



Medical and Health Professional Education
Best Evidence Medical Education

BEME Spotlight 48

Test-enhanced learning in health professions education: A systematic review: BEME Guide No.48

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Review citation

Michael L. Green, Jeremy J. Moeller & Judy M. Spak (2018): Test-enhanced learning in health professions education: A systematic review: BEME Guide No. 48, Medical Teacher, DOI: 10.1080/0142159X.2018.1430354

Review website

<https://bemecollaboration.org/Published+Reviews/BEME+Guide+No+48/>

Keywords

Test-enhanced learning, Retrieval effect, Memory, Retention and transfer

Headline conclusions

TEL demonstrates consistent and robust effects across different health professions, learner levels, TEL formats, and learning outcomes. TEL items that require production of information (short answer) perform better than items that require recognition of information (multiple choice). The effectiveness of TEL extends beyond knowledge assessed by examinations to clinical applications, such as radiograph interpretation, cardiopulmonary resuscitation simulation, standardized patient encounters, and clinical reasoning.

Background and context

Looming assessments indirectly enhance learning by driving students' study behaviors. Assessment also directly augments learning through Test-enhanced learning (TEL). Cognitive psychology studies demonstrate that subjects who engage in deliberate attempts to recall information show better learning, retention, and transfer than students who spend the same time studying the same material. We reviewed TEL interventions in health professions education.

Review objectives

To systematically review controlled studies of TEL interventions in health professions education, including study design, study quality, subject demographics, TEL interventions, and quality, characteristics, and outcomes.

Review methodology

Search Strategy: We searched 13 electronic databases from 2000 to present, using appropriate MeSH and text words and screened the reference lists of and articles citing the captured articles. We also manually searched 14 medical education journals.

Inclusion and Exclusion Criteria: Inclusion criteria included controlled studies of TEL interventions in health professions education that reported an objective learning outcome and compared TEL to studying the same material or to a different TEL strategy.

Data Extraction: Two raters independently screened articles for inclusion, abstracted information, and determined quality scores. To allow comparisons among heterogeneous studies, we determined the standardized mean difference (SMD) for the learning outcomes.

Data Synthesis: Two raters showed excellent agreement in the study screening and inclusion processes (Kappas 0.79 to 0.93) and quality score determination (Intraclass correlation coefficient 0.93, $p < 0.0001$). Nineteen included studies reported 41 outcomes with sufficient data to determine a SMD. All studies were RCTs (11 employing a within-subjects design) with quality scores ranging from 9.5 to 15.5 out of 18. Subjects included medical students, nursing students, allied health students, residents, physicians in CME programs, and dental and dental hygiene students. TEL interventions included short answer questions (SAQs), multiple choice questions (MCQs), simulation, standardized patients, and key features questions.

Of the 29 outcomes comparing TEL to studying the same material, 26 showed SMDs favoring TEL (0.09 to 2.5), with some 95% CIs crossing zero due to low sample sizes. Among the six immediate learning outcomes, five favored TEL (SMD 0.09 – 0.44). Among the 23 retention outcomes (1 week to 6 months), 21 favored TEL (SMD 0.10 – 2.5). The 3 studies that measured transfer demonstrated a positive impact of TEL. In two studies, TEL with SAQs resulted in better recall than TEL with MCQs.

Implications for practice

Educators should include TEL in health professions curricula to enhance recall, retention, and transfer. Ideally, “tests” should be repeated, spaced over time, utilize items that require production of information, and include feedback. Further studies should recruit larger samples, support outcomes with more validity evidence, and examine different TEL interventions and outcomes.

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