The Art and Science of Developing Classroom Examinations

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Chief Officer, Examinations
National Council of the State Boards of Nursing

Objectives

- Describe the process utilized by NCSBN to write examination items for use on the NCLEX RN/PN examinations
- Discuss NCLEX how to use the NCLEX practice analysis and detailed test plan to assist with periodic curricular evaluation and development of classroom assessments.
- Explore the process used to set the NCLEX cut score and how to modify the standard setting process to help set classroom examination meaningful cut scores

NCLEX® Development Process

- Practice Analysis/Job Analysis
  - Conducted by NCSBN every 3 years
  - Literature search
  - Practice Analysis Expert Panel
    - List of nursing activities created and incorporated into a questionnaire

- Practice Analysis and KSA Study
  - Conducted by NCSBN every 3 years
  - KSA Analysis Expert Panel
  - List of nursing core competencies required for entry level practice and gained through pre-licensure education
  - Incorporated into a questionnaire

- Knowledge, Skills and Ability Study
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- Test Plan
  - Item Review
  - Editorial Review
  - Sensitivity Review
  - BON Review

- Pre-Testing
  - DIF Review
  - NEC/NIRSC Review

- Examination Administration
  - Master Pool Review

- Exam Review
  - Item Review
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### Test Plan

- The Practice Analysis guides the Test Plan by linking specific activities from the Practice Analysis with content on the examination.
- Outline of content entry-level nurses must know to be considered minimally competent.

### NCLEX® Detailed Test Plan

- Two important purposes
  - Guide NCLEX-RN item development
  - Guide candidate examination preparation

### 2013 NCLEX-RN® Test Plan

<table>
<thead>
<tr>
<th>Safe &amp; Effective Care Environment</th>
<th>17-23%</th>
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<tr>
<td>Management of Care</td>
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</tr>
<tr>
<td>Safety &amp; Infection Control</td>
<td>9-15%</td>
</tr>
<tr>
<td>Health Promotion &amp; Maintenance</td>
<td>6-12%</td>
</tr>
<tr>
<td>Psychosocial Integrity</td>
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<tr>
<td>Physiological Integrity</td>
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<tr>
<td>Basic Care &amp; Comfort</td>
<td>6-12%</td>
</tr>
<tr>
<td>Pharmacological &amp; Parenteral Therapies</td>
<td>12-18%</td>
</tr>
<tr>
<td>Reduction of Risk Potential</td>
<td>9-15%</td>
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<td>Activity Statements</td>
</tr>
<tr>
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<tr>
<td>Integrate advance directives into client plan of care</td>
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<tr>
<td>Assign and supervise care provided by others (e.g., LPN/VN, assistive personnel, other RNs)</td>
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<tr>
<td>Organize workload to manage time effectively</td>
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<tr>
<td>Participate in providing cost effective care</td>
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<tr>
<td>Initiate, evaluate, and update plan of care (e.g., care map, clinical pathway)</td>
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<tr>
<td>Provide education to clients and staff about client rights and responsibilities</td>
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<tr>
<td>Advocate for client rights and needs</td>
</tr>
<tr>
<td>Collaborate with health care members in other disciplines when providing client care</td>
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<tr>
<td>Manage conflict among clients and health care staff</td>
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<tr>
<td>Maintain client confidentiality and privacy</td>
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<td>Provide and receive report on assigned clients (e.g., standardized hand off communication)</td>
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<td>Perform procedures necessary to safely admit, transfer or discharge a client</td>
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<td>Prioritize the delivery of client care</td>
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### Sounds Good for the NCLEX, But What About My Classroom?

- NCLEX measures practice competence not educational achievement.
- Curricular review
  - Goals
  - Terminal Objectives
  - Enabling Objectives

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- Recognize ethical dilemmas and take appropriate action
Management of Care
( Goal )

- Terminal Objective
  - Prioritize the delivery of client care

Prioritize the delivery of client care
( Terminal Objective )

- Enabling Objectives
  - Scope of practice
  - Client prioritization
  - Plan of care
  - Comprehensive physical assessment
  - Comprehensive health history
  - Client risk assessment

NCLEX® Development Process

Item Development - Item Writers
- Create the questions or “items” that are used on the NCLEX-RN® examination
- Requirements
  - Current, unencumbered nursing license
  - Current employment position of faculty teaching basic, undergraduate RN nursing content in the clinical area
  - Master’s Degree

Item Development - Item Reviewers
- Examine the items that are created by Item Writers
- Requirements
  - Current, unencumbered RN nursing license
  - Current employment consists of providing direct client care in a clinical setting and working with RN entry-level nurses more than 8 hours per week

Editorial Review
- Clarity
- Grammar
- Punctuation
- Spelling
- Style
**Sensitivity Review**
- Stereotypes
- Assumptions
- Ethnocentrism and Elitism
- Inflammatory material
- Language
- Gender

**Board of Nursing Review**
- Boards of Nursing and Regulatory Bodies may review examination items to determine if the items:
  - Reflect entry-level nursing practice
  - Are consistent with the Jurisdiction’s Nursing Practice Act (NPA)

**NCLEX® Development Process**

**Pretest Items**
- Every item is pretested before being placed in the operational pool
- Statistical data is gathered on each pretested item
- Data is used to evaluate items and ensure all operational items are accurate and fit the testing model

**Pretest Items (con't)**
- 15 pretest items on every NCLEX-RN examination
- Randomly intermixed with operational items in the beginning of the exam
- Not used to estimate the candidate’s ability
- Used for building the item bank
- Indistinguishable from operational items for candidates

**Item Difficulty**
- In a computerized adaptive test, items are targeted to a candidate’s ability
- In order to target items to a candidate’s ability, the difficulty of the item must be known in advance
- To get the maximum amount of candidate information per item, the computer attempts to select items for which the candidate has a 50% chance of answering correctly
### Expected Structure

<table>
<thead>
<tr>
<th>Ability</th>
<th>Easy</th>
<th>Difficult</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>11111111111111111111111111111110100</td>
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### Difficulty is Inconsistent with Ability

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### Gross Item Misfit

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#### Classical Test Theory Notion of Item Difficulty

- **Easier**
  - Low Ability
  - High Ability

- **Harder**
  - Low Ability
  - High Ability
Easier

0.00

0.10

0.20

0.30

0.40

0.50

0.60

0.70

0.80

0.90

1.00

-5 -4 -3 -2 -1 0 1 2 3 4 5

Probability of a Correct Response

Candidate Ability

One Parameter Logistic Model
(Ability-Difficulty)

Harder

Item Pool Maintenance

- Overall item pool maintenance is ongoing.
- Conduct Master Pool item review several times a year to ensure items remain current and accurate.

NCLEX® Development Process

Additional Review Processes

- In order to ensure fairness of the NCLEX, additional review processes are conducted
  - Differential Item Functioning (DIF) analyses – compare item performance of two groups of candidates, adjusting for candidates’ ability
  - Readability analyses – assess level of reading ability required

Differential Item Functioning (DIF)

- Difficulty of an item should only be reflective of nursing content measured
- It should not be contingent upon factors irrelevant to nursing practice
- Regardless of the other factors, the difficulty of an item relative to the other items should remain the same

The Concept of DIF
If an item shows a significant amount of DIF, it is reviewed by a DIF panel to determine if there is an identifiable problem with the content.

If the panel determines that there is a problem, the item is reviewed by the NCLEX Examination Committee.

Readability

- The relative ease or difficulty with which a reader understands text.
- Readability analysis is performed on all operational item pools.
- When reading ability is not part of the construct of interest, reading demands should be kept at the lowest level possible.

Readability (con’t)

- Fry Readability Index from 1993 to 2003
  - Uses sentence length and the number of syllables per word.
- Lexile® framework from 2003 to present
  - Uses word familiarity (frequency with which the word is used in the English language) as indicator of word difficulty.
  - Ranges from 0L to over 2000L.
  - Higher Lexiles represent more difficult reading levels.

Readability (con’t)

- NCLEX criteria:
  - NCLEX-RN not to exceed 1300 Lexiles.
  - Non-nursing books with readability range similar to the NCLEX:
    - Animal Farm by George Orwell – 1170L.
    - The Swiss Family Robinson by Johann David Wyss – 1260L.

NCLEX Passing Standard

To maintain validity of the NCLEX examination, the passing standard is reviewed and reconsidered every three years along with the revision of the NCLEX Test Plan.

STANDARD SETTING
What is Standard Setting?

Standard setting is a process that determines the minimal amount of knowledge, skill, or ability that is required for licensure.

Importance of Standard Setting

- If standard is set too low, we will certify some candidates who are unqualified
- If standard is set too high, we will deny a certification to some candidates who are qualified or competent
- Set appropriate standard while referencing the criterion

Why set a Common Passing Standard?

- Same meaning of minimal competence in all NCSBN test user areas
- Portability of NCLEX results (policy decision)

Standard Setting

- The NCLEX passing standard is a point on the ability continuum that the candidate must EXCEED in order to pass the examination
- It is the minimum ability required to safely and effectively practice nursing at the entry-level
- NCSBN’s Board of Directors (BOD) determines the final passing standard

The Board of Directors Considers…

- Candidate performance on the NCLEX since 1994
- Results of a criterion-referenced standard-setting exercise by a panel of judges
- Information describing the educational readiness of high school students who expressed an interest in nursing
- Results of annual survey of employers and educators

Panel of Judges (POJ) Composition

- An important aspect of criterion-referenced standard setting is the composition of POJ
- A POJ representative of the nursing profession is crucial in establishing validity of the resulting passing standard recommendation
POJ Recruitment Criteria

- Represent all the NCSBN test user areas
- Hold current valid RN license in the location where they practice
- Currently employed in clinical practice providing direct care and working with entry-level nurses
- Represent areas of specialization where newly licensed nurses are often employed
- Faculty members must be teaching students in a clinical setting
- With the exception of entry-level incumbents, panelists must have at least two years of nursing experience

Sounds Good for the NCLEX, But What About My Classroom?

- Standard setting for the classroom
  - Simplified Angoff Method
  - Gross Modification of the Nedelsky Formula
  - Correlated cut score

The Science of computer Adaptive TESTING

Bonuses Material

What Is An Adaptive Test?

- Difficulty of each item is tailored to the person taking it
- The computer re-estimates the candidate’s ability after every answer
- With each answer, the candidate’s ability estimate gets more precise
- An item selection algorithm selects (from a large item bank) an item the candidate should find challenging

Tailoring the Examination

- Reduces the number of easy items that high-ability candidates receive
  - Easy items tell little information about a high performer’s ability
- Reduces the number of difficult items that low-ability candidates receive
  - Candidates guess on items that are too difficult

Variable Length

- The number of questions candidates receive on their exam depends upon their ability
  - Longer length exam – ability is “close” to the passing standard
  - Shorter length exam – ability is “far” from the passing standard - clearly above or clearly below
Content Balancing

- To ensure each examination conforms to Test Plan specifications, the item selection algorithm:
  - Determines what content area deviates the most from the test specifications
  - Selects an item from that content area at the appropriate difficulty level to administer next

Pass-Fail Decisions

- All CAT examinations need a set of stopping rules
- For the NCLEX, comparison to the passing standard starts with the 60th operational item
- No decisions regarding a candidate’s pass-fail status are made until:
  - At least 60 operational items have been answered
  - The exam has conformed to current NCLEX Test Plan percentages

Exam Stopping Rule #1 – 95% Confidence

- If the computer is 95% confident of passing after 60th operational item – PASS
  - If candidate ability is clearly above the passing standard, the candidate passes and the examination ends
- If the computer is 95% confident of failing after 60th operational item – FAIL
  - If candidate ability is clearly below the passing standard, then the candidate fails and the examination ends
Exam Stopping Rule #2 – Maximum Length

- Candidates with abilities very close to the passing standard will receive maximum length examinations
- Computer disregards the 95% certainty requirement
- Outcome depends on whether the final ability estimate is ABOVE or BELOW the passing standard.
  - ABOVE = Pass
  - AT or BELOW = Fail

Exam Stopping Rule #3 – R.O.O.T.

- Candidates who run-out-of-time (R.O.O.T.) before reaching either one of the previous two criteria
- If the candidate's estimated ability has been consistently ABOVE the passing standard on the last 60 items - PASS
- If their estimated ability falls to or below the passing standard even once - FAIL