



Evaluation of online learning and educational resources on learning outcomes in medical education: A Systematic Review

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Introduction and Purpose

- Medical students have access to many resources aimed at academic success, but the literature is lacking on their impact on outcomes.
- Some literature has shown that study behaviors that included the usage of “third party” resources were associated with increased Step 1 performance.
- The significance of investigating the effectiveness of external medical education resources for medical students is multi-faceted and has several implications for both students and the medical education system as a whole
- The purpose of this review was to evaluate the impact of online learning and external educational resources on medical student learning, academic performance, and educational outcomes.

Methods

- Screened articles from 5 databases: PubMed, Scopus, ERIC, Embase, and PsycINFO
- Utilized a combination of subject headings/MeSH terms and text words representing medical education, medical students, and online learning resources.
- Citations were imported into Covidence for title and abstract screening, as well as full-text screening, conducted independently by two authors.
- Data Extraction followed a dual process and included setting, resources used, types of students, duration and outcomes.

Results

- Out of 2471 citations reviewed 21 articles were selected for review. Process illustrated in Figure 4.
- Studies were mostly evenly distributed in the preclinical (10) and clinical settings (9), with two studies not specifying the year of medical students. Figure 1 shows a breakdown of the types of students found in studies.
- The types of resources included in the studies are represented in Figure 2. The majority of the studies used video-based resources (9) and web-based resources (8).
- Examples of resources included commercial Step 1 question banks, short learning videos on iPod Touches, virtual blackboard videos, and computer games.
- Outcomes of the studies were assessed by various methods illustrated in Figure 3.

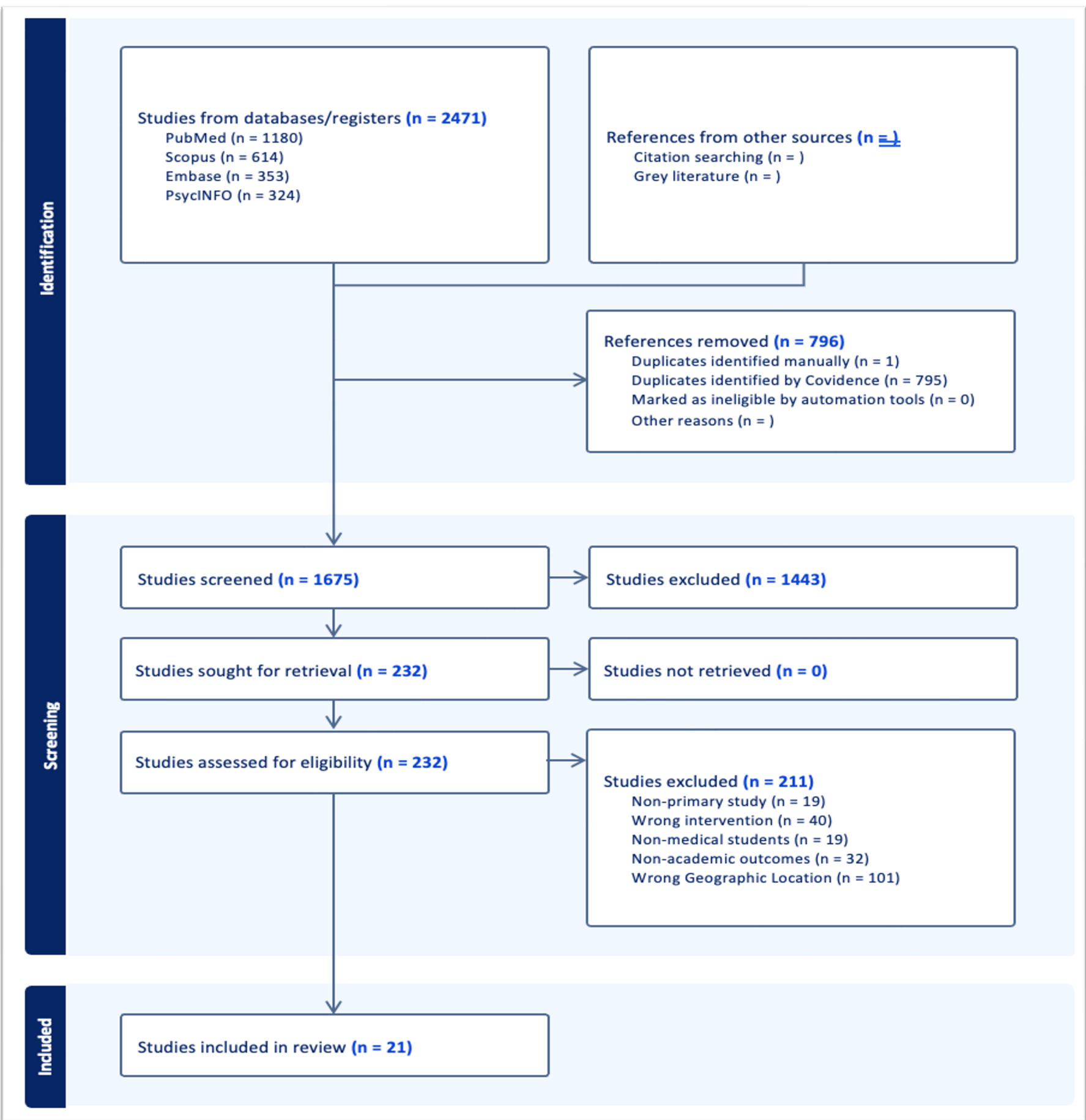


Figure 4: Study Selection Process

Types of Students

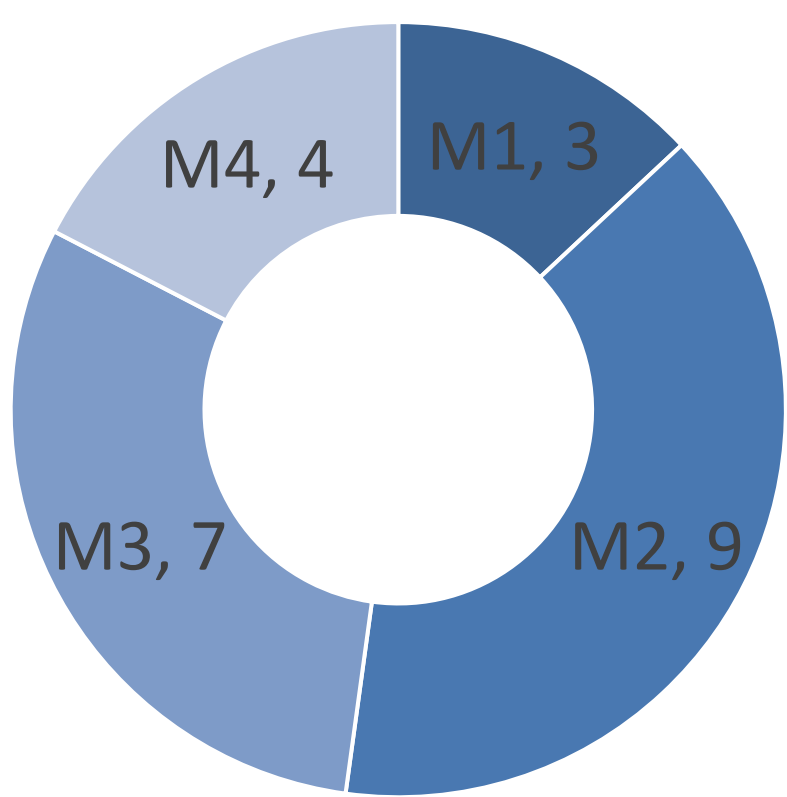


Figure 1: Types of Students

Resources Used

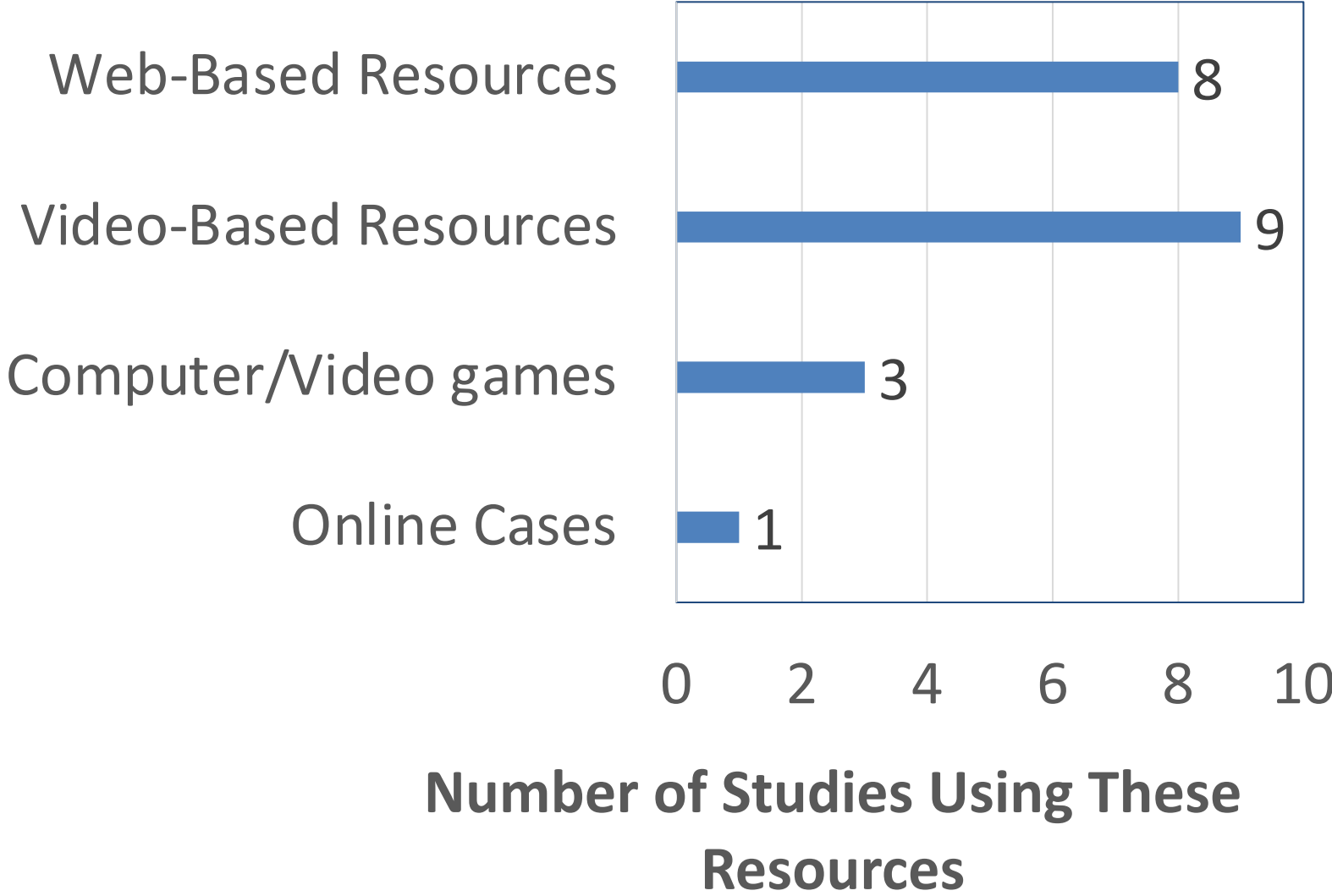


Figure 2: Resources Used

Methods of Assessing Outcomes

Methods of Assessing Outcomes	
Exam (knowledge and skills)	17
Questionnaire/Survey	15
End of Course Evaluation	2
Case Presentation	1
Board Exam	1
Tutor Evaluation	1
Video-Based Exam	1

Figure 3: Methods of Assessing Outcomes

Discussion

- The impacts these resources have vary from direct improvement on examinations to increased student satisfaction during learning.
- The majority of studies demonstrated that, regardless of the type of intervention, student satisfaction with resources increased compared to traditional methods (lecture, textbook, etc.).
- Limitations include a minimal number of studies that focused on objective assessments (Step Scores, shelf examinations, and course grades). More studies that include these metrics would help more schools incorporate alternative methods.

Conclusions

- External learning resources from varying modalities can be used to impact medical educational outcomes positively.
- The positive outcomes of using commercial question banks showed that working on more practice questions was associated with higher Step 1 scores, NBME assessments, final course grades, and instructor-written exams.
- Video-based resources were met with increased student satisfaction over traditional lecture modalities with varying results on associated assessment outcomes.