Today's Overview

1 • Assessment and Blueprint- Dr. Josie Weiss

2 • Test construction- Dr. Linda Gibson-Young

3 • Test Analysis- Dr. Christopher Blackwell
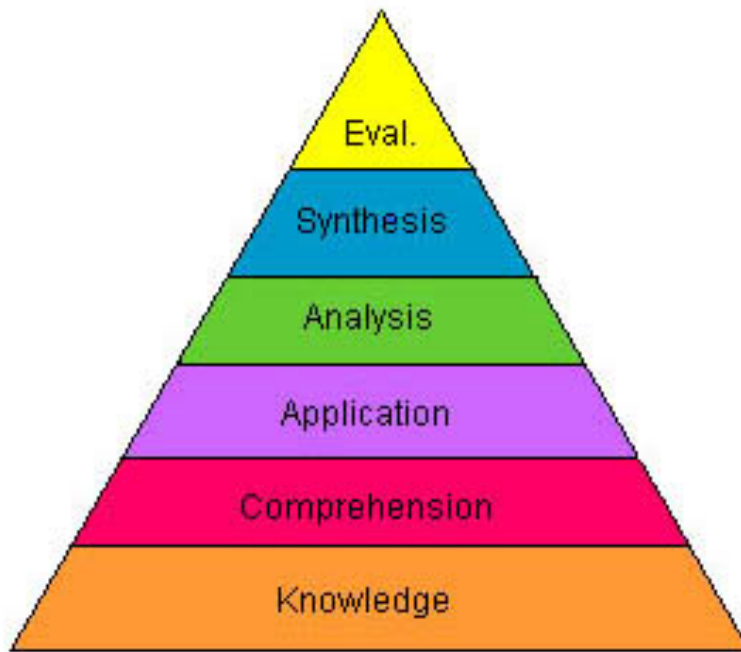
Assessment and Blueprint

Josie Weiss, PhD, FNP-BC, PNP-BC, FAANP

College of Nursing

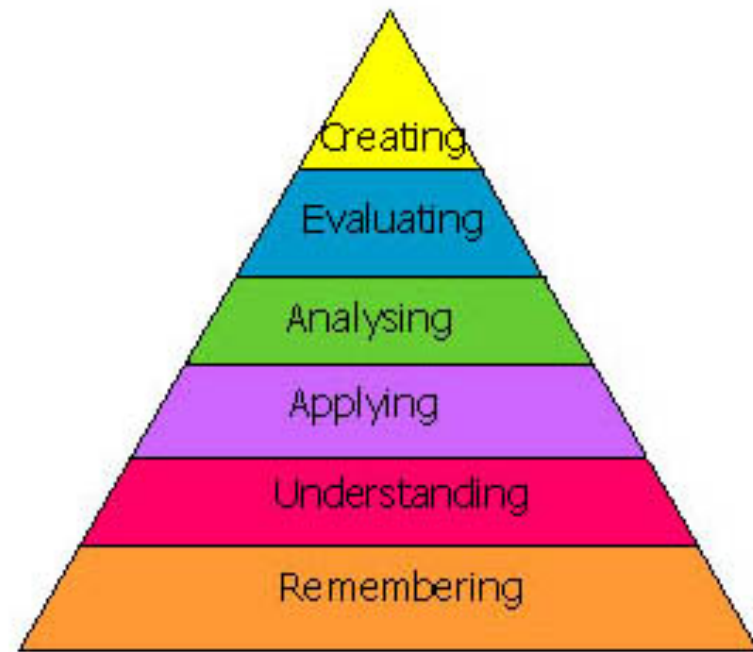**University of Central Florida**

Using Blooms Taxonomy

- Guide for addressing appropriate cognitive level in test construction

- Basis for test development based on course objectives

- A measure to determine effectiveness in meeting course objectives
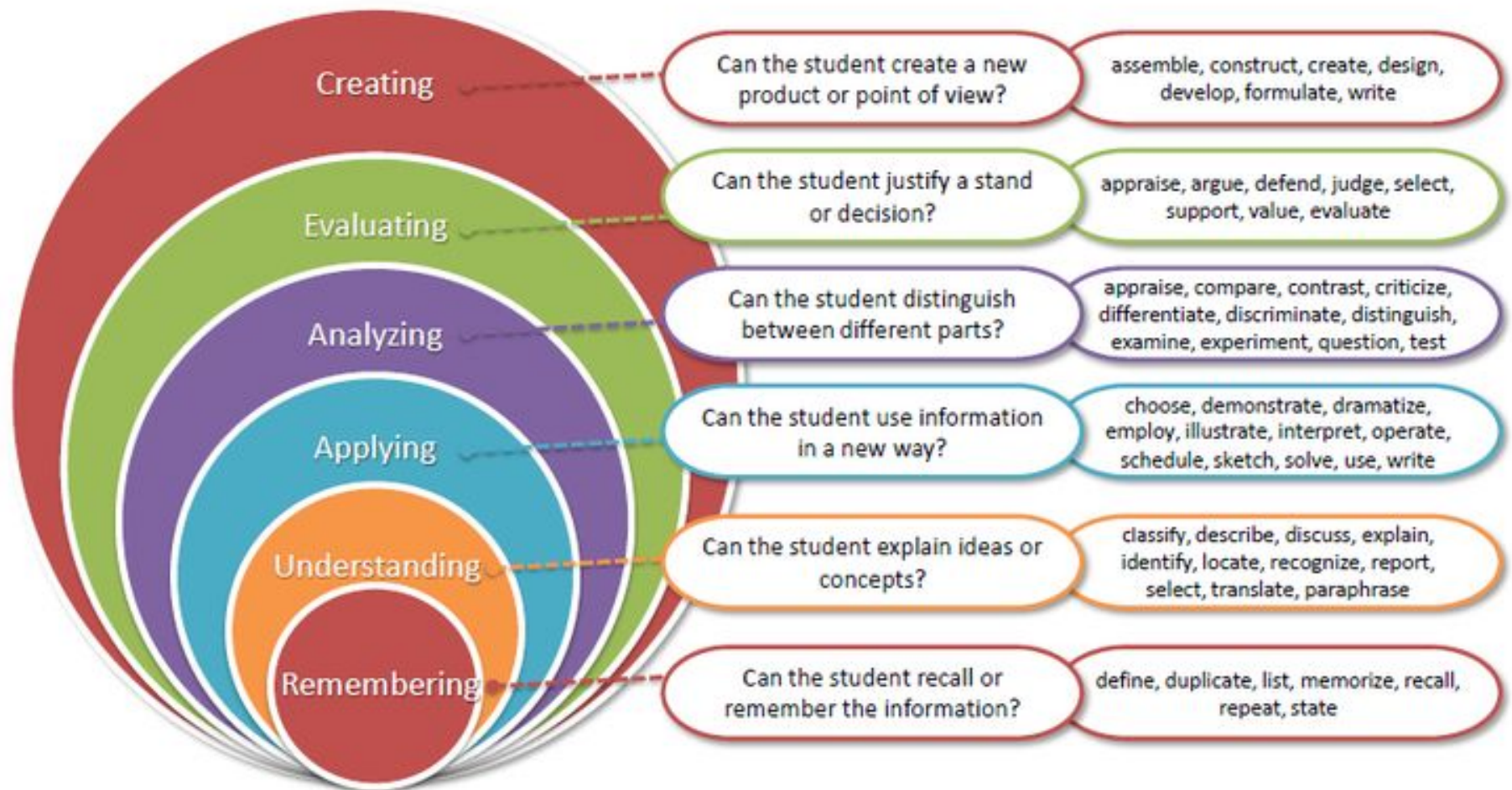
A Blooming Review

A Blooming Review

Bloom's Taxonomy (Revised)

Level	Question	Verbs
Creating	Can the student create a new product or point of view?	assemble, construct, create, design, develop, formulate, write
Evaluating	Can the student justify a stand or decision?	appraise, argue, defend, judge, select, support, value, evaluate
Analyzing	Can the student distinguish between different parts?	appraise, compare, contrast, criticize, differentiate, discriminate, distinguish, examine, experiment, question, test
Applying	Can the student use information in a new way?	choose, demonstrate, dramatize, employ, illustrate, interpret, operate, schedule, sketch, solve, use, write
Understanding	Can the student explain ideas or concepts?	classify, describe, discuss, explain, identify, locate, recognize, report, select, translate, paraphrase
Remembering	Can the student recall or remember the information?	define, duplicate, list, memorize, recall, repeat, state

Tying Objectives

- Course objectives
- Class or unit objectives
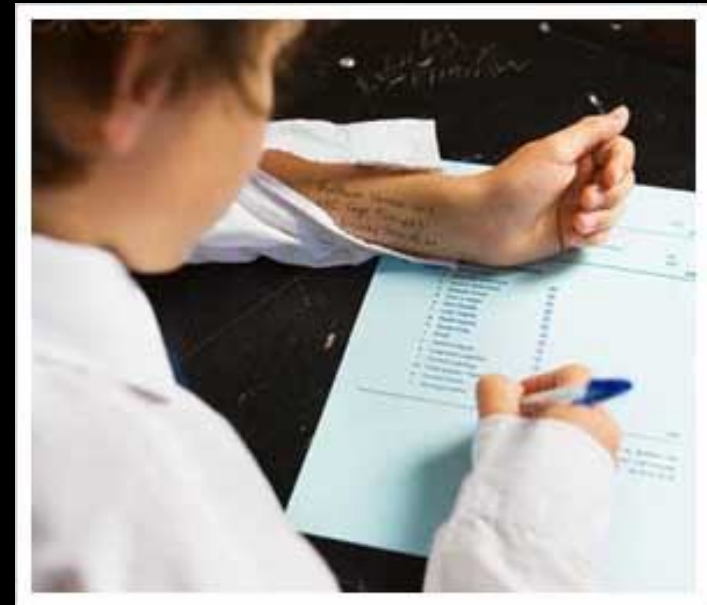 - Exams reflect objectives
  - Guide blueprint

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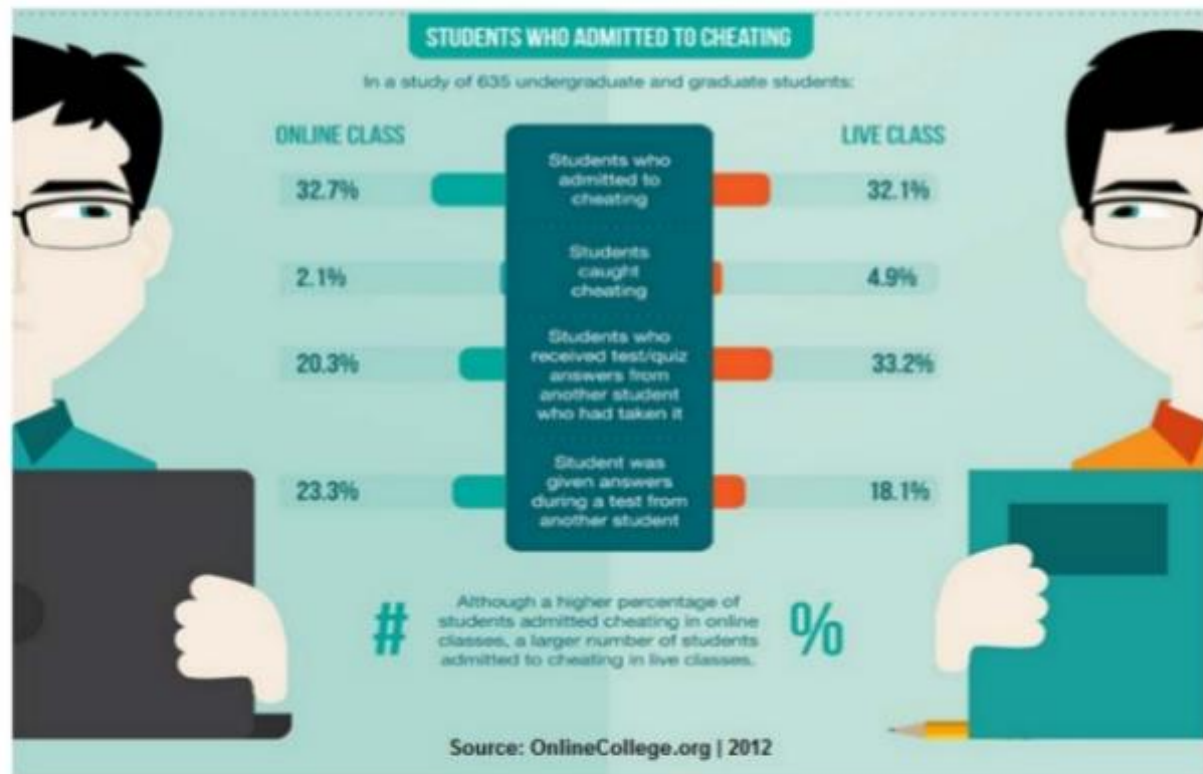
Ensuring Integrity

Ensuring Integrity

- Be aware: Cheating is rampant!
- Strategies to discourage cheating
  - Proctored exams
  - Scrambled questions & answers
  - Test banks
  - Honor codes
- Plan for addressing

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Testing Policies

- Clearly stated in course syllabus
  - Dates
  - Method of testing
  - Value of test within course
- Discussed with students prior to exams
- Provide blueprint
- Study guides

Achievement Tests and Assessments

- Test questions should measure learning outcomes and students' learning characteristics

- Results should be valid and reliable
  - Tests what it's meant to test and with results that are statistically reproducible
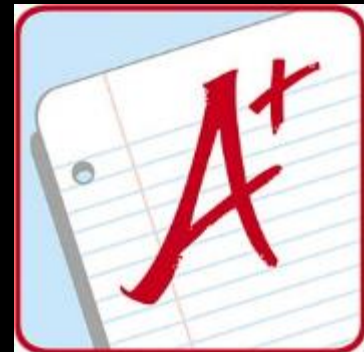
Achievement Tests and Assessments (cont.)

- Provides input for faculty about where content emphasis is needed or where misinterpretations possibly occurred

- Promotes student learning and retention
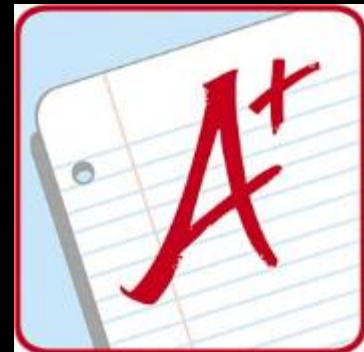
Planning the Test

- Step One: Determine best type of exam to administer for given objective
- Step Two: Define intended learning outcomes (Bloom's Taxonomy)

Planning the Test

- Step Three: Decide type(s) of test questions to use
  - Multiple Choice
  - True/False
  - Matching
  - Fill in the Blank
  - Essay
- Certification examinations are primarily multiple choice

Planning the Test

- Step Four: Develop the Test Blueprint:
    - Match blueprint with purpose of test
    - Relate learning outcomes to content
    - Indicate weight needed for each item:
        - Time spent on each area of instruction?
        - Outcomes most essential for retention and transfer of knowledge?

Planning the Test

- Testing Blueprint Example:
  - Cardiovascular (50 Question Exam)

Content Area	Assessment	Diagnosis	Management	Outcome Evaluation
HTN	5	1	5	1
Dysrhythmias	2	2	2	1
Ischemic Dz	3	3	6	2
HF	5	5	1	1
Hyperlipidemia	0	0	2	1
Coagulation Dz	1	1	1	0

Providing Instructions

- Prior to exam
- Clear and concise
- Written format (syllabus)
- Resources allowed during exam
- Time allowed

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Promote Success

- Help students appreciate value
- Team rather than us vs. them approach
- Be generous
    - Answer review
    - Bonus points?

Test Construction Steps

- Define test purpose.
- Describe population to be tested.
- Determine test length.
- Specify difficulty and discrimination levels.
- Determine scoring procedure.
- Select item formats.
- Construct test blueprint.
- Write test items.

- Have test items critiqued.
- Arrange items on the test
- Write item-specific directions.
- Write general directions.
- Proofread.
- Reproduce the test.
- Prepare a scoring key.
- Prepare students.

Classification of Item Formats

Selected response

- True-False
- Matching
- Multiple-choice
  Multiple-response

Constructed response

- Short-answer (fill-in-the-blank)
- Essay

Writing the Test Items

- Each test item should relate to the test blueprint:
  - Content area or objective
  - Level of complexity of task (taxonomy)
- Select appropriate assessment tasks for the ability to be tested

Multiple Choice

- Stem:
  - A 45 year-old female patient complains of shortness of breath. Which item in the patient's history would indicate a risk for chronic obstructive pulmonary disease (COPD)?

- Distractors/Key:
  - a. mother with COPD
  - **b. 25-year pack history (KEY)**
  - c. exercise-induced asthmatic episodes
  - d. fever and productive cough for one week

Rules: Stem Writing

- Use either the best answer or the correct answer format

  - Best answer format refers to a list of options that can all be correct in the sense that each has an advantage, but one of them is the *best*

  - Correct answer format refers to one and only one right answer

- Use the active voice

- Have your questions peer-reviewed

- Avoid giving unintended cues – such as making the correct answer longer in length than the distractors.

Rules: Stem Writing

- Ensure that the directions in the stem are clear, and that wording lets the examinee know exactly what is being asked

- Avoid window dressing (excessive verbiage) in the stem

- Word the stem positively; avoid negative phrasing "not" or "except"

- Avoid giving clues such as linking the stem to the answer

Writing a Good Stem

- BAD stem:

  Which drug would be best for pneumonia?

- WHY is this a bad stem?
  – Could reflect direct recall rather than critical thinking
  – There are multiple types of pneumonias with various evidence-based treatment approaches
  – There are no data in the question to assist the student in drawing any clinical correlations

Writing a Good Stem

- Let's fix it!

A 79 year-old female presents to the emergency department from a skilled nursing facility with fever of 102°F and shortness of breath for 36 hours. Her SPO$_2$ is 86%; and the patient's chest x-ray reveals diffuse bilateral infiltrates. Which action would be best?

Rules: Options and Distractors

- Place options in logical or numerical order
- Use letters in front of options rather than numbers
- Keep options independent; options should not be overlapping
- Keep the length of options fairly consistent.
- Avoid, or use sparingly, the phrase all of the above
  - NOT used on ANCC exams
- • Avoid, or use sparingly, the phrase none of the above
  - NOT used on ANCC exams

Rules: Options and Distractors

- Position the correct option so that it appears about the same number of times in each possible position for a set of items

- Make sure that there is one and only one correct option

- Use plausible distractors.

- Incorporate common errors of students in distractors

- Use familiar yet incorrect phrases as distractors

- Use true statements that do not correctly answer the item

- Distractors that are not chosen by any examinees should be replaced

General Rules for Writing Test Items

- Every item should measure something important.

- Every item MUST have a correct answer.

- Use clear, simple, concise, precise, grammatically correct language.

- Avoid of the following.

- Avoid jargon, slang, or unnecessary abbreviations.

- Avoid negative terms.

Example…

Clinical manifestations of Parkinson's disease include muscle rigidity and which of the following signs and symptoms?

a. Decreased salivation and nystagmus
b. Increased salivation and diplopia
c. Tremors at rest and decreased perspiration
d. Tremors during activity and increased perspiration

Testing at Different Cognitive Levels

- Knowledge
  - Recall of facts
  - Memorization
  - Test items require no understanding

Knowledge Level Example

What is the normal fasting blood glucose range?

a.   60-100 mg/dl
b. 101-140 mg/dl
c. 141-180 mg/dl
d. 181-220 mg/dl

Knowledge Level Example

Coronary artery perfusion occurs primarily during:

   a. diastole.

   b. expiration.

   c. inspiration.

   d. systole.

Comprehension

- – Understanding information
- – Ability to explain a concept

Comprehension-Level Example

When a patient with right hemianopsia is eating a meal, at which position might there be food left?

a. 12 o'clock
b.   3 o'clock
c.   6 o'clock
d.   9 o'clock

Application

– Use information in:

- New context

- Unfamiliar situation

- Familiar situation with new emphasis or direction

Application-Level Example

The nurse practitioner completes a developmental assessment of a 4-year-old. Which behavior suggests the need for further testing?

a. Cannot follow 5 commands in a row
b. Has difficulty holding a crayon between thumb and finger
c. Is unable to balance on each foot for 6 seconds
d. Keeps making mistakes when asked about the day of the week

Application-Level Example

A 40-year-old patient with rheumatoid arthritis develops a new onset of nocturnal pain and swelling of the fingers. Examination reveals asymmetrical swelling of the small joints of the fingers of the right hand. The patient was recently prescribed hydrochlorothiazide (Microzide) 25 mg daily for hypertension. The patient's new symptoms are caused by:

a.   carpal tunnel syndrome.

b.   gout.

c.   osteoarthritis.

d.   Reiter syndrome.

Analysis

- – Break down information into component elements
- – Clarify meaning of data
- – Identify relationships among concepts

Analysis-Level Example

A mother telephones a psychiatric-mental health nurse practitioner to report that her 11-year-old child is unusually active, irritable, and unable to sleep for more than a few hours each night. The child was recently diagnosed with a major depressive disorder and has been taking fluoxetine (Prozac) for six weeks. The nurse practitioner is most concerned that the:

a.   child is awake and unsupervised at night.

b.   child's energy level has increased.

c.   medication dosage needs to be increased.

d.   medication has caused mania.

Analysis-Level Example

A 45-year-old patient who is an opera singer reports progressive hoarseness for the last four weeks. The hoarseness began after a three-hour opera performance. The patient does not smoke and reports no weight loss, upper respiratory infection, dysphagia, or shortness of breath. The family nurse practitioner manages this patient by:

a. ordering a computed tomography scan of the head.

b. ordering an immediate lateral neck x-ray.

c. prescribing systemic antibiotics and cool mist inhalations.

d. requesting a referral for evaluation of the larynx.

Preparing Students for the Test

- Instructor-made test typically measures students' maximum performance rather than typical performance.
  - Create conditions under which students will be able to perform at their best.
    - Requires adequate preparation of students to take the test
    - Begin preparing students when the test is scheduled

Rationale and use of feedback

- Useful as teaching strategy
- Appreciated by student learners
- Time consuming, but needed
- Link to resources

- Administer ….

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Test Item Analysis

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Board-Certification Examination Item Components

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Purposes of Evaluation

- Identification of learning
  - Allows students to demonstrate mastery of essential themes, content, and objectives
- Determination of grades
- Diagnosis of problems:
  - Learning Needs
  - Learning Deficits
- Prepares for Cert Exam

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GOOD Question

A 79 year-old female presents to the emergency department from a skilled nursing facility with fever of 102°F and shortness of breath for 36 hours. Her SPO_2 is 86%; and the patient's chest x-ray reveals diffuse bilateral infiltrates. Which action would be best?

a. admit the patient to a medical/surgical unit and begin levofloxacin (Levaquin®)

b. repeat the chest x-ray in the emergency department to confirm the suspected diagnosis

c. discharge the patient and prescribe azithromycin (Zithromax®) 250 mg per day for 10 days

d. obtain sputum gram stain and culture and sensitivity and begin antibiotic therapy when the results are obtained

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BAD Question

A 5 year-old patient presents with otitis media. Which action is best?

a. prescribe amoxicillin (Trimox®)

b. educate parents about the use of acetaminophen (Tylenol®) for fever

c. educate parents about the use of aspirin (Bayer®) for fever

d. educate the parents about the importance of adequate hydration

Validity and Reliability of Tests

- Validity:
  - Does the exam measure what it is intended to measure?
  - Was the test properly constructed, administered, and scored?
  - What was the correlation coefficient (r)?
    - Positive Relationship: High or low scores on one measure are accompanied by high or low scores on another
    - Negative Relationship: High scores on one measure are accompanied by low scores on another measure

- Reliability:
  - Degree of consistency of test scores
- Measured by Kuder-Richardson Formulas (KR-21)
- KR-21 should be between .5 and .8

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Validity and Reliability of Tests

- Factors That Lower Reliability of Test Scores:
  - Too few items
  - Too many too hard or too easy items
  - Inadequate test conditions
  - Poorly written items without discrimination
  - Scoring is subjective

Item Analysis

- Item Difficulty (P Value):
  - Percentage of group who answered item correctly
  - P = .05 (50%) = Good Discrimination Index
  - Upper limit = 1 (100% answered correctly)
  - Lower limits depends on # of possible responses and probability of guessing correctly
  - If 4 options (A, B, C, D) then P = .25 (possibility of guessing right answer)
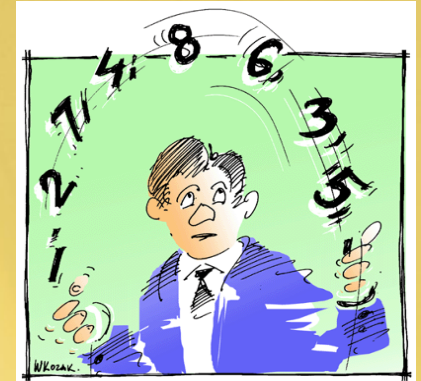
Item Analysis

- Item Discrimination: Who Knew it and Who Didn't!
  - Measured through point biserial correlation
  - Good discrimination item = Point biserial are highly positive for correct answer and negative for distractors
  - Indices > .3 are good; > .4 = VERY good

Item Analysis

- Distractor Evaluation:
  - Evaluate each individually
  - Should appeal to the non-learner
  - Point biserial = 0 = Students didn't select; needs revision/replacement
  - Negative discriminating power occurs when more students in lower group than upper group choose correct answer: Needs revision/replacement!

Item Analysis

- Compute Item Analysis:
  - Mean Score: Average score of test-takers
  - Median: The point at which 50% are higher and 50% are lower
  - Standard Deviation: Measures variability of test scores around the mean
  - Ideal = Item answered correctly by 1/3; answered incorrectly by lower 1/3

Item Revision

- P values are too high or too low

- Correct answers have low positive or negative point biserials

- Distractors have highly positive point biserials

- Items that correlate < .15 with total test scores should be restructured; probably confusing or nonsensical to test takers

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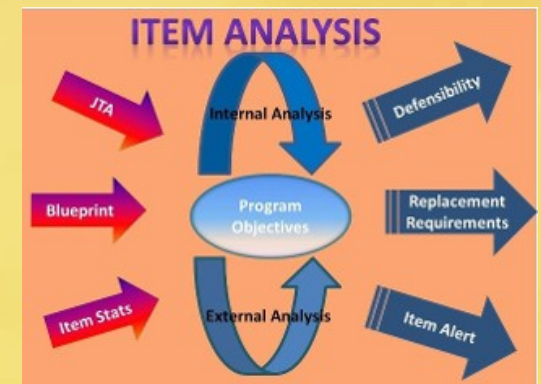
Examples

1. Which of the following would be suggestive of heart failure?

   a. S3 and S4 audible at apex

   b. S2 sound louder at base

   c. S1 sound louder at apex

   d. S1 and S2 equal at Erb's point

Point-Biserial = -.27   Correct Answer = A   Total Group = 88.24%

Distractor Analysis:	A	B	C	D
Point-Biserial:	-.27	.27	0.00	0.00
Frequency:	88%	12%	0%	0%

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Examples

2. A patient presents to the primary care clinic with a new onset of cough? Which newly prescribed medication might be responsible for this new symptom?

   a. acetaminophen (Tylenol®)

   b. acarbose (Precose®)

   c. lisinopril (Zestril®)

   d. atorvastatin (Lipitor®)

Point-Biserial = -.61   Correct Answer = C   Total Group = 76.47%

Distractor Analysis:	A	B	C	D
Point-Biserial:	-.59	0.00	0.61	-.24
Frequency:	6%	0%	88%	6%

ANCC Board Certification Points

- FNP-BC (2013):
  - 200 questions (175 scored)
  - 4 Hours to Completion

Category	Domains of Practice	No. of Questions	Percent
I	Foundations for Advanced Practice	59	34%
II	Professional Practice	46	26%
III	Independent Practice	70	40%
	Total	175	100%

- http://www.nursecredentialing.org/familynp-tco

ANCC Board Certification Points

- ANP exam retired 1/15
- AGPCNP-BC (2013):
    - 200 questions (175 scored):
    - 4 Hours to completion

Category	Domains of Practice	No. of Questions	Percent
I	Foundations of Practice	49	28%
II	Professional Role	66	38%
III	Independent Practice	49	28%
IV	Healthcare Systems	11	6%
	Total	**175**	**100%**

- http://www.nursecredentialing.org/Documents/Certification/TestContentOutlines/AdultGeroPCNP-TCO.pdf

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ANCC Board Certification Points

- ## AGACNP-BC (2013):
  - 200 questions (175 scored)
  - 4 Hours to completion

Category	Domains of Practice	No. of Questions	Percent
I	Foundations of Practice	49	28%
II	Professional Role	66	38%
III	Independent Practice	49	28%
IV	Healthcare Systems	11	6%
	Total	**175**	**100%**

- http://www.nursecredentialing.org/Documents/Certification/TestContentOutlines/AdultGeroAcuteCareNP-TCO.aspx

ANCC Board Certification Points

- Scoring:
  - Scoring is Pass/ Fail:
    - Passing standard determined statistically and not easily/publicly accessible
  - Candidates who pass receive no score information or diagnostic information
  - Candidates who fail receive diagnostic feedback:

The diagnostic feedback categories are:

LOW The score you obtained for this content area is below an acceptable level. Substantial study of this content area is recommended prior to retaking the examination.

MEDIUM The score you obtained for this content area is marginally acceptable; however, further study of this content area is recommended.

HIGH The score you obtained for this content area is well above average; however, a review of this content area may be helpful to you prior to retaking the examination.

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ANCC Board Certification Points

- Question Items:
  - Questions *will be* multiple choice:
    - A, B, C, or D options
    - NO MATCHING
    - NO TRUE/FALSE
    - NO MULTIPLE or COMBINATION ANSWERS
  - Questions *may* contain "exhibits"
  - Questions will *not* ask for incorrect answers
  - Questions will *not* ask to "select all that apply"

AANP Board Certification Points

- FNP-BC (2011): 150 questions (135 scored):

Domains and Tasks for Family NP Examination

Domains and Tasks for Adult NP Examination

DOMAIN I	# of Items (135-item* exam)
01 – Assessment	48
02 – Diagnosis	33
03 – Plan	31
04 – Evaluation	23
TOTAL	135

Patient Age Ranges for Family NP Examination

DOMAIN II – Patient Age Ranges	Number of Items (135-item* exam)	Percentage of Items
Prenatal	4	2.9%
Pediatric	19	3.6%
Adolescent	24	18.1%
Adult	52	38.6%
Geriatric	28	21.1%
Frail elderly	8	5.8%
TOTAL	135*	100%

* Each examination consists of 150 multiple-choice items. Of the 150 questions, 15 are pretest questions that **are not** counted

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AANP Board Certification Points

- AGPCNP-BC (2011): 150 questions (135 scored):

Domains and Tasks for Adult-Gerontology NP Examination

Domains and Tasks for Adult-Gerontology NP Examination

DOMAIN I	# of Items (135-item* exam)
01 – Assessment	47
02 – Diagnosis	34
03 – Plan	30
04 – Evaluation	24
TOTAL	135

Patient Age Ranges for Adult-Gerontology NP Examination

DOMAIN II - Patient Age Ranges	Number of Items (135-item* exam)	Percentage of Items
Adolescent	9	6.7%
Adult	59	43.7%
Geriatric	50	37.0%
Frail elderly	17	12.6%
TOTAL	135	100%

* Each examination consists of 150 multiple-choice items. Fifteen of the questions are pretest questions that **are not** counted in the candidate's final score.

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AANP Board Certification Points

- ANP-BC offered through 1/16
- ALL candidates receive a score:
    - Range = 200-800
    - Minimum Passing = 500
- One handbook for all programs:
- http://www.aanpcert.org/ptistore/resource/documents/2013%20CandidateRenewalHandbook%20-Rev%2011%2025%202013%20forNCCA(FINAL).pdf

Test Item Analysis

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Board-Certification Examination Item Components

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WORKSHOP ACTIVITY

QUESTIONS