Keeping Your CCA Program Current and Relevant
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Certifying Based on Knowledge and Skills: An Overview

• What are our goals?
  – Increase the proficiency of those who work with crops and soils
  – Distinguish and reward those who have achieved a minimum level of proficiency

• How do we accomplish this?
  – Define and communicate expectations
  – Provide educational offerings
  – Assess knowledge and skills
Process for Reaching Our Goals

• Define and communicate expectations
  Performance Objectives
• Provide educational offerings
  Various Methods
• Assess knowledge and skills
  Exams
Objectives—Major Steps

• Start by listing your educational goals—the broad topics that you wish your learners to know
• Within those goals, develop learning objectives to provide detail and specify outcomes
• Organize the learning objectives into logical categories
• Test the objectives with stakeholders to assure their validity, and modify accordingly
• Redo the objectives periodically to ensure they are up to date
Objectives: Use An Appropriate Verb

Non-Specific Verbs Open to Many Interpretations

- Know
- Understand
- Really understand
- Learn
- Appreciate
- Be aware of

Verbs Describing More Specific Behavior

- Describe
- Identify
- Differentiate
- List
- Recognize
- Define
- Classify
- Use
Objectives Can Address Various Cognitive Outcomes

- Basic recall of facts or terminology
- Comprehension of data
- Application of knowledge to solve a problem
- Analysis of a situation

*Educators often try to move students to higher levels*  
*But can be more difficult to develop test items for these higher levels!*
Specific Help with Objectives

• SMART concept is useful—Specific, Measureable, Attainable, Realistic
• Develop using subject matter experts familiar with the science and its application in the field
• Topics can sometimes seem limitless. To minimize gridlock, focus on “need to know” vs. “nice to know”
Validate Objectives by Surveying End-Users

Competency Area 1. BASIC CONCEPTS OF PLANT NUTRITION

How important is it for a Certified Crop Adviser to be able to:

1. List the 18 elements essential for plant nutrition
   - Of no use
   - Nice to know
   - Should know
   - Need to know
   - 0
   - 1
   - 2
   - 3

2. Classify the essential elements as macronutrient or micronutrient
   - Of no use
   - Nice to know
   - Should know
   - Need to know
   - 0
   - 1
   - 2
   - 3

3. Describe the functions of nitrogen in a plant
   - Of no use
   - Nice to know
   - Should know
   - Need to know
   - 0
   - 1
   - 2
   - 3

Please add any additional objectives that you think should be included under the Nutrient Management area.

_______________________________________________________________________
_______________________________________________________________________

Certified Crop Adviser
Exams—Major Points

• Develop items that match the learning objectives
• Create enough items to adequately sample content
• Goal for each item is to distinguish those who have the knowledge from those who do not
• Don’t include items that you think nearly everyone might get correct, or nearly everyone might fail—these will do little to distinguish amongst examinees
• Write items as simply as possible. Limit modifiers, long phrases, and clauses
• Provide only the information necessary to complete the question. Confounding information may inadvertently test beyond your desired subject matter
• Balance the exam content according to importance of topics
What Item Format is Best?

• **True/False**  Easy to develop, easy to score
  – But high chance of guessing

• **Completion**  Reduces chances of guessing
  – But can be difficult to write beyond simple recall

• **Essay**  Great for advanced concepts
  – But evaluation is time consuming and subjective

• **Multiple Choice**  One of the more reliable formats
  – Useful in a range of cognitive areas
  – But can be more difficult to write

*Our standard for CCA is multiple choice*
Multiple Choice

- Consists of a stem with 3 to 5 choices, only one being correct
- Can be either question style or completion style
- *With CCA, our standard is four-choice completion style*

What is a function of nitrogen in plants?

A) A component of cell walls.
B) Part of the chlorophyll molecule.*
C) Primarily for energy transfer.
D) Helps regulate osmotic potential.
Writing Effective Multiple Choice Items

• Try to write in active, not passive voice
• Always include a verb in the stem
• Question stems should be directed—a competent test-taker should be able to synthesize a plausible answer without looking at responses
• Incorrect responses should be reasonable and plausible but always incorrect
• Keep responses of similar length
• The length of the stem and one response should be at most 32 words
• Put numerical choices in sequence
Performance Objective: Describe the functions of nitrogen in a plant.

**Does not fit Performance Objective (PO)**
A grower can increase N fixation in legumes by
A) reducing tillage.
B) limiting applications of phosphorus.
C) ensuring a neutral soil pH.*
D) early harvest of forage.

**Stem not directed/D is not plausible**
Nitrogen is
A) part of the chlorophyll molecule.*
B) immobile in the soil.
C) a secondary element.
D) absorbed in the plant’s stomach.

**Different question style**
What is a function of nitrogen in plants?
A) A component of cell walls.
B) Part of the chlorophyll molecule.*
C) Primarily for energy transfer.
D) Helps regulate osmotic potential.
• Don’t repeat information in each solution that could be incorporated into the stem
• Watch for wording associations between the stem and the correct solution
• Watch the use of definitive words such as always or never, which often indicate incorrect selections, and sometimes or usually, which are common as correct answers
• Use negatively stated items sparingly. For example, the stem “Functions of nitrogen in the plant include the following EXCEPT”
• Avoid using multiple correct answers such as “B and C correct,” or “All of the above.” These often just add unnecessary complication and can contribute to a test-taker’s ability to guess
**EXAMPLE SURVEY TO DETERMINE THE RELATIVE IMPORTANCE OF COMPETENCY AREAS**

**Recommendation for Test Content**

Listed below are the six competency areas of nutrient management that may be covered in a test for crop advisers. What percent of the questions should be in each area? If you think an area should not be included in the test, put 0 in the space provided. Make sure your responses sum to 100.

**PERCENT OF TEST QUESTIONS**

<table>
<thead>
<tr>
<th>Competency Area</th>
<th>Percentage</th>
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<tr>
<td>1. Basic concepts of plant nutrition</td>
<td>______</td>
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<td>2. Basic concepts of soil fertility</td>
<td>______</td>
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<td>3. Soil testing and plant analysis</td>
<td>______</td>
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<td>4. Nutrient sources and applications</td>
<td>______</td>
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<td>5. Soil pH and soil amendments</td>
<td>______</td>
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<td>6. Nutrient management planning</td>
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### Distribution of Test Items Among Modules--International

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# Test Distribution in Pest Management—International

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Establishing the Minimum Level of Achievement

- Normative vs. Criterion Referenced

**DETERMINING THE MINIMUM LEVEL OF ACHIEVEMENT**

To establish the minimum passing score for this exam, evaluate each question based on the following criterion:

What percent of minimally qualified examinees will be able to answer this question correctly? Please write your response, in percent, for each of the questions on the exam. This information will be summed to help determine the minimum passing.

1. ____%
2. ____%
3. ____%
Evaluating Exam Performance

- **Too easy or too hard**  An item that almost everyone gets correct, or oppositely that almost everyone misses, does little to sort those who know the subject as compared to those who do not.

- **Incorrect answer**  Look for the possibility that an item is miskeyed.

- **Technical or regional interpretation issues**  Be on the lookout for words and techniques that differ significantly from region to region or among scientific communities.

- **Wording**  Long, confusing wording or terms not familiar to test takers may discriminate reading or comprehension ability as much as what you specify in your learning objectives.

- **Distractors not performing**  With multiple choice questions, incorrect answers/distractors chosen by none or a very low percentage of test-takers add little to the question’s usefulness.
### Research by Osterlind
ASA (Test Administration 2/6/09) CCA International

#### Matrix of Responses by Fifths for Question 25

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#### Percent of Correct Response by Fifths for Question 25

- 5th +
- 4th +
- 3rd +
- 2nd +
- 1st +

#### Matrix of Responses by Fifths for Question 26

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#### Percent of Correct Response by Fifths for Question 26

- 5th +
- 4th +
- 3rd +
- 2nd +
- 1st +

#### Matrix of Responses by Fifths for Question 27

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#### Percent of Correct Response by Fifths for Question 27

- 5th +
- 4th +
- 3rd +
- 2nd +
- 1st +
Keeping Test Reliable

- Cut score is adjusted to maintain intended level of competency over time
- Equator questions
- Changes in test format require revalidation
CCA Exam Development

The Certified Crop Adviser program is committed to ensuring the integrity of its programs by upholding accepted educational standards for performance objectives, exam development, and exam review. The resources on this page are for the use of regional programs in ensuring their documents, processes, and procedures are valid and current.

CCA Exam Development Articles
Recording of the April 12, 2012 CCA Exam Webinar
Slides from the April 12, 2012 CCA Exam Webinar
Standard Setting for Certified Crop Adviser Exams

References:
How to Write Better Tests: A Handbook for Improving Test Construction Skills by Lucy C. Jacobs, Ph.D., Indiana University
Certification

Delivering Outcomes-Based Education for Professionals: Building Exams to Assess Knowledge and Abilities

This is the second in a series of articles examining some educational best practices and delivering educational outcomes-based exams. The goal of exam development is to assess students' knowledge and skills. The following suggestions come from those experienced in constructing exams:

- Develop test items that match the outcomes that you have established—the learning objectives.
- Create enough items to adequately sample subject areas. The number of items in each section should be balanced according to its importance relative to other subject areas.
- Don't include items that you think nearly everyone might answer correctly or incorrectly—these will do little to distinguish amongst examinees.
- Write items as simply as possible. Limit long phrases and clauses, and provide only the information necessary to complete the question. If the goal is to demonstrate mastery of subject areas related to crops or soils, complicated grammar may test reading aptitude as much as the information that you are targeting.

Examples of Multiple-Choice Test Items Needing Improvement

Performance objective: Describe the functions of nitrogen in a plant.

Does not fit performance objective

A grower can increase N fixation in legumes by:

- reducing tillage
- limiting applications of phosphorus
- ensuring a neutral soil pH
- using harvest of forage

Stem not directed and “d” is not plausible

Nitrogen is:

- a part of the chlorophyll molecule
- immobilized in the soil
- a secondary element
- absorbed in the plant's stem

Multiple-choice items consist of a stem and a list of possible responses or distractors (see examples below). Use a minimum of three but no more than five choices. The stem can be written as either a question or an incomplete sentence, but it is best to use one or the other within an exam vs. mixing styles. Consider these suggestions when writing multiple-choice items:

- Try to write in active, not passive voice.
- Always include a verb in the stem.
- Questions should be directed—a competent test taker should be able to synthesize a plausible answer without looking at suggestions.
Checklist for State/Regional/Provincial CCA Programs

• Performance Objectives
  – Updated at least every four years
  – End user reviewed

• Exam
  – Matches performance objectives
  – Updated at annually
  – Exam items performing satisfactorily
Final Thoughts

• Performance Objective Documents and Exams are by their nature fluid
• Both documents need maintenance to keep them current, relevant, and performing as intended
• Find a summary of these comments on ASA web site
• Contact us to provide assistance