Adaptive Quizzing Improves End-of-Program Exit Examination Scores

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ABSTRACT

Background: A third of nursing schools use a standardized, end-of-program exit examination requiring minimum passing scores for student progression. Student failures on high-stakes tests have negative implications for students and schools of nursing. Adaptive quizzing has increased grades, graduation rates, and NCLEX-RN passing rates and reduced test anxiety in nursing students.

Purpose: To diminish the negative effects of high-stakes testing and increase standardized exit examination scores, an undergraduate nursing program incorporated customized adaptive quizzing for nursing students in their final nursing course before graduation.

Methods: End-of-program exit examination scores were compared in a preintervention cohort of students and postintervention cohort assigned individualized adaptive quizzing.

Results: Statistically significant increases in end-of-program exit examination scores were evident in groups of students completing the customized adaptive quizzing assignments.

Conclusion: The use of tailored adaptive quizzing increased exit examination scores, supporting the implementation of customized assignments for remediation.

Keywords: adaptive quizzing, exit examination, NCLEX-RN, standardized test

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approximately a third of all nursing schools require an exit examination, often requiring minimum passing scores for student progression. Student failures on high-stakes tests have negative implications for students and schools of nursing. Adaptive quizzing has increased grades, graduation rates, and NCLEX-RN passing rates and reduced test anxiety in nursing students.

Purpose

The purpose of this study was to determine if the use of computerized adaptive quizzing assignments significantly increased standardized end-of-program exit examination scores. Variables of interest included the percentage of students in each group achieving a score of 850 or higher on the examination.

Adaptive Quizzing Versus Adaptive Testing

In contrast to a linear test with fixed test items, computer adaptive testing or quizzing is based on an assessment of
Adaptive Quizzing in Nursing Education

There is limited literature on the use of computer adaptive quizzing to increase exit examination scores in prelicensure nursing education. The authors searched CINAHL, PubMed, and ERIC databases with the following terms: adaptive quizzing, adaptive testing, computerized adaptive testing, and nursing education. There were only a few published articles describing the use of an adaptive quizzing program as an individualized tool to improve end-of-program exit examination scores in nursing.

Corrigan-Magaldi et al.10 found adding adaptive quizzing enhanced students’ active participation in learning and was a component of a remediation program that increased passing rates on the NCLEX-RN. Simon-Campbell and Phelan11 reported that adaptive quizzing improved nursing students’ performance, increased their knowledge, reduced test anxiety, and improved grades and graduation rates. Adaptive quizzing in this study was used as a low-stakes tool to enhance studying. Cox-Davenport and Phelan’s9 study exploring the effect of adaptive quizzing did not demonstrate an impact on exit examinations but showed increased mastery of more difficult content, which supports adaptive quizzing’s use as an effective study tool when preparing for the NCLEX-RN examination.

Methods

Following institutional review board approval, data were collected from 4 cohorts of accelerated option BSN students in their last clinical course prior to graduation. This study was designed as a quasi-experimental, retrospective, pretest-posttest study, with 1 control (curricula as usual)—no adaptive quizzing assignments—and 3 intervention groups (modified curricula—adaptive quizzing assignments tailored to individualized areas of needed improvement on the standardized diagnostic exit examination). The standardized diagnostic exit examination provided a baseline assessment of the students’ proficiency on content learned previously in the curriculum and mirrored the final end-of-program standardized exit examination.

The computerized adaptive quizzing program was added to the senior-level, final adult health nursing course. This course is a 6-credit combined didactic and clinical course, with learning experiences provided via 112 hours of preceptorship in the clinical setting and didactic content focused on a review of content, emphasizing in-class question-and-answer sessions. Students are required to pass their final examination, a standardized exit examination, to pass the course and graduate from the nursing program. If unable to pass the standardized exit examination on the first attempt, students are provided an online remediation course and are able to take a second version of the examination. If students fail to achieve a score of 850 or greater, they are required to repeat the course.

Design

On the first day of the course, students were administered the baseline (pre) standardized diagnostic exit examination. This was the sole diagnostic examination provided to students throughout the program. Standardized diagnostic exit examination scores specific to content areas that demonstrated areas needing improvement (scores <850) were used to tailor the adaptive quizzing assignments.

Three adaptive quizzing assignments were required and assigned to all students in accordance with their baseline standardized diagnostic examination results. The first was based on each student’s 3 lowest-scoring areas (targeting areas scoring <850), the second was based on the cohort’s 3 lowest-scoring areas (<850), and the third adaptive quizzing assignment was a general topics review. Items consisted of multiple choice and alternate format items such as multiple response, hot spot, and matching.

The majority of students scored lowest in Client Needs subcategories of Basic Care and Comfort, Safety and Infection Control, and Pharmacological and Parenteral Therapies. Based on this finding, assignments were customized to address the lowest-scoring concepts on the Client Needs section of the standardized diagnostic exit examination, which included basic concepts of care of the client. The goal of the assignment was for students to reach a mastery level of 2. Levels are defined as level 1: beginner, level 2: intermediate, and level 3: expert in the content area. Level 2 reflects the level of difficulty of the majority of the NCLEX and the standardized exit examination content; students who master level 2 are shown to be better prepared for this examination. Students received credit for the adaptive quizzing assignment if they were able to attain a mastery level of 2. Students who were unable to meet this level received credit for the assignment if they answered a minimum of 100 items per section per week. Students who achieved a mastery level of 2 answered about 75 to 90 items per week.

Repeated-measures analysis of variance and χ² analyses were used to analyze the data. SPSS version 24 (IBM Corp, Armonk, New York) was used for statistical analysis.
Results
A total of 254 students’ data were analyzed (n = 58 control, n = 196 intervention). Demographic data revealed 37% of students as Hispanic/Latino, 32% as white, and 14% as black, with others less than 9%. Eighty-five percent were female. No statistically significant differences were identified in baseline diagnostic exit examination scores for the control and intervention groups. There was a statistically significant effect of the adaptive quizzing assignments on standardized end-of-program exam exit examination scores (control group mean, 912.27; intervention group mean, 982.20; \( F_{1,250} = 19.34; P < .001 \)). A \( \chi^2 \) analysis of the number of scores achieved above and below the 850 score target also demonstrated statistically significant results, \( \chi^2 \) (N = 252) = 7.18, \( P = .007 \). A total of 93.0% of the participants in the group receiving adaptive quizzing assignments achieved a score greater than 850 compared with the control group where only 76.8% had a score of greater than 850.

Discussion
Increased success rates on the end-of-program exit examination have financial and psychological advantages, as students can progress to graduation without the added burden of needing to retake an exit examination, possibly delaying graduation and entry into the workforce. The use of adaptive quizzing in nursing education has demonstrated beneficial effects for students including improved test performance and graduation rates, increased student engagement, reduced test anxiety, and increased critical thinking. This study not only reinforces these previous findings but also validates the use of customized adaptive quizzing and individualized student remediation to significantly increase standardized exit examination scores.

The strain of high-stakes testing on those students who do not pass the exit examination is well documented; therefore, faculty should embrace multifaceted and innovative teaching strategies to best prepare students.\(^\text{13}\) Diverse levels of academic proficiency among nursing students suggest students garner additional benefits from personalized assignments to prepare them for high-stakes exit examinations. The study shows the use of a pretest/diagnostic examination may demonstrate an effective method faculty and students can use to identify challenging material prior to teaching and reviewing content and high-stakes testing. The implementation of an adaptive quizzing program targeting student specific areas of difficulty provides a modality to address identified areas of needed improvement. Results indicate that educators should consider customizing adaptive quizzing to students’ areas of weakness to reap the maximum benefit from its implementation. Future work should determine if the effects have an impact on NCLEX pass rates.

Limitations of the study include a single-site sample, which was predominantly female. The sample size also favors the intervention group, which was much larger than the control group. This disparity is due to the course being assigned to a different faculty member who, after a semester of teaching the course, decided to trial the intervention. Another limitation is a lack of comparison of a standardized adaptive quizzing intervention versus an individualized intervention, limiting generalizability of findings. Although the intervention increased exit examination scores, only a small impact was found on NCLEX-RN pass rates, but this may be related to the school’s historically high pass rates in general. Passing scores at the school have been consistently high compared with the national average for first-time candidates’ preintervention and postintervention. The school’s preintervention pass rate in 2014 was 87.70% (national average, 81.78%), and in 2015 was 95.73% (national average, 84.53%).\(^\text{14}\) The postintervention passing rate in 2016 was 96.39% (national average, 84.57%), and in 2017 was 97.22% (national average, 87.11%).\(^\text{14}\) Despite the fact that the impact of the intervention on NCLEX pass rates was minimal, improvement was noted.

Conclusion
This study indicates the use of adaptive quizzing to remediate students’ individual areas of weaknesses significantly increases standardized end-of-program exit examination scores. Faculty may need to step away from traditional, one-size-fits-all pedagogy and incorporate tailored teaching and evaluation methods addressing each student’s knowledge deficits to effectively strengthen his/her preparation for NCLEX.

References

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