Systematic Review

Using Crosswords in UG Medical Education: A Systematic Review on its Feasibility, Cognitive Impact & Affective Response

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ABSTRACT

Background: Newer teaching-learning methods are the need of the hour. More and more students are feeling for innovation in medical education. National Medical Commission, the apex body governing medical education in India is also encouraging the innovations in medical education. Students get bored of continuous didactic lectures. Using gamification strategies will create curiosity and interest in the topic and make students concentrate on the teaching without coercion.

Methods: Articles dealing with the components of using crosswords in medical education with emphasis on 'feasibility for faculty', 'the Cognitive Impact' and 'the Affective Impact' were searched using Google scholar search engine. Google scholar labs were used for suggestions. Around 190 articles were found out of which 46 matched the points of review.

Results: How it can be made feasible from teacher's angle is addressed in this article. This also shows positive cognitive and affective impact on students.

Conclusion: Gamification strategies in the form of crosswords for teaching learning activity in medical education may be used as adjuvant to reinforce the learning on the desired topic. It does help students to retain and recall.

Keywords: **A**ffective response, **C**ognitive impact, **C**rosswords in Medical Education, feasibility, undergraduate medical students

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INTRODUCTION

Undergraduate medical education in MBBS imposes a peculiar and intense cognitive load on its students, marked by the rapid need to grasp an enormous, complex body of formative knowledge, especially regarding subjects such as Anatomy and Pharmacology. Traditional passive methods of teaching, although crucial, usually do not adequately support long-term retention and cannot counteract the high level of academic stress and anxiety associated with medical school.[1,2] Therefore, there has been a constant, worldwide drive toward incorporating newer, more active forms of learning strategies that achieve maximum engagement while effectively helping to solidify large volumes of medical terms.[3,4]

One such method showing increased promise across health science curricula involves the use of gamification through game-like elements in educational settings to enhance motivation and retrieval practice.[5,6] The use of crossword puzzles in this realm represents a particularly intuitive yet effective means of low-stakes formative assessment. The production of crosswords inherently involves two of the most impactful educational constructs, Active Recall and Constraint-Based Learning, forcing students to produce answers rather than simply identifying them.[7,8] Although existing literature on retrieval practice often reports clear cognitive gains, what is typically missing is an overarching examination of administrative and affective factors driving its sustainable success.[9,10] This systematic review is attempted to explore, through a systematic analysis, the utility of crossword puzzles as an adjunct learning tool for undergraduate MBBS students.

Specifically, this review will synopsize current evidence on three critical dimensions:

1. *Feasibility for Faculty* – examining time commitment, resource demands, and technological barriers for effective large-scale implementation.
2. *Cognitive Impact* – assessing the efficiency of crosswords in improving terminology recall and retention.
3. *Affective Impact* – analyzing their role in student motivation, engagement, and reduction of performance anxiety.

In addressing these practical and pedagogical realities, this review hopes to deliver actionable recommendations for medical educators seeking to adopt crosswords as a viable tool in consistently reinforcing student mastery.

METHODS

Articles dealing with the components of using crosswords in medical education with emphasis on *feasibility for faculty*, the *Cognitive Impact* and the *Affective Impact* were searched using Google scholar, PubMed, PubMed Central and medical education journals.

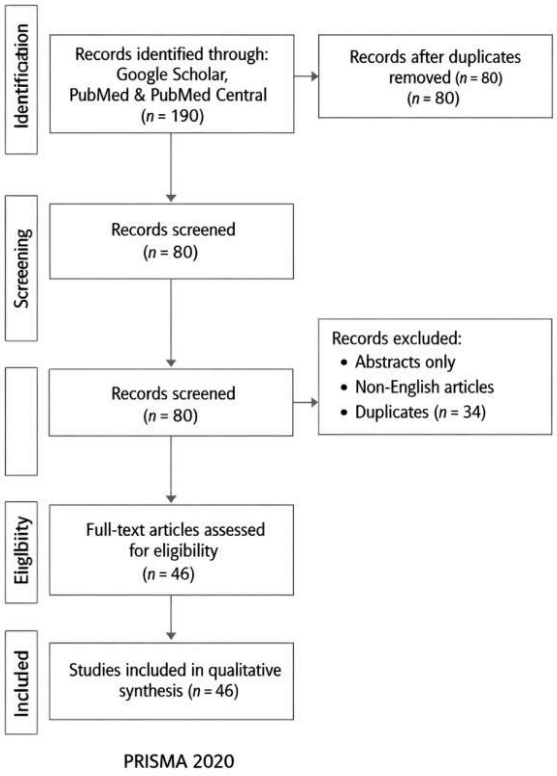

Figure 1: PRISMA chart of search strategy

Google scholar labs were used for suggestions. Around 190 articles were found out of which 46 matched the points of review. 'Microsoft copilot' was used for generating figures and tables. It was also used to make the sentences more meaningful. Approval of the Institutional Ethics Committee for this review is not mandated.

RESULTS

To visually synthesize the findings of this review, a concept map (Figure 2) has been included to illustrate the interrelationship between the three core domains: *Feasibility*, *Cognitive Impact*, and *Affective Response*.

Table 1:Feasibility of Crossword Integration (Teacher's Angle)

Theme	Key Findings	References
Faculty preparation	Requires 3–4 hrs; online tools reduce time; poor design hinders deep learning	9, 12, 13
Content validity	Expert validation essential; mapping to Bloom's taxonomy improves reliability	4, 12
Time considerations	Short puzzles (8–30 min) feasible; longer ones limit lecture coverage	2, 13–15
Curriculum integration	Works best as adjunct, not replacement; selective use improves engagement	9, 16, 19
Student perceptions	Increased engagement, reduced anxiety, enjoyable break from lectures	18, 33, 34
Technology/automation	LMS, chatbots, online generators reduce workload; barriers include training gaps	20, 25–28

Table 2: Cognitive Impact: Knowledge Retrieval & Retention

Theme	Key Findings	References
Active recall/testing	Crosswords strengthen memory via retrieval practice; meta-analysis shows significant gains	22, 23
Knowledge retention	Improved recall of drug names, terminology, and concepts; higher post-test scores	18, 33, 34
Self-learning	Encourages independent study and vocabulary building; boosts confidence	18, 34
Anxiety reduction	Provides relaxing, low-stakes assessment; reduces performance stress	33, 36
Long-term retention	Gains persist weeks after intervention; validated in nursing and physiology	37, 38
Attitudinal benefits	Students report enjoyment, motivation, and improved attitudes toward learning	16, 34

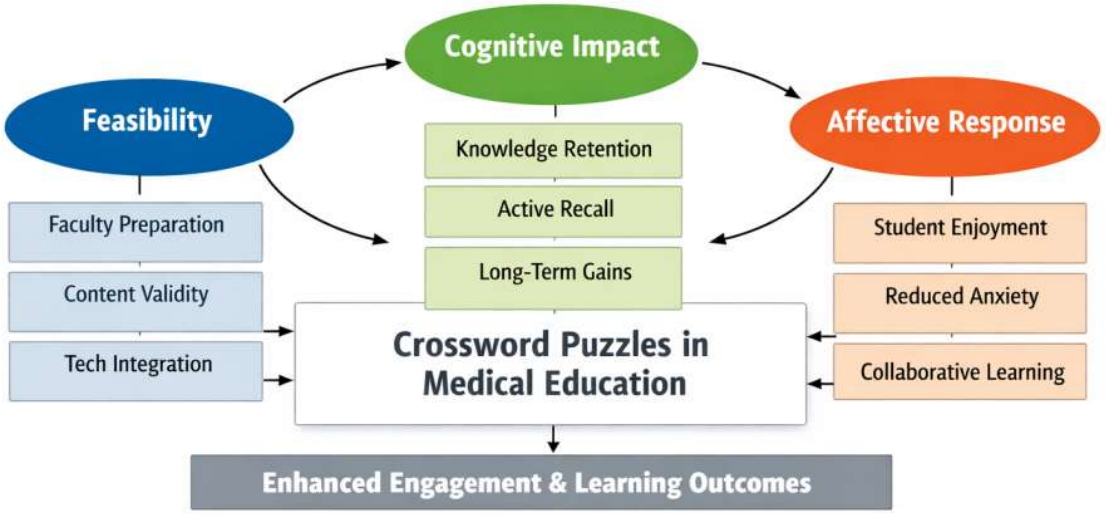

Figure 2: Concept map summarizing the integration of crossword puzzles in undergraduate medical education

Table 3: Affective Response: Engagement & Motivation

Theme	Key Findings	References
Student enjoyment	Seen as fun, recreational break; combats lecture fatigue	2, 5, 33
Motivation	Boosts interest in topics; encourages active participation	16, 34
Collaboration	Group puzzles foster teamwork and peer learning	6, 17
Reduced anxiety	Relaxing activity; lowers stress during lectures and assessments	33, 36
Satisfaction	High ratings from students; preferred over passive methods	2, 18, 34

This map consolidates the thematic analysis and highlights how crossword puzzles function as a multifaceted educational tool. By linking faculty implementation strategies with student-centered outcomes, the diagram reinforces the conclusion that crossword-based gamification enhances both engagement and learning outcomes in undergraduate medical education.

DISCUSSION

This review synthesizes evidence on the feasibility, cognitive impact, and affective response to crossword puzzles in undergraduate MBBS education. Faculty across disciplines have successfully implemented crosswords as low-cost, engaging tools that reinforce terminology, boost recall, and foster active learning.[1,2,3] The cognitive impact is consistently positive, with studies reporting improved retention, self-directed learning, and performance gains.[22, 23,18] Affective responses are equally encouraging students describe crosswords as enjoyable, anxiety-reducing, and motivational. [33, 34,16]

Despite these benefits, implementation challenges

persist. Faculty preparation time, content validation, and integration into packed curricula require strategic planning.[9,12] Online tools and automation offer scalable solutions [8,26,27], but institutional support and training are crucial for sustained adoption.[28]

This review also highlights the need for more robust, longitudinal studies to evaluate long-term retention and performance outcomes.[37,38] Comparative trials between crossword-based learning and other gamification strategies may further clarify their relative effectiveness. [6,14]

In conclusion, crossword puzzles represent a feasible, cognitively enriching, and affectively rewarding adjunct to traditional teaching. Their structured use can enhance engagement and mastery in MBBS education, especially when aligned with Bloom's taxonomy and formative assessment goals.[4,5]

Conclusion

In conclusion, crossword puzzles are a feasible and engaging adjunct to undergraduate medical education when supported by appropriate content design, validation, and time management. Their use as post-lecture reinforcement activities can enhance active recall, self-assessment, and long-term retention through repeated engagement with key concepts. Beyond cognitive benefits, crosswords also contribute positively to the affective domain by functioning as low-stakes learning tools that reduce anxiety, promote psychological safety, and improve learner motivation. As a gamification strategy, crossword-based teaching–learning activities may effectively reinforce core concepts and complement traditional teaching methods in MBBS education.

Declarations

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