IMPROVING OBJECTIVE TEST WRITING

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The Blessings of Writing Teacher-Made Tests

The Good…
“I wrote that! I’m sooooo good!”

The Bad…
“I wrote that???”

The Ugly…
I wrote THAT????

… and all on one exam!
Our Path Today

1. Determine which learning objectives are appropriate for assessment using objective test items.
2. Review guidelines for constructing high quality objective test questions.
3. Increase the cognitive level of objective test questions.
4. Improve the quality of objective test items by correcting the flaws.
Why Do We Test?

- Communication
- Motivation
- Identification
- Determination of
  - Grade
  - Student understanding
The Bottom Line

- We want to be able to make inferences concerning the knowledge and/or skills of those we test!
What should we test on??

**Front-End Assumptions**

1. Learner cannot learn everything you teach.
2. Teacher cannot test on everything taught.
3. Not all knowledge is of equal importance.
The “Objective” Test

- What does “Objective Test” really mean?
  - Universal Grader!!
Objective Test Options

- True and False
- Matching
- Multiple Choice
  - One correct answer
- Multiple Select
  - Multiple correct answers
- Context-Dependent Item Sets (Scenario-based)
  - Can be used for most options
Determining Levels of Test Items

- Quick Review of Lower & Higher Order Learning
- Bloom’s Revised Taxonomy and Objective Test Item Writing
Lower Order Learning

- **What is it?**
  - Take previously learned concepts and use to
    - Remember
    - Understand
    - Apply
<table>
<thead>
<tr>
<th>Level</th>
<th>Skills Demonstrated</th>
<th>Common Verbs</th>
<th>Appropriate For Objective Tests?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remembering (Knowledge)</td>
<td>Able to retrieve, recall or recognize knowledge from memory</td>
<td>Define, duplicate</td>
<td>✔</td>
</tr>
<tr>
<td></td>
<td></td>
<td>List, memorize</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recall, repeat</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reproduce, state</td>
<td></td>
</tr>
</tbody>
</table>

WYSIWYG questions ("What You See is What You Get!")
## Bloom’s Taxonomy - Basic (Lower Order) Learning

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<tr>
<td><strong>Understanding</strong></td>
<td>Able to explain, organize and arrange concepts. Able to recognize concept when it has been restated in different terms from original learning.</td>
<td>Classify, describe, discuss</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Explain, identify, locate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recognize, report, select</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Translate, paraphrase</td>
<td></td>
</tr>
</tbody>
</table>
### Bloom’s Taxonomy - Basic (Lower Order, Transitional) Learning

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<tbody>
<tr>
<td>Applying</td>
<td>Able to carry out or use a procedure through executing or implementing. Able to use (apply) something learned in one context to a novel situation.</td>
<td>Choose, demonstrate Dramatize, employ Illustrate, interpret Operate, schedule Sketch, solve Use, write</td>
<td>✓</td>
</tr>
</tbody>
</table>

Requires remembering and understanding!
Higher Order Learning

- **What is it?**
  - Take previously learned concepts and use knowledge to
    - Analyze
    - Evaluate
    - Create
### Bloom’s Taxonomy (Revised): Higher Order Learning

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>Analyzing (Relationships)</td>
<td>Able to break material or concepts into parts, determine how parts relate or interrelate to one another or to an overall structure or purpose</td>
<td>Appraise, compare, Contrast, criticize, Differentiate, Discriminate, Distinguish, examine, Experiment, Question, test</td>
<td>✓</td>
</tr>
</tbody>
</table>

*Requires lower order knowledge base!*
## Bloom’s Taxonomy: Higher Order Learning

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</tr>
</thead>
<tbody>
<tr>
<td>Evaluating (Opinion)</td>
<td>Able to make judgments based on criteria &amp; standards through checking &amp; critiquing</td>
<td>Appraise, argue Defend, judge Select, support Value, evaluate</td>
<td>✗</td>
</tr>
<tr>
<td>Creating (Synthesis)</td>
<td>Able to perform original &amp; creative thinking; create something new; reorganize elements into new pattern Creative solutions to novel problems</td>
<td>Assemble, construct Create, design Develop, formulate Write</td>
<td>✗</td>
</tr>
</tbody>
</table>

Requires lower order knowledge base!
First Things First!

Tweaking and Prioritizing Objectives

- Choose action verbs with care!
- Not all knowledge is of equal importance!
Tweaking Objectives

- **Revisit topic objectives**
  - Do verbs accurately reflect expected learner outcomes?
  - Are the levels appropriate for
    - The topic?
    - The learner?
  - Review Bloom’s Taxonomy!

At what level should the student demonstrate competence??
Preparing an Exam??

Prioritize your material!
- **Priority 1 = Must Know**
- **Priority 2 = Should Know**
- **Priority 3 = Nice to Know**
- **Priority 4 = Who Cares?**
Priority 1: Must Know

- **Examples**
  - **Patient Safety**
    - Examples
      - Correct procedure for inserting IV catheter
      - Checking placement of feeding tube tip before initiating feedings
      - Correct maximum rate of infusion for intravenous Dilantin
Priority 1: Must Know

- **Examples**
  - **Hierarchy/Step Progression**
    - Crucial underlying concepts
      - Asepsis
    - Ordered Information
      - Procedures -- consider which steps CANNOT be missed and/or placed out of order!
        - Urinary catheterization
        - ABCs of CPR
Priority # 2: Should Know

- **Important but not a safety or hierarchy/step progression issue**
  - Based on concepts being taught
  - What are your “should knows?”
Priority #3: Nice to Know

- **Not necessary to know for safe practice**
  - Fun details
  - Gee whiz facts

- **Look out for these!!**

Now where did that rare bird go?????
Priority #3: Nice to Know

- We all have our sacred cows -
  - Those topics that we just LUV to teach... and teach...
    and teach ...and teach
Priority #4: Who Cares?

- “Picky” little factoids
  - Uncommon procedures
  - Miscellaneous lab values
  - Unnecessary details

Surgically remove “who cares” information.
## Test Construction Worksheet

<table>
<thead>
<tr>
<th>Obj. #</th>
<th>Objective</th>
<th>*Bloom Objective Level</th>
<th>Priority</th>
<th># of Items for Obj.</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>List four examples of conditions that place a patient at risk for developing respiratory failure.</td>
<td>R</td>
<td>X</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Bloom Levels: R=Remember; U=Understand; Ap=Apply; An=Analyze; E=Evaluate; C=Create
Weighting by Priority

- Give any desired values to priorities

- Example
  - Priority 1: 75%
  - Priority 2: 20%
  - Priority 3: 5%
  - Priority 4: None

- 50 item test using previous weighting
  - Priority #1: 38 Items (75%)
  - Priority #2: 10 Items (20%)
  - Priority #3: 02 Items (5%)
  - Priority #4: None
Weighting by Time-On-Task

- **Primary Assumption**
  - Time spent = level of importance

- **Example**
  - Assume: 50 Item test covering 5 hours of material
  - \[\frac{50}{5} = 10\] items per hour of material
  - If spent 2 hours on Topic 1 and 1 hour on each of other topics -
    - Topic 1 (2 Hours) = 20 Items
    - Topics 2, 3, & 4 (1 Hour each) = 10 Items/topic
CLIMBING THE TESTING LADDER

Cognitive Levels as a Tool for Leveling Test Items
Choosing the Best Type of Test Item
Remembering (Knowledge) Level
Objectives

- **Choose**
  - True and False (if used at all)
  - Multiple Choice
    - particularly one best answer
    - matching
  - Short Answer

- Involves memorization and simple recognition among answer choices
Knowledge

The serum toxic level of Aminophyllin is defined as a level any level higher than

A. 10 mcg/ml
B. 15 mcg/ml
C. 20 mcg/ml *
D. 25 mcg/ml
Understanding (Comprehension) Level

Objectives

☐ Choose

☐ Multiple Choice
  ■ particularly one best answer
  ■ matching

☐ Short Answer

☐ Choose when you want

☐ Simple interpretation of data (e.g., lab values, vital signs, symptoms) to answer the item

☐ Does not require relating concepts to other data
A patient has an arterial blood gas drawn. The results are:
- pH = 7.30, PCO$_2$ = 55, PO$_2$ = 75, HCO$_3$ = 32, SaO$_2$ = 80%

The nurse identifies the patient’s pH as being

A. Within normal range
B. Acidotic *
C. Alkalotic
Choose

- Multiple Choice Items
  - One Best Answer
- Context-Dependent Items

Choose why you want student to use knowledge of

- procedures, rules
- principles or theories

to apply to novel reality based situation
A patient has received intravenous t-PA for acute myocardial infarction treatment. She complains of a headache during the infusion. Based on this information, which nursing action should the nurse take?

A. Discontinue the streptokinase infusion
B. Assess patient’s neurological status *
C. Administer ordered acetaminophen
D. Determine the patient’s cardiac rhythm
Analysis Level Objectives

- Choose
  - Context-Dependent Items
  - Multiple Choice or Select Items
  - Essay
  - Case Analysis
  - Simulation

- Choose when you want student to
  - Distinguish between critical and non-critical information
  - Breakdown behaviors or communication
  - Interpret relationships between things
  - Examine information components to answer the question
### Applying to Test Item: Analysis

1. A high acuity patient has the following trends available:

<table>
<thead>
<tr>
<th>Time</th>
<th>VS</th>
<th>O2</th>
<th>ABG</th>
</tr>
</thead>
<tbody>
<tr>
<td>0900</td>
<td>BP, 120/82; HR, 92/min; RR, 20/min</td>
<td>28%</td>
<td>pH 7.38, PaCO(_2) 43, HCO(_3) 24, PaO(_2) 92, SaO(_2) 98%</td>
</tr>
<tr>
<td>1100</td>
<td>BP, 142/88; HR, 102/min.; RR, 26/min</td>
<td>40%</td>
<td>pH 7.44, PaCO(_2) 37, HCO(_3) 24, PaO(_2) 86, SaO(_2) 92%</td>
</tr>
<tr>
<td>1200</td>
<td>BP, 156/90; HR, 112/min; RR, 30/min</td>
<td>50%</td>
<td>pH 7.47, PaCO(_2) 33, HCO(_3) 24, PaO(_2) 76, SaO(_2) 86%</td>
</tr>
</tbody>
</table>

Based only on the above trends, which statement can be made?

A. The patient’s compensatory mechanisms are maintaining a steady state of respiratory insufficiency
B. The patient’s compensatory mechanisms are not adequately maintaining his oxygenation status
C. The trends are consistent with acute ventilatory failure
D. The trends are consistent with improving right-to-left pulmonary shunt
Evaluation & Creativity (Synthesis)

- Not commonly tested on
  - Essay type test questions are best
- Learner is “asked to make judgments about the value of material and methods for given purposes, or the extent to which materials and methods satisfy criteria.” NCSBN, 1995, p. 19
Final Thoughts on the Taxonomy

- It can be a useful tool
- Educators tend to test at the bottom two levels (knowledge and comprehension)
- Research shows that learners remember more when they learn at the higher levels
MEASURING MORE THAN RECALL
SAMPLE QUESTIONS

Adapted from
National Council of State Boards of Nursing
Leveling the Test: Hints for Success

- Leveling should be based on level of objectives - consider that when developing objectives.
  - Don’t write “List 5 types of ____.” for an objective and ask an application item based on it.

- Start off test with a few knowledge and comprehension items

- Mix the leveling of questions
Leveling the Test: Hints for Success

- Include some but not too many knowledge level questions
- Include a moderate amount of comprehension level items
- Include many application items
- Include a few -to-moderate number of analysis items
Ways to “Up the Ante”
(Measure More Than Recall)

- In place of asking for the action of a medication, ask how the medication affects a particular patient (age, pre-existing health condition, etc.)
  - Requires extra steps in reasoning
  - Learner must know the medication plus potential age-related problems and possible complications associated with pre-existing health conditions
Ways to “Up the Ante”
(Measure More Than Recall)

- Pose problems in which the learner must prioritize among goals, nursing diagnoses, or interventions in order to answer the item
  - Learner will need to analyze the given situation to determine which of the correct answers is the priority one
  - Something is usually a priority because of other factors that come into play, requiring the learner to have additional knowledge and apply it.
Ways to “Up the Ante”
(Measure More Than Recall)

- Rather than asking for a particular intervention when a client experiences a particular disease process (such as an MI),
  - describe a client who is having an MI and ask the learner for appropriate action to take, given the clinical description.
Leveling an Item: Digoxin

Knowledge Level

Digoxin (Lanoxin) is which type of drug?

- A. Loop diuretic
- B. Cardiac glycoside *
- C. Bronchodilator
- D. Antiarrhythmic
• **Comprehension Level**

– The nurse is evaluating a client who is taking cardiac glycosides. Which statement by the client would indicate that the client may be experiencing toxicity?

A. “I hear a ringing in my ears.”
B. “I am only urinating a few drops at a time.”
C. “Things look yellow and a little blurred to me.” *
D. “I have not had a bowel movement in three days.”
A 60 year old client is admitted to the medical unit with atrial fibrillation. When preparing to administer the prescribed digoxin 0.125 mg, p.o., the nurse auscultates an irregular heart rhythm with a rate of 92. Which of the following actions would be most appropriate for the nurse to take?

A. Withhold the digoxin and notify the physician that the client has an irregular heart rhythm

B. Withhold the digoxin and recheck the heart rate and rhythm in one hour

C. Administer the digoxin and notify the physician that the client has an irregular heart rhythm

D. Administer the digoxin and document the heart rate and rhythm. *
• **Analysis Level**

The nurse is caring for a 60-year-old client on a telemetry unit. The client’s EKG rhythm strip is illustrated below. The client has prescriptions for the following medications: digoxin (Lanoxin) 0.125 mg p.o. daily; furosemide (Lasix) 20 mg p.o. BID; and Maalox 30 cc PRN. It is 8 am. Which of the following actions would be most appropriate for the nurse to take?

[Insert EKG strip of atrial fibrillation]

A. Administer the digoxin and document the heart rate and rhythm.

B. Withhold the digoxin and recheck the heart rate and rhythm in one hour.

C. Administer the digoxin and notify the physician that the client has an irregular heart rhythm.

D. Withhold the digoxin and notify the physician that the client has an irregular heart rhythm.
In Summary

- Prioritize importance of concepts!
- Consciously design tests to fit priorities!
- Coordinate topic objectives with item writing!
- Provide a mix of item levels!
End of Part I

Contact me for additional information!
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