

Association for Surgical Education

Predicting and enhancing American Board of Surgery In-Training Examination performance: does writing questions really help?



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Abstract

BACKGROUND: The generative learning model posits that individuals remember content they have generated better than materials created by others. The goals of this study were to evaluate question generation as a study method for the American Board of Surgery In-Training Examination (ABSITE) and determine whether practice test scores and other data predict ABSITE performance.

METHODS: Residents (n = 206) from 6 general surgery programs were randomly assigned to one of the two study conditions. One group wrote questions for practice examinations. All residents took 2 practice examinations.

RESULTS: There was not a significant effect of writing questions on ABSITE score. Practice test scores, United States Medical Licensing Examination Step 1 scores, and previous ABSITE scores were significantly correlated with ABSITE performance.

CONCLUSIONS: The generative learning model was not supported. Performance on practice tests and other data can be used for early identification of residents at risk of performing poorly on the ABSITE. © 2016 Elsevier Inc. All rights reserved.

When preparing for the American Board of Surgery In-Training Examination (ABSITE), many residents engage in repetitive self-testing strategies using online question banks such as the practice questions on the SCORE Portal (Surgical Council on Resident Education) or the Surgery Board Weapon website (TrueLearn, Pittsburgh, PA). A less commonly used learning strategy is one in which residents

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generate questions as study materials. Generating questions engages the learner in a deeper level of understanding, which Wittrock¹ termed the “generative effect.” This strategy is rooted in the levels of processing theory of cognition,² which posits that the more deeply information is processed the more likely it will be remembered. Additionally, constructivist learning theory posits that learners interact with knowledge to reformulate given information, generate new cognitive structures, and link information to what the learner already knows.^{3–5} In addition to engaging the learner in more active and deeper processing of information, the process of writing questions may also have the benefit of encouraging metacognitive awareness⁶ (ie, the learner reflects on what he/she knows and does not know) and thinking like “a test writer” (ie, a process in which the learner discerns important content that test creators may include on an examination).

The generative effect has received a great deal of empirical support in the laboratory using tasks such as presenting lists of rhyming word pairs vs requiring participants to complete the word pairs (eg, “rave-cave” vs “rave-c___”).⁷ In this paradigm, participants who complete the word pairs perform significantly better than participants who simply memorize the word pairs.

In applied educational settings, the generative effect has been successfully studied using tasks such as generating content outlines vs being given outlines,⁸ taking lecture notes vs being given notes,⁵ and writing questions for practice tests vs not writing questions.^{5,9–12} This effect has been demonstrated with students in primary,⁹ secondary,^{4,8,11} and undergraduate^{3,5,10,12–14} educational settings. However, the practice of generating study questions for practice tests has not been substantially implemented in the surgical education literature.

At the University of Texas Health Science Center at San Antonio, the process of asking residents to write questions for practice tests has been a part of our ABSITE and American Board of Surgery Qualifying Exam (ABS-QE) preparation plan since 2007. During this time, we administered 11 practice tests. Residents are asked to write 4 to 5 questions for each of these practice tests, which are administered 2 to 3 times per year. The tests comprised a select number of well-written questions. Corneille et al¹⁵ conducted a study evaluating the effectiveness of practice tests and showed that performance on practice tests correlated with actual ABSITE scores and ABS-QE first-time pass rates. Additionally, we have seen a rise in median ABSITE scores from 48th to 70th percentile and our ABS-QE first-time pass rate has been 98% for a period of 5 consecutive years.

It is important to note that not all residents actually wrote questions for the practice tests despite being asked to do so. In a follow-up unpublished study, we examined practice test and ABSITE data from a 5-year period (2007 to 2012). During this timeframe, residents completed a total of 334 individual practice tests. A total of 170 practice tests were completed by residents who generated

questions for the respective practice tests, whereas 164 tests were completed by residents who did not generate questions. The residents who wrote questions achieved significantly higher ABSITE percentile rank scores than those who did not write questions (57.7 ± 30.3 vs 46.3 ± 28.7 , $P < .001$). These results are limited by the fact that data were collected at a single institution using a nonrandomized, quasi-experimental research design (ie, all residents were asked to generate practice test questions).

In addition to using practice tests as predictors of ABSITE scores, a number of studies have examined whether scores on the United States Medical Licensing Examination (USMLE) can serve as useful predictors. Previously published research on the utility of USMLE Step 1 and Step 2 has yielded contradictory results.^{16–18}

Spurlock et al¹⁸ conducted an analysis of 34 residents at 2 institutions. They found that USMLE Step 1 score significantly correlated only with postgraduate year (PGY) 3 ABSITE scores. Step 2 score significantly correlated with ABSITE scores at all PGY levels. Spurlock et al concluded that Step 1 scores were of little value.

In a larger study, Alterman et al¹⁶ examined correlations between Steps 1, 2, and 3 and ABSITE scores by performing an 18-year review (1990 to 2008) of all matched residents ($n = 101$) at a single institution. They found that Step 1 score correlated with ABSITE scores at all PGY levels, Step 2 was correlated only for PGY1 and 3 ABSITE scores, and Step 3 correlated with PGY1, 2, 4, and 5 ABSITE scores. However, the authors reported using Pearson correlation coefficient to analyze ABSITE percentile rank scores. Because percentile rank scores are not normally distributed, Pearson correlations are not the appropriate statistical selection. Thus, it is difficult to make conclusions from the data.

We wished to add to the existing body of evidence regarding the utility of USMLE scores as predictors of ABSITE performance by using a large, multi-institutional study.

This study had 4 aims. First, we examined the effects of writing questions on ABSITE performance using a multi-center, randomized experimental design. In accordance with the published literature on the levels of processing and constructivist theories, we hypothesized that residents who wrote practice test questions would perform better on the ABSITE than residents who did not write questions. Second, we evaluated the relationship between question quality and ABSITE performance. We hypothesized that residents who generated questions with higher question-related mechanics, content, and quality scores had engaged in deeper processing and would achieve higher ABSITE scores than residents who had lower question rating scores. Third, we examined whether performance on practice tests could be used to predict ABSITE performance. We hypothesized that practice tests could serve as a useful tool for early identification of residents at risk for performing poorly on the ABSITE. Fourth, we examined whether

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