positive response was observed from the questionnaires.

**CONCLUSION** Applying crossword puzzles as a new strategy is a useful and easy way for undergraduate medical students to learn pathology.

*Keywords: crosswords, learning pathology, undergraduate medical education*  
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## INTRODUCTION

Crossword puzzles have been created since the ancient Egyptian days. The first 'modern' crossword created by Arthur Wynne dates back to 1913.<sup>(1)</sup> Nowadays, crossword puzzles are commonly seen in newspapers, books, journals and magazines. They have been widely used as an educational tool in nursing and recently in undergraduate medical education.<sup>(2–6)</sup> Applying crossword puzzles in education has advantages in building critical thinking, communication, cooperative learning skills and attitudes. They also motivate concept and provide ways for discovering misconceptions.<sup>(7,8)</sup> With the changing trend in current medical education, it is imperative to introduce new strategies to make learning more interesting, especially in the undergraduate medical curriculum in order to engage students in active learning.

Pathology, being a subject bridging the basic medical sciences and clinical practice, requires a firm foundation of knowledge as a critical necessity. Learning pathology consists of two components. Learning and understanding the concept of pathology begins from general pathology, which is usually introduced beforehand, followed by systemic pathology. Second-year medical students are introduced to many new terms and concepts within a short time in the undergraduate pathology course. It is a challenge to provide adequate practice and necessary repetition to reinforce

key concepts.<sup>(9,10)</sup> In line with the current trend in integrated learning, applying crossword puzzles as one of the means in the learning process would help to motivate students' cognitive function. Hence, this study was carried out to determine students' performance and perception in pathology crosswords as an active way of learning, and to assess their ability in memorising difficult terms in pathology.

## METHODS

A crossword competition in pathology was conducted for two batches (year 2009 and 2010) of Phase 2 MBBS students in Malaysia. There were 12 groups of students per batch, with 8–10 students in each group. Two sets of puzzles were prepared using an online application from Discovery Education (puzzlemaker.school.discovery.com), which was accessed on October 30, 2009. There were 20 questions each for the assessment of general and systemic pathology. 30 minutes were allocated for each set of questions. A sample of the type of questions prepared is shown in Fig. 1. The purpose was to compare the students' recent and remote memorising ability in general and systemic pathology, as general pathology was taught a year before proceeding to systemic pathology teaching. Questions with varying degree of difficulties were prepared and evenly distributed in both puzzles,

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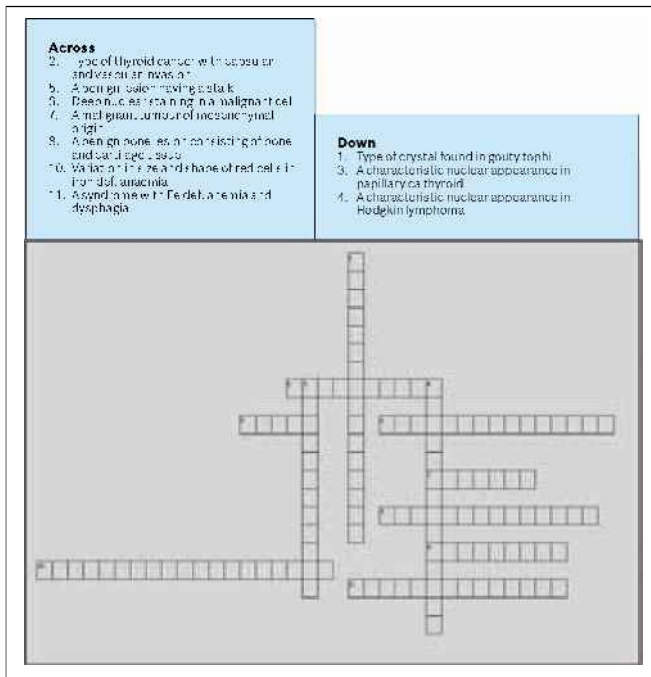


Fig. 1. Illustration shows a sample crossword used in the competition.

as shown in Fig. 2. Survey questionnaires were used to assess the students' perception of the competition. The groups that obtained the highest scores were awarded prizes as an incentive. Descriptive analysis was performed using the Statistical Package for the Social Sciences version 11.0 (SPSS Inc, Chicago, IL, USA), for comparison of performance.

## RESULTS

The mean score of correct answers in the general pathology crossword puzzle was 12.75 and 11.50 in batch 2009 and 2010, respectively. The mean score for systemic pathology in the 2009 and 2010 batch was 14.50 and 13.83, respectively, and the total performance score was 27.5 and 25.33, respectively. The minimum score for correctly answered questions in general pathology was 9 and 8 in the 2009 and 2010 batch, respectively, and that for systemic pathology was 12 and 11, respectively. Total performance score for the 2009 batch was 21 and that for the 2010 batch was 20. The maximum score of correctly answered questions in general pathology was 17 and 16 in the 2009 and 2010 batch, respectively. The maximum score for systemic pathology was 17 and the total performance score was 32 for both the batches. Overall, the performance of students from the 2009 batch appeared to be better. However, there was no significant difference in the students' performance between general and systemic pathology in both batches ( $p > 0.05$ ) (Table I).

The majority of the students from both batches responded positively to the survey questionnaires, as shown in Table II. Most indicated that the crossword puzzles were useful and contributed to their learning by identifying key concepts and vocabulary as well as enhancing their collaborative and cooperative learning. Students expressed their interest to participate in more of such exercises and accepted this method as a means of teaching and learning.

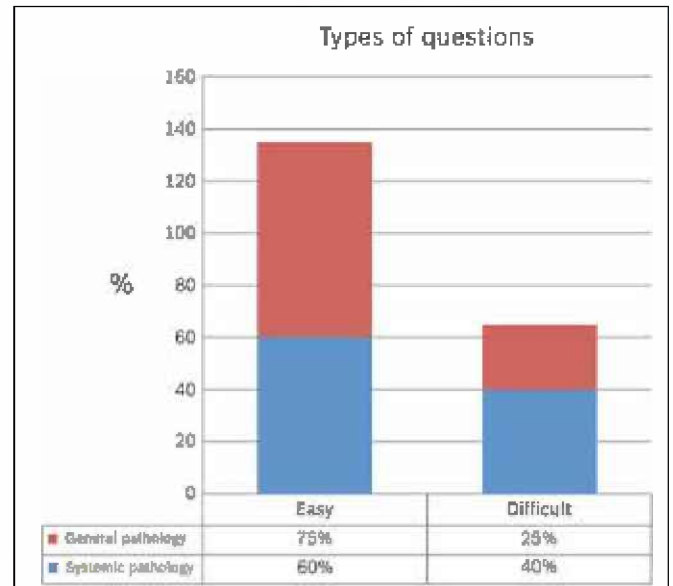


Fig. 2. Graph shows the distribution of the types of questions constructed in the crossword puzzles.

Table I. Comparative frequency distribution chart of scores between medical students from the 2009 and 2010 batches.

	General pathology		Systemic pathology		Total score	
	2009	2010	2009	2010	2009	2010
Mean	12.75	11.50	14.50	13.83	27.25	25.33
Median	12.50	11.50	14.50	13	27.50	25.50
Mode	12	9	13	13	25	22
SD	2.598	2.714	1.931	1.697	3.049	3.576
Range	8	8	5	6	11	12
Min	9	8	12	11	21	20
Max	17	16	17	17	32	32

Note: each batch contained 12 small groups, and each group contained 8–10 students. SD: standard deviation

## DISCUSSION

With regard to teaching pathology to medical students at the undergraduate level, many new terms and concepts are introduced in a short time frame, especially in the haematology system and neoplasia section. Thus, Saxena et al performed an assessment by constructing crossword puzzles in these two areas. Their findings supported the view that crossword puzzles provide an opportunity to perform small group discussions, recall essential concepts and build critical thinking.<sup>(9)</sup> In our study, we modified the way of assessment by structuring crossword puzzles into general and systemic pathology, with the aim of discovering the extent of the students' knowledge and perception in the basic concepts of diseases taught in general pathology, as well as their ability to apply the knowledge in systemic pathology. We were also able to assess the students' memorising capacity in general pathology, which was taught a year before systemic pathology.

As the questions were set up in a fairly even distribution from easy to difficult, students at all levels of knowledge were able to participate. Current medical education emphasises small group teaching, as it represents a student-orientated way of learning

Table II. Responses for the survey questionnaire by medical students from the 2009 and 2010 batches.

Question	Frequency (%)			
	Yes		No	
	2009 (n = 93)	2010 (n = 100)	2009 (n = 93)	2010 (n = 100)
Q1. Crossword puzzles help me to improve the vocabulary in pathology.	79.5	83.4	20.5	16.6
Q2. Crossword puzzles reflect the key concepts of the course.	77.7	66.6	22.3	33.4
Q3. Crossword puzzles are useful learning tool.	82.8	91.7	17.2	8.3
Q4. Crossword puzzles help me learn in collaboration in my group.	88.2	91.7	11.8	8.3
Q5. The competitive aspect of the puzzles contributes to its effectiveness.	86.0	75.0	14.0	25.0
Q6. I recommend the crossword puzzles to be part of this course material.	83.9	91.7	16.1	8.3
Q7. I enjoy doing the crosswords.	86.0	83.3	14.0	16.7
Q8. This exercise is just a waste of time.	12.9	16.7	87.1	83.3
Q9. Crossword questions are too easy.	6.5	5.0	93.5	95.0
Q10. Crossword questions are too difficult.	52.7	75.0	47.3	25.0

rather than a teacher-orientated approach. It requires student participation and interaction, promotes deeper understanding, encourages problem-solving, participation and personal responsibility for learning, as well as aids in developing interpersonal and social skills.<sup>(11,12)</sup> Today, most medical schools apply small group teaching in the form of problem-based learning sessions and integrated learning activities. Our study supports introducing crossword puzzle as a means of small-group activity. It is useful not only in stimulating intra-group activity, but also in inter-group competitive activity. With the same set of questions being used for both batches, the insignificant difference in performance between the two batches also reflected the consistency and contingency of construction of the questions as well as the students' performance.

Games and puzzles are active learning tools that are useful for acquiring cognitive, affective and psychomotor knowledge and skills.<sup>(13,14)</sup> Various forms of games and puzzles have been used as a complementary aid to traditional teaching, such as the jeopardy-style game in obstetrics,<sup>(15)</sup> frame game in psychiatry,<sup>(16)</sup> panel board games in immunology,<sup>(17)</sup> and card and puzzle games for gastrointestinal physiology.<sup>(18)</sup> A specially constructed digital games-based learning was conducted by Kanthan and Senger in 2011 for an undergraduate pathology course, and it showed improved academic performances, as measured by examination test scores, along with increased student satisfaction.<sup>(19)</sup> In conclusion, applying crosswords puzzles as a new strategy is an easy and useful way for undergraduate medical students to learn pathology.

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