

Part 2, Item Characteristics and Cognitive Processing

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This article is a continuation of the research on the development and evaluation of innovative item formats for the NCLEX examinations that was published in the March/April 2009 edition of *Nurse Educator*. The authors discuss the innovative item templates and evaluate the statistical characteristics and level of cognitive processing required to answer the examination items.

Innovative items contain content or functionality that is not possible in a text-based, multiple-choice question (item).¹ Thus, these item types have the potential for expanding an examination's construct representation by providing opportunities to measure constructs or dimensions that cannot be measured, or cannot be measured well, using traditional multiple-choice items.² Innovative types of items are also considered to have the capacity to tap higher levels of cognitive processing as compared with traditional text-based, multiple-choice items. Prior research on the statistical characteristics and cognitive processing of items that use alternate formats (innovative items) provided evidence to support the initial development of these item types for the NCLEX examination.³⁻⁵ Because the development of innovative items is expensive and time-consuming, examination programs have to carefully consider strategies and rationale for production and operation of these item types. The primary purpose of this project was to inform future directions for item development by investigating the levels of cognitive processing required to answer various types of innovative items and the statistical characteristics of the different item types.

by investigating the thought processes used by nursing students when responding to various types of items, some of which were specifically created to require a higher degree of critical thinking and reasoning.

Procedures

Item templates for various types of innovative items were developed and tested in part 1 of this multistage research project.²⁰⁻²² In this second stage (part 2), the item template formats were refined (Figure 1). The content for the initial item development was directed at creating items with the purpose of expanding the domain coverage of the NCLEX, either by testing skills and processes that could not be tested with text-based, multiple-choice items or by improving the ways in which certain concepts are tested.

Item Refinement and Production

The first step in this project was refining the item templates and producing innovative item variations. A group of subject matter experts (SMEs) revised items and templates from part 1 and developed new items. The group was asked to develop variations of the items that would enable the researchers to determine how nursing students process the items and to gather statistical information about the items.

Once the innovative versions of items were completed, text-based versions of the same items were created and refined as much as possible to have "parallel" test forms. There were some innovative items for which it was not possible to create a text-based item with any fidelity, so the items appeared in the innovative format on both test forms.

Pilot Testing

Participants

A total of 103 senior-level nursing students participated in this study across 6 testing occasions. Participants represented both baccalaureate and associate degree nursing programs.

Ninety-four percent of the participants were female, and 6% were male. Eighty-three percent were white-not of Hispanic origin. Other demographic groups represented were African American (3%), Asian other (5%), Hispanic (5%), Pacific Islander (1%), and other (4%). Ten percent were nonnative English speakers. When rating their level of computer experience, 86% identified themselves as being experienced or very experienced with computers. Regarding their experience with computer-based tests, 97% were at least somewhat experienced with 36% experienced and 38% very experienced. Of the 103 participants, 89 took the test under normal conditions in a computer laboratory, and 14 were tested in individual think-aloud sessions.

Item Refinement and Production

Once the innovative items were produced and refined, a set of existing, nonoperational multiple-choice items was selected so that a representative number of items could be administered. In terms of item content, whenever possible, all the unique items were developed in pair, with 1 item in the traditional text format and the other in an innovative format. Each item pair measured identical content. Two fixed forms were constructed to include a combination of text-based and

They were encouraged to explain their reasoning for selecting the answer to an item before moving on to the next item.

Analysis and Results

II. Procedure

The examination was delivered on computer through a Web-based interface. Once participants logged in, the software randomly assigned them to either form A or B. As participants progressed through the examination, statistical information was gathered; both classic item statistics and Rasch calibrations were computed.

Examinee responses from the 89 participants, those who were not included in the think-aloud sessions, were used to complete item analyses. A total of 42 participants completed form A, and 47 participants completed form B. Difficulty values for items presented in both innovative and text-only format were generally similar. For cases in which the difference in difficulty was noticeable, the innovative format was usually more difficult (approximately 10 items were more difficult in

research and policy discussions will be needed to determine whether any of these innovative item formats will be incorporated into the NCLEX.

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