THE EFFECTIVENESS OF A COMPUTERIZED ADAPTIVE PROGRAM ON ACADEMIC SUCCESS IN A MEDICAL-SURGICAL NURSING COURSE

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PROGRAM OBJECTIVES:

- Discuss the use of computerized adaptive testing as a mechanism of formative assessment in nursing education.
- Explain the effectiveness of computerized adaptive testing on student success in nursing education.
- Conflict of Interest Statement: Dr. Rose Schwartz is on the Advisory Board for Wolters Kluer Passpoint.
FORMATIVE ASSESSMENT

- Learners should take control of their learning
- Provides feedback
- Promotes self-reflection, self-evaluation and self correction
- Helps student focus on content at hand rather than final grade
- Places facts within a conceptual scaffold to identify patterns, reach reasonable conclusions and adapt their knowledge base.
COMPUTERIZED ADAPTIVE TESTING

Computerized adaptive testing (CAT) is a form of a computer-based test that adapts to the examinee's ability level.
COMPUTERIZED ADAPTIVE TESTING

• Blends computer technology modern measurement models
• Question difficulty is adjusted based upon a students prior answer.
• Difficulty level – 50% chance of answering correctly
• Goal – determine true ability level.
• Precision increases as more questions are answered.
• National Council Licensure Exam (NCLEX) utilizes CAT
PURPOSE

• Determine the effectiveness of utilizing a computerized adaptive testing program as a formative assessment strategy to promote active learning and to improve academic success in a medical surgical nursing course.
Nursing 330 A FA 2014 - Fall 2014

Class Performance

Mastery Level vs. # of Questions Answered

Mastery Level Histogram

Class Average Mastery Level: 6.5

Number of students

Mastery Level
## Strengths & Weaknesses

Click on a topic to view your students' performance question by question.

### Strong Topics:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Class Mastery Level</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chapter 39: Oxygenation</strong></td>
<td>6.97</td>
<td></td>
<td></td>
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<tr>
<td>Based on 69 students</td>
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<tr>
<td><strong>Chapter 38: Bowel Elimination</strong></td>
<td>6.95</td>
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<tr>
<td><strong>Chapter 33: Activity</strong></td>
<td>6.88</td>
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### Weak Topics:

<table>
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<th>Topic</th>
<th>Class Mastery Level</th>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
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</thead>
<tbody>
<tr>
<td><strong>Chapter 28: Complementary and Alternative Therapies</strong></td>
<td>1</td>
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<td></td>
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<tr>
<td>Based on 4 students</td>
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<tr>
<td><strong>Chapter 3: Health and Illness</strong></td>
<td>1.25</td>
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<td></td>
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</tr>
<tr>
<td>Based on 4 students</td>
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<tr>
<td><strong>Chapter 17: Documenting, Reporting, Conferring, and Using Informatics</strong></td>
<td>1.3</td>
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<tr>
<td>Based on 10 students</td>
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</table>
METHOD

• Students enrolled in Medical-Surgical Nursing I were recruited.
• All students in the class were required to complete a minimum of 50 CAT questions per chapter.
• Mastery level was calculated by the computerized adaptive program.
• All students in the class were eligible for additional points to their exam grades based upon mastery level.
• Students were not penalized if they chose not to participate in the study.
DATA COLLECTION

• Demographic Questionnaire
• Exam Grades
• HESI conversion scores
• Number of questions completed per exam and overall
• Average mastery level per exam and total
SAMPLE

- 123 Junior BSN nursing students in Medical Surgical Nursing I
  - Age:
    - 21.40 mean (18-37, SD 2.974)
  - Gender:
    - 8.1% male, 91.9% female
  - Race:
    - 72.4% white, 27.6% (black/African American, Asian and Pacific Islander)
SAMPLE

• GPA:
  • 3.476 mean (3.0-3.92, SD 0.25)

• Working:
  • 56% worked on average 12 hours/week (3-35, SD 7.4)
# TESTING DATA

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Range</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam I</td>
<td>85.55</td>
<td>70.0</td>
<td>97.5</td>
<td>27.5</td>
<td>5.94</td>
</tr>
<tr>
<td>Exam II</td>
<td>86.20</td>
<td>63.2</td>
<td>100</td>
<td>36.8</td>
<td>7.25</td>
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<tr>
<td>Exam III</td>
<td>81.14</td>
<td>60.0</td>
<td>93.3</td>
<td>33.3</td>
<td>6.97</td>
</tr>
<tr>
<td>HESI</td>
<td>84.74</td>
<td>60.6</td>
<td>100</td>
<td>44.4</td>
<td>9.37</td>
</tr>
</tbody>
</table>
TESTING DATA

- Final Grade
  - Mean – 87.58
  - Range – 30.5
    (66.8- 97.3)

- Number of CAT questions
  - Mean – 1969
  - Range – 4360
    (71- 4431)

- Mastery Level
  - Mean – 6.29
  - Range – 7 (1.0-8)
RESULTS

• There was a strong positive relationship between number of questions completed and mastery level.

<table>
<thead>
<tr>
<th></th>
<th>Exam 1 mastery level</th>
<th>Exam 2 mastery level</th>
<th>Exam 3 mastery level</th>
<th>Final mastery level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam 1 # questions</td>
<td>$p = &lt; .001$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$r = .85$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exam 2 # questions</td>
<td>$p = &lt; .001$</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$r = .89$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exam 3 # questions</td>
<td></td>
<td>$p = &lt; .001$</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$r = .89$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total # questions</td>
<td></td>
<td></td>
<td>$p = &lt; .001$</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$r = .84$</td>
<td></td>
</tr>
</tbody>
</table>
RESULTS

• There was a weak positive correlation between Exam 2 grades and mastery level ($p=0.009$, $r=0.22$)

• There was no correlation between Exam 1 & 3 grades and number of questions or mastery level
RESULTS

• There was no correlation between HESI score and total number of questions or total mastery level.

• There was a weak positive correlation between total weighted grade and average total mastery level (p=.005, r=.23)
ADDITIONAL ANALYSIS

• There was a weak negative relationship between working status and final course grade ($p=.25, r=-.20$)
## ADDITIONAL FINDINGS

<table>
<thead>
<tr>
<th></th>
<th>Exam 1 # questions</th>
<th>Exam 2 # questions</th>
<th>Exam 3 # questions</th>
<th>HESI total number of questions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean</strong></td>
<td>910.34</td>
<td>455.33</td>
<td>455.72</td>
<td>1969.86</td>
</tr>
<tr>
<td><strong>Std. Deviation</strong></td>
<td>464.6</td>
<td>271.2</td>
<td>334.6</td>
<td>1065.3</td>
</tr>
<tr>
<td><strong>Minimum</strong></td>
<td>22</td>
<td>10</td>
<td>10</td>
<td>71</td>
</tr>
<tr>
<td><strong>Maximum</strong></td>
<td>1923</td>
<td>1075</td>
<td>1486</td>
<td>4431</td>
</tr>
</tbody>
</table>
QUALITATIVE COMMENTS

• Reported that CAT was helpful in preparing for exams.

• Reported that they had limited amount of time to reach the mastery level.
DISCUSSION

• Weak correlation between Exam 2 grade and final grade and mastery level.
• The number of questions completed by the students decreased over the course of the semester.
QUESTIONS