Measuring the Power of Learning.®

Developing Praxis Tests

Tennessee State Board of Education Workshop

November 14, 2019

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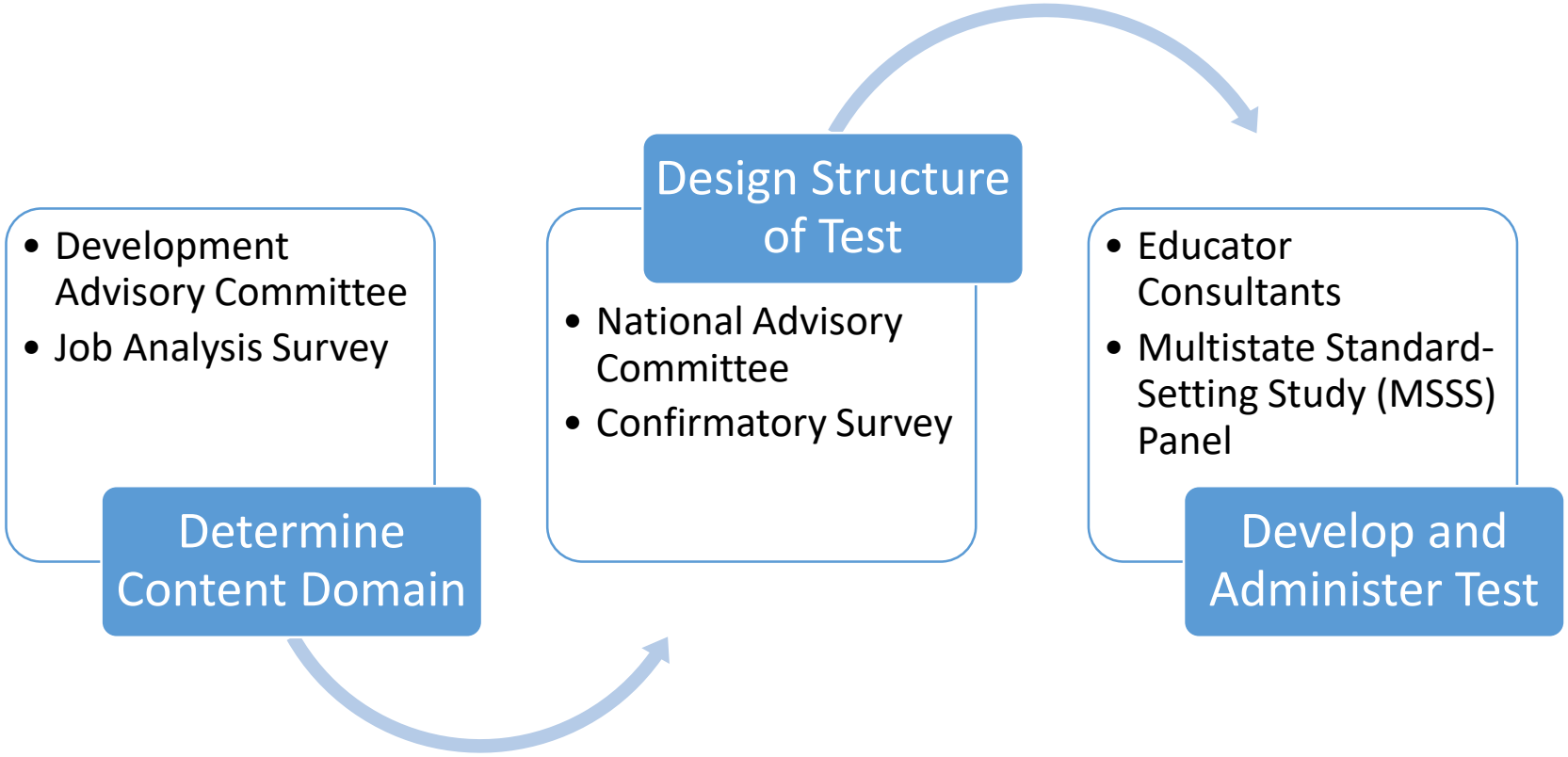
Knowledge • Performance • Professional Learning

Involving Educators to Develop Praxis Tests
From Design through Implementation



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Involving Educators to Develop Praxis Tests
From Design through Implementation

- Ensuring diverse perspectives by recruiting educators …
  - across states that use Praxis
  - from varied educational settings
    - rural, suburban & urban schools
    - small, mid-size & large colleges/universities
- Work with state agencies and associations to build diverse committees with regards to gender and race/ethnicity

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Praxis Development Process

Accumulation of validity evidence to support the use of Praxis tests

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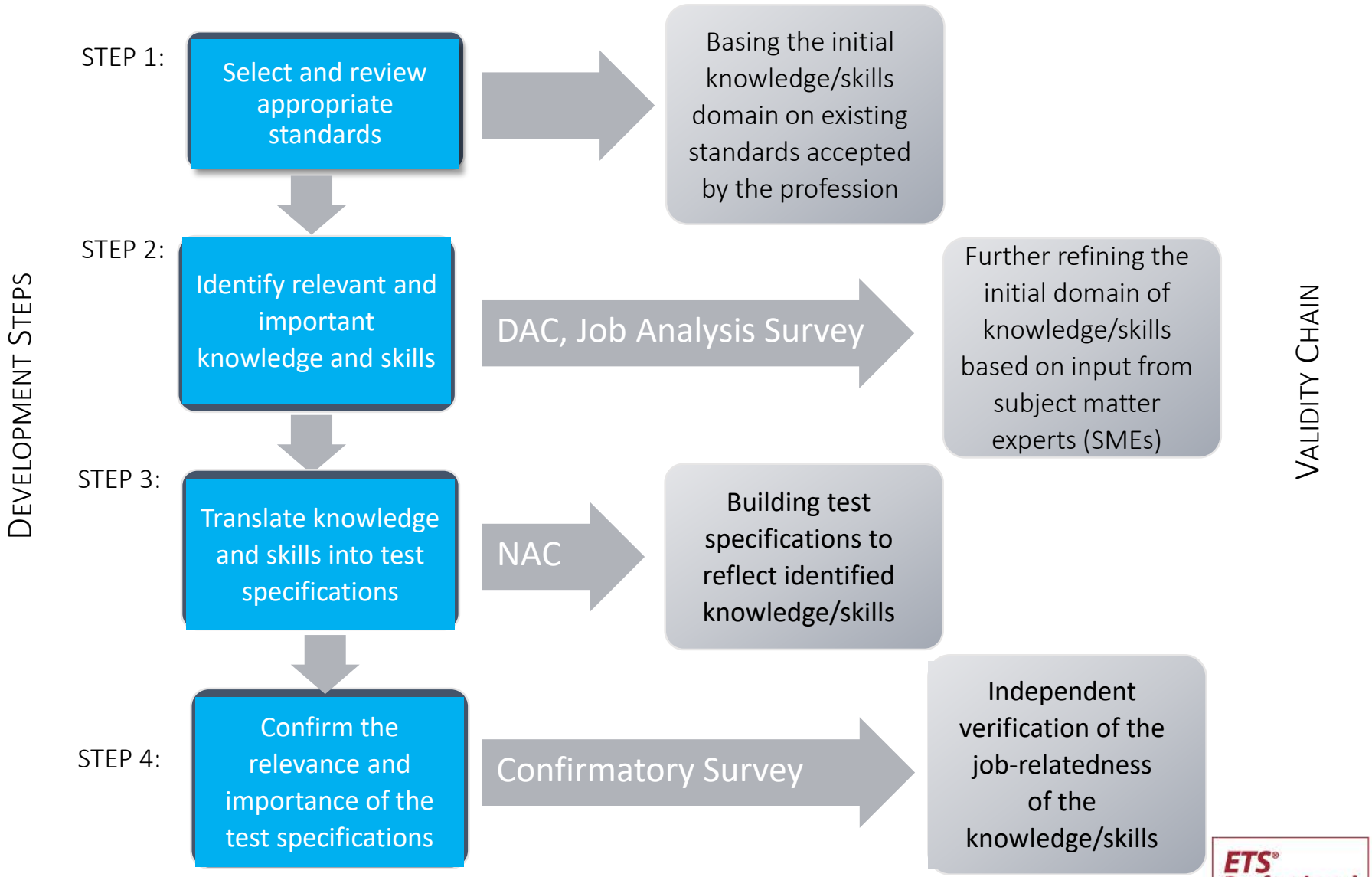
Development Steps and Validity Chain



BLUE boxes represent steps that rely heavily on educators

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Development Steps and Validity Chain

Development Steps

STEP 1: Select and review appropriate standards

Validity Chain

Basing the initial knowledge/skills domain on existing standards accepted by the profession

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Aligning to Appropriate Standards

Praxis Test	National Standards
• Teaching Reading: Elementary	• International Literacy Association
• Biology: Content Knowledge	• Next Generation Science Standards National Science Teachers Association
• Special Education: Content Knowledge & Applications	• Council for Exceptional Children

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Development Steps and Validity Chain

DEVELOPMENT STEPS

STEP 2:

Identify relevant and important knowledge and skills

DAC, Job Analysis Survey

Further refining the initial domain of knowledge/skills based on input from subject matter experts (SMEs)

VALIDITY CHAIN

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Online Job Analysis Survey

I. Phonological and Phonemic Awareness including Emergent Literacy

Directions

How important are the knowledge and skills specified in the statements below for beginning teachers in order for them to provide effective reading instruction for ELEMENTARY SCHOOL students?

	Not at all important	Of little importance	Of some importance	Moderately important	Important	Very important
Is familiar with receptive and expressive components associated with oral language development	○	○	○	○	○	○
Is familiar with how to identify cultural, environmental, and linguistic factors that may have an impact on literacy development	○	○	○	○	○	○
Is familiar with instructional methods for teaching phonological awareness (i.e., syllables and onset and rime) and phonemic awareness (i.e., phoneme segmenting, blending, deletion, and substitution)	○	○	○	○	○	○

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Online Job Analysis Survey

II. Earth's Processes and Materials

A. Tectonics and Internal Earth Processes

Directions
At what level (i.e., depth) should a beginning Earth and Space Sciences teacher demonstrate this knowledge/skill?

	Recall (e.g., define, identify, list, etc.)	Skill/Concept (e.g., classify, compare, interpret, etc.)	Strategic Thinking (e.g., assess, differentiate, revise, etc.)	Extended Thinking (e.g., apply, analyze, create, etc.)
Theory of plate tectonics and its supporting evidence a. Plate movement (e.g., ridge push and slab pull) b. Convergent, divergent, and transform boundaries c. Hot spots d. Potential driving forces (e.g., mantle convection) e. Seismic, magnetic, fossil, and other evidence for plate tectonics f. Geographic features (e.g., trenches, mountains, rift zones)	○	○	○	○

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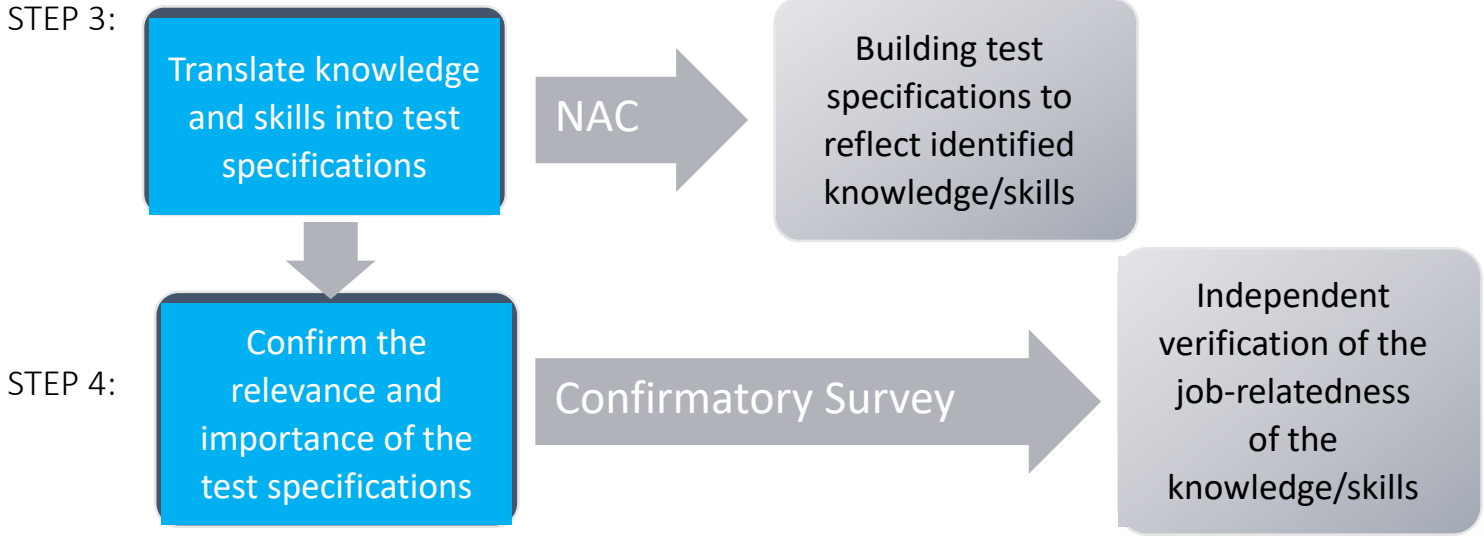
Development Steps and Validity Chain

Development Steps



Validity Chain

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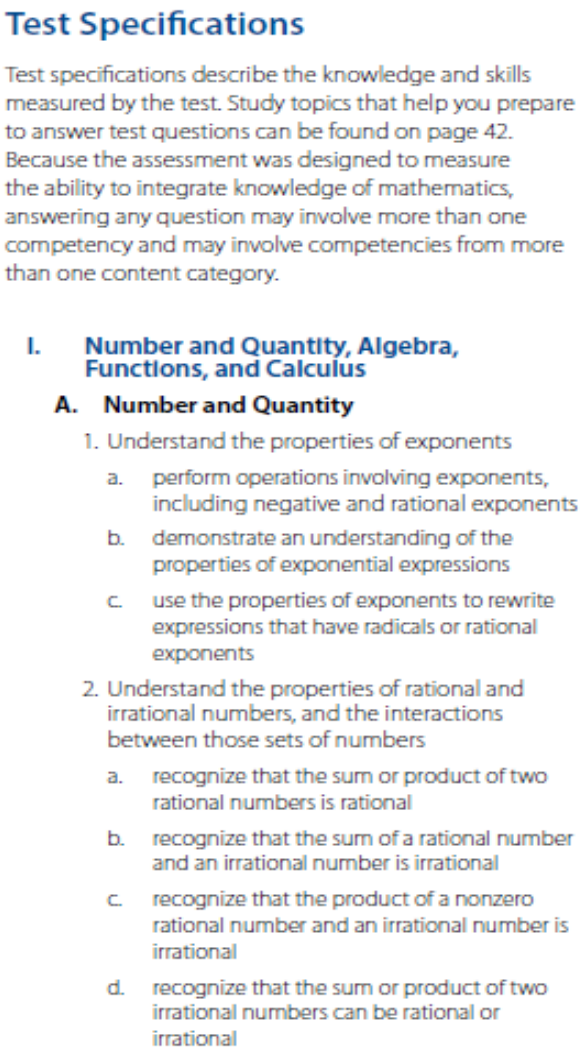
Test Specifications



Test Specifications

Test specifications describe the knowledge and skills measured by the test. Study topics that help you prepare to answer test questions can be found on page 42. Because the assessment was designed to measure the ability to integrate knowledge of mathematics, answering any question may involve more than one competency and may involve competencies from more than one content category.

I. Number and Quantity, Algebra, Functions, and Calculus

A. Number and Quantity

1. Understand the properties of exponents
   - a. perform operations involving exponents, including negative and rational exponents
   - b. demonstrate an understanding of the properties of exponential expressions
   - c. use the properties of exponents to rewrite expressions that have radicals or rational exponents
2. Understand the properties of rational and irrational numbers, and the interactions between those sets of numbers
   - a. recognize that the sum or product of two rational numbers is rational
   - b. recognize that the sum of a rational number and an irrational number is irrational
   - c. recognize that the product of a nonzero rational number and an irrational number is irrational
   - d. recognize that the sum or product of two irrational numbers can be rational or irrational

Test specifications provide detailed description of the content of the test to guide

- students preparing to the test, and
- preparation programs developing curricula

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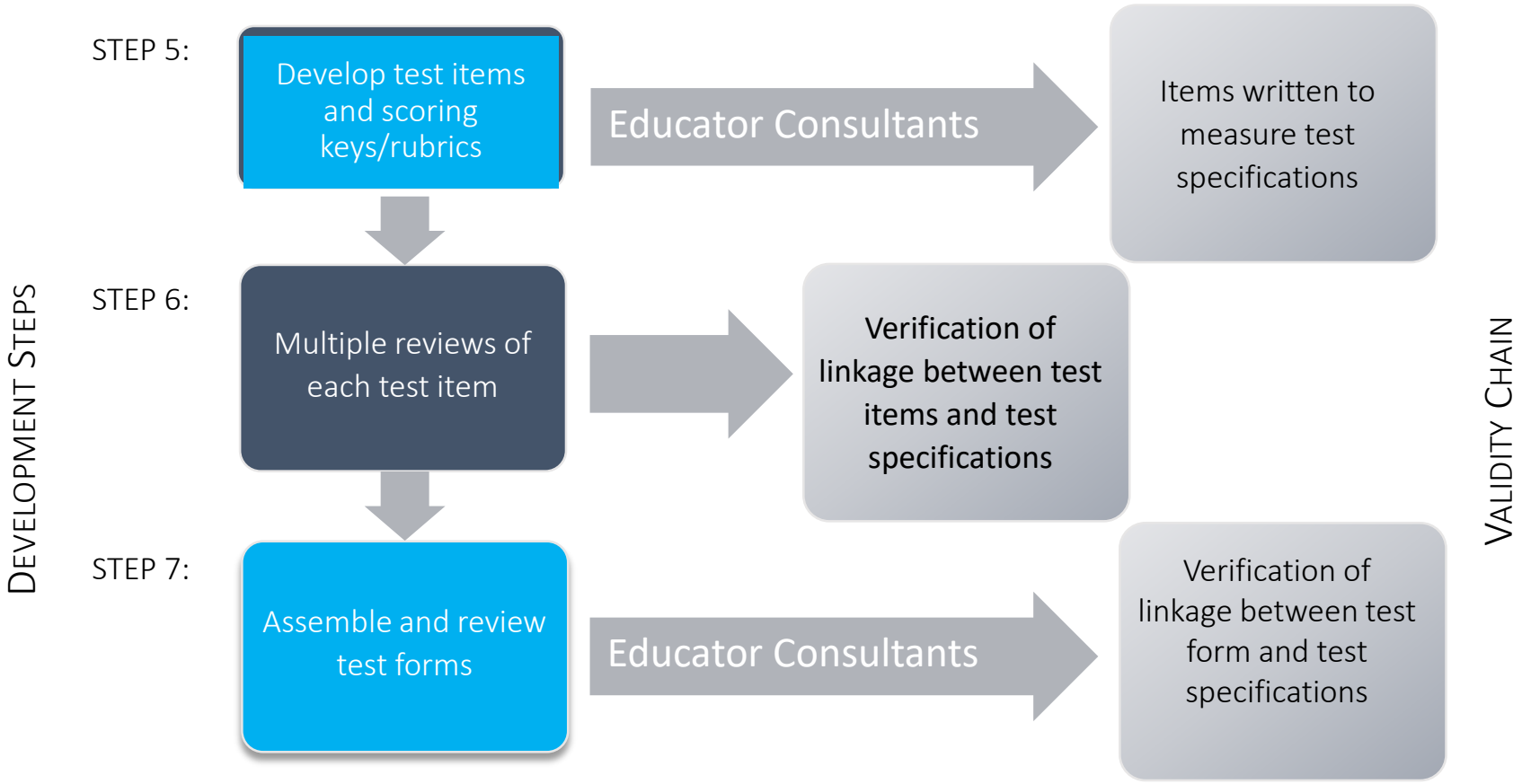
Development Steps and Validity Chain



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Evidence Gathering …
… Developing Relevant Test Items

- What must the test taker SHOW? (i.e., critical behavioral indicators)
  - In other words, "What would someone have to know or know how to do in order to show that knowledge or accomplish that skill?"
- Is this necessary at the time of entry into the profession?

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Test Specs to Evidence Example

Knowledge Statement:

"Is familiar with the provisions of major legislation that impact the field of special education (e.g., Public Law 94-142, IDEA 2004, Section 504)."

In order to conclude that the test taker "Is familiar with the provisions of major legislation …" he or she must be able to….

- Identify the major aspects of IDEA
- Determine when a child is eligible for a 504
- Compare an IEP and a 504 plan

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Test Item Mapped to Test Specs

Sample Item: ← Identify the major aspects of IDEA

According to the least restrictive environment provision in the Individuals with Disabilities Education Act (IDEA), a student with a disability must be educated with non-disabled peers

(A) when appropriate facilities are available
(B) only if the student has a mild disability
(C) if the student has a severe disability
(D) to the greatest extent possible

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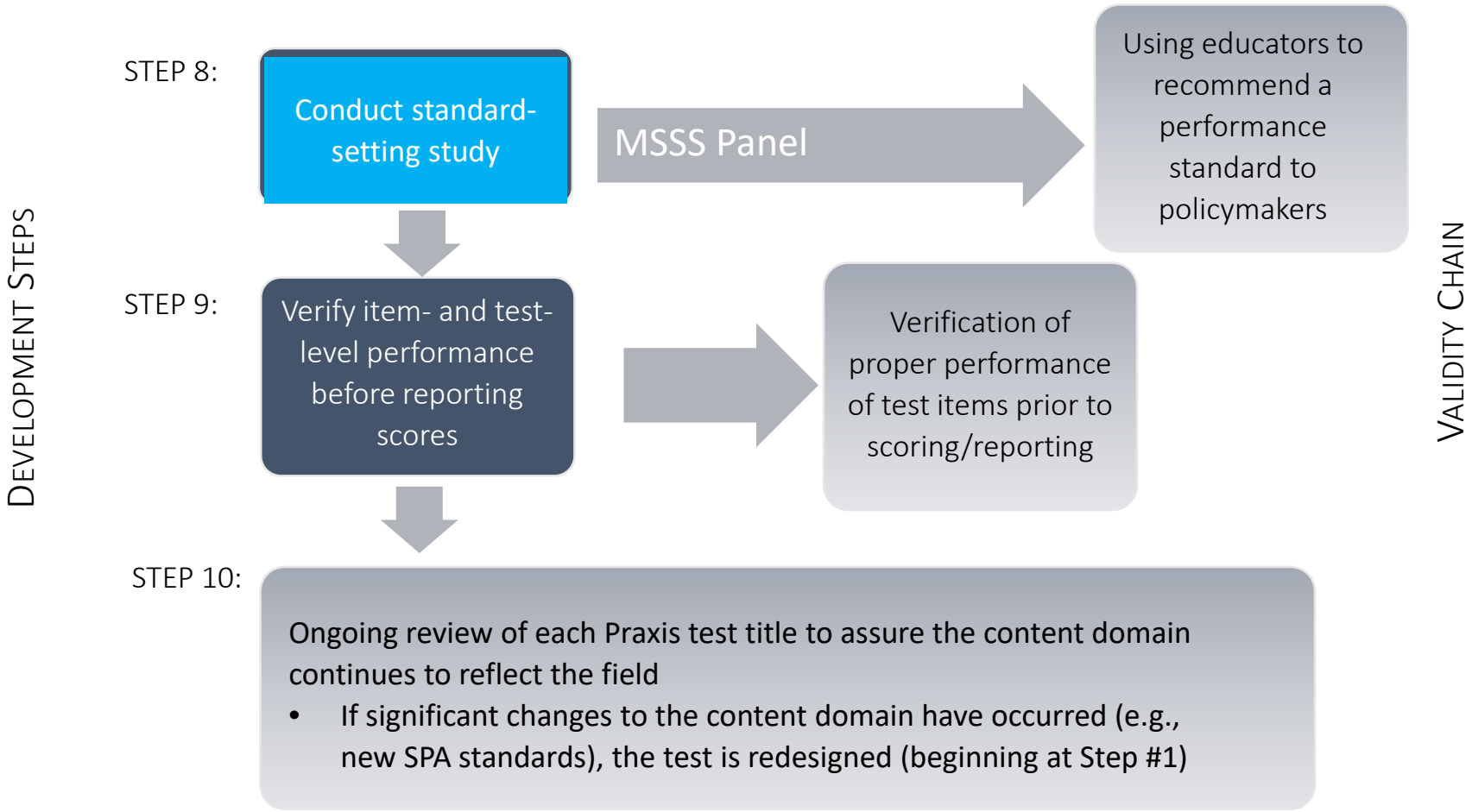
Development Steps and Validity Chain



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Development Steps and Validity Chain

DEVELOPMENT STEPS

STEP 8:

VALIDITY CHAIN

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Standard-Setting

- The standard-setting process for a new or revised Praxis test is the final phase in the development process
- The credibility of the standard-setting effort is established by **properly following a reasonable and rational system of rules and procedures** that result in a test score that differentiates levels of performance (Cizek, 1993)

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Standard-Setting Components

- Standard setting involves three important components
  - The first component is the test itself. The test is designed to measure knowledge and skills determined to be important for competent performance as a beginning teacher.
  - The second component is the describing of the level of knowledge and skills necessary for competent performance.
  - The last component is the process for mapping the description onto the test.

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Steps in the Process

- First step was understanding the test
  - Prior to the study, panelists were asked to review the specifications for the test they would be evaluating.
  - At the study, following an overview of the licensure process and standard setting, the panelists "took the test."
    - Then the panel discussed the content of the test and what is expected of beginning teachers.

The purpose of these activities is to familiarize the panelists with what is being measured and how it is being measured.

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Steps in the Process (cont'd.)

- Next the panelists developed a profile or description of the "just qualified candidate" or JQC.
  - The JQC is the candidate who just crossed that threshold of demonstrating the level of knowledge and skills needed to enter the profession.
  - The definition highlights the knowledge and skills that differentiate the candidate just over the threshold from the candidate who is not quite there yet.

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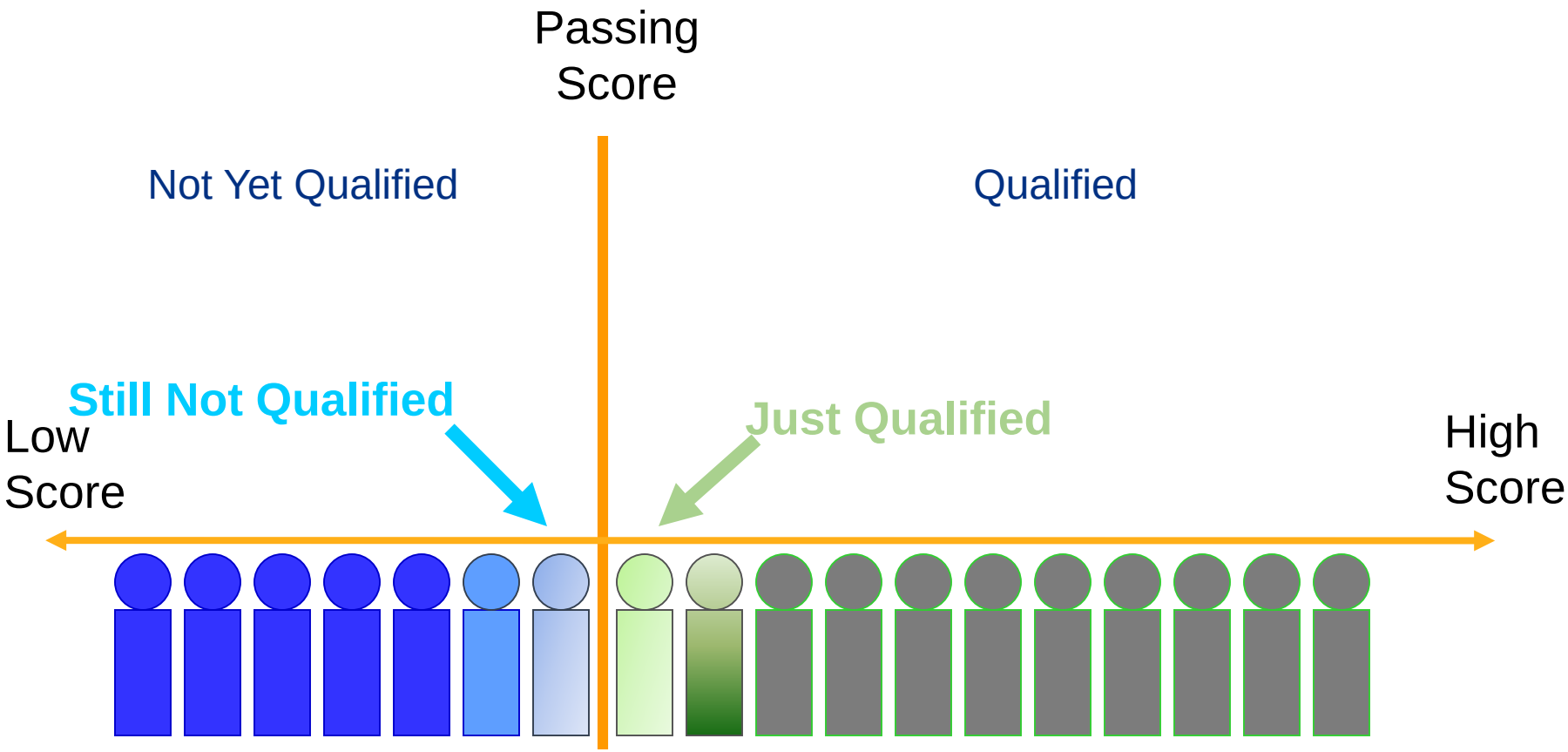
Describing a Just Qualified Candidate



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Steps in the Process (cont'd.)

- Now the panelists were ready to make their standard-setting judgments.
  - Panelists were trained in the standard setting method, had an opportunity to practice making judgments, and then made their question-by-question judgments.
    - Modified Angoff method for selected-response questions– judge the likelihood that a JQC will answer a question correctly
    - Extended Angoff method for constructed-response questions– judge the rubric score JQC would likely earn

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Standard-Setting Methods (cont'd.)

- Multiple rounds—Panelists made two rounds of judgments.
  - During the first round, panelists made independent judgments.
  - The judgments were summarized, both at a question and overall test level, and panelists engaged in discussions about their rationales for particular judgments.
  - After discussion, the panelists could change their original judgments.

Panelists' Evaluation

- Critical to the validity of the standard-setting process is that (a) panelists understand the task, and (b) implementation of the study as planned.
  - Following training and before the panelists begin making judgments, they were asked to confirm that they understand the process and the judgment task.
  - After the study, the panelists were asked to complete an evaluation of the study — their understanding of the steps in the process, the effectiveness of key steps, and their overall impressions of the recommended passing scores.

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Setting Operational a Passing Score

- Each state reviews the information from the study and decides what it will adopt as its passing score for the test

- States may want to consider other information
  - Estimated conditional standard error of measurement
  - Standard error of judgment
  - Importance of minimizing false positives or false negatives

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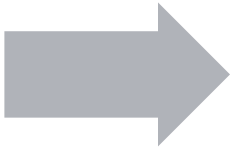
Development Steps and Validity Chain

Development Steps

STEP 9:

Verify item- and test-level performance before reporting scores



Verification of proper performance of test items prior to scoring/reporting

Validity Chain

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Item Analysis

Does each question behave as expected?

- How difficult is it?
- How well does it distinguish high from low ability?
- How do the incorrect options behave?
- Does it have a **single** correct response?

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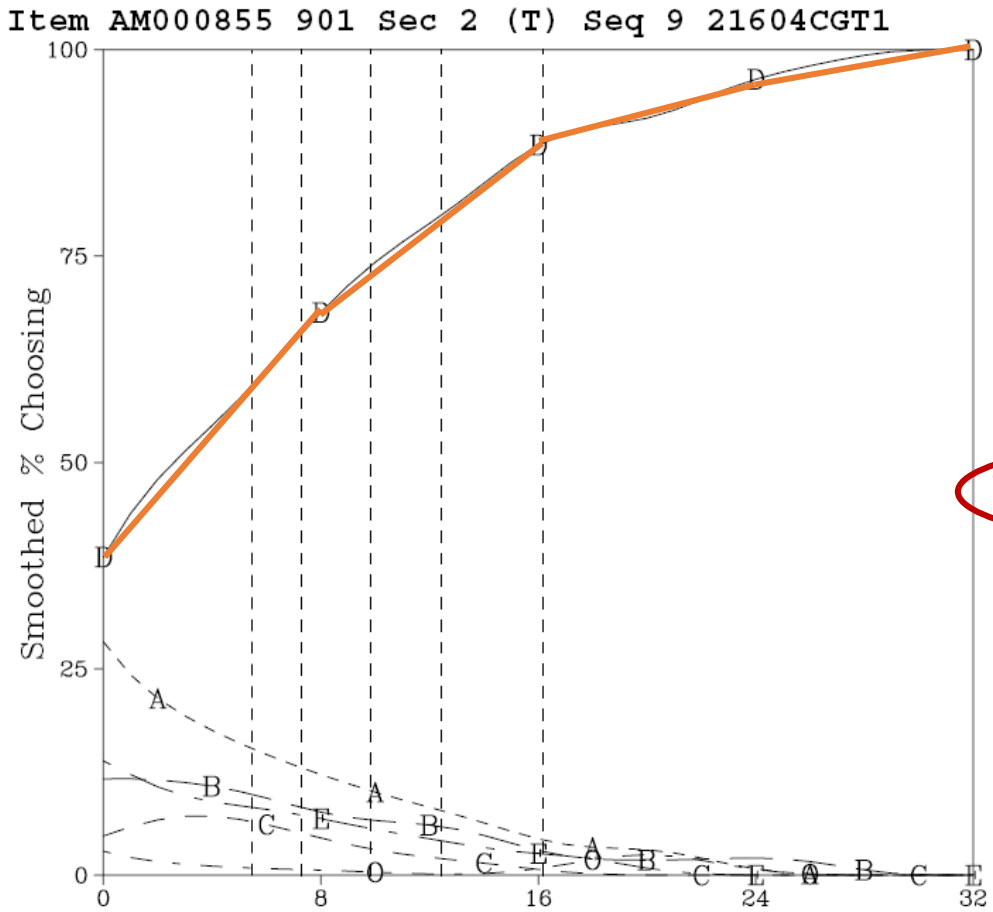
Item Statistics

- **Difficulty** – how hard is the question for a group of test takers?
- **Discrimination** – how sharply does the question separate test takers who are generally strong in the subject from those who are generally weak?
    - Candidates with higher total test scores should have a higher probability of answering a question correctly.

Sample Item Analysis



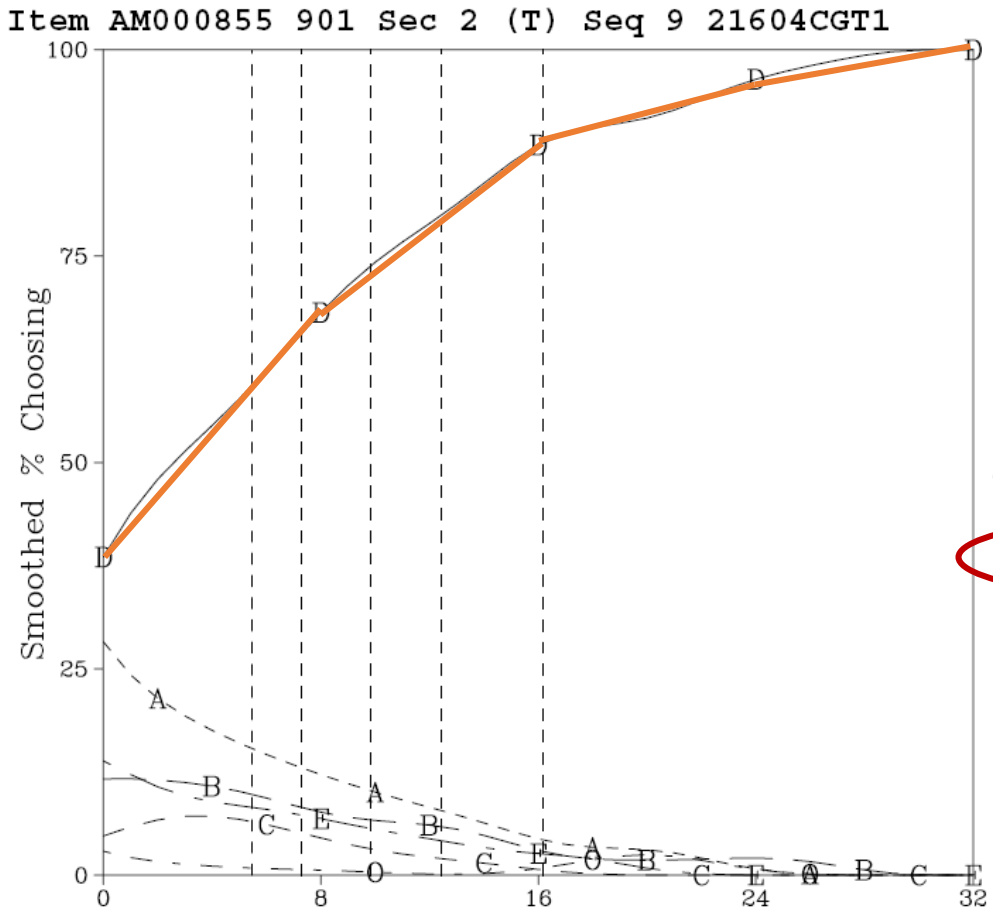
Multiple Choice, 5 choice

	N	%Tot	Criterion Mean	SD	Top 10%
A	272	10.4	8.2	3.4	2.6
B	176	6.8	8.6	3.4	2.0
C	90	3.5	7.6	2.5	0.0
*D	1901	73.0	11.1	4.3	91.7
E	146	5.6	8.3	3.2	1.7
Omt	18	0.7	10.3	6.1	2.0
NR	0				
Rch	2603	100.0	10.3	4.3	

Average Item Score	0.73
Delta	10.55
Correlation with Crit.	0.44
Percent Reached	100.00

Item difficulty

Sample Item Analysis



Multiple Choice, 5 choice

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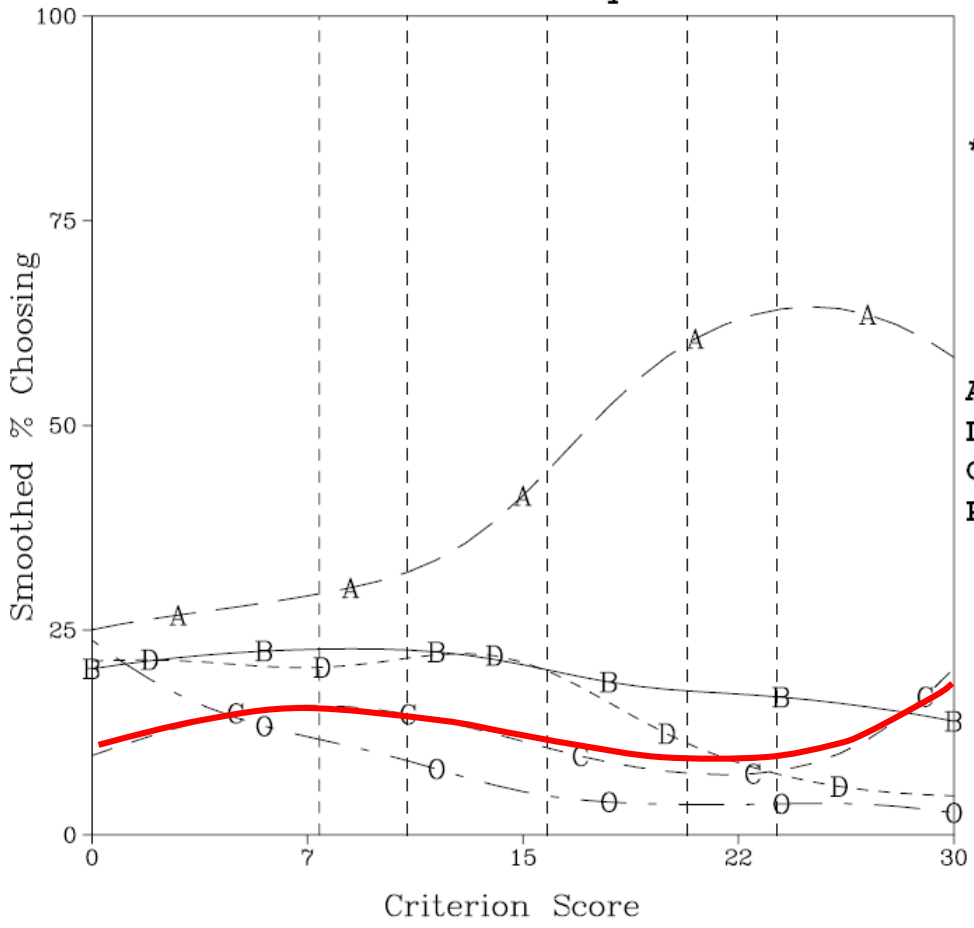
Omt	18	0.7	10.3	6.1	2.0
NR	0				
Rch	2603	100.0	10.3	4.3	

Average Item Score 0.73
Delta 10.55
Correlation with Crit. 0.44
Percent Reached 100.00

Item discrimination

Another Sample Item Analysis

Item VC239416 901 Sec 1 (T) Seq 26 218NC4C01



	N	%Tot	Criterion Mean	SD	Top 20%
A	1137	45.5	17.7	5.7	64.7
B	494	19.8	15.1	5.8	15.9
*C	290	11.6	14.9	6.5	10.3
D	409	16.4	13.8	5.0	5.6
Omt	168	6.7	12.4	6.1	3.6
NR	0				
Rch	2498	100.0	15.9	6.0	

Average Item Score	0.12
Delta	17.70
Correlation with Crit.	-0.09
Percent Reached	100.00

Multiple Choice, 4 choice

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Differential Item Functioning

Is an item particularly hard or easy for test takers from specified demographic groups?

Focal		**Reference**
• Female	vs.	Male
• African American	vs.	White
• Asian American	vs.	White
• American Indian	vs.	White
• Hispanic	vs.	White

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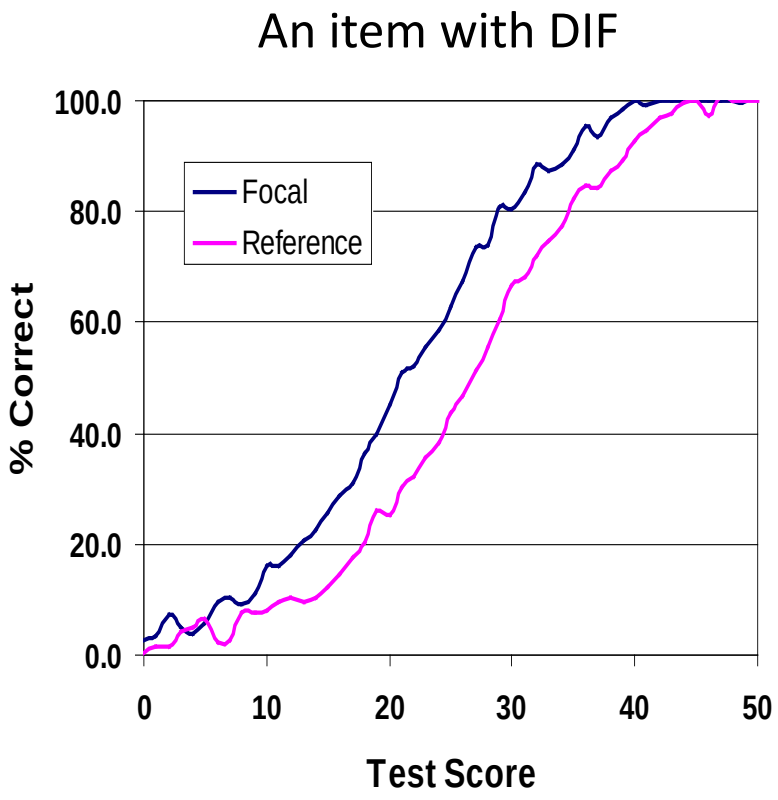
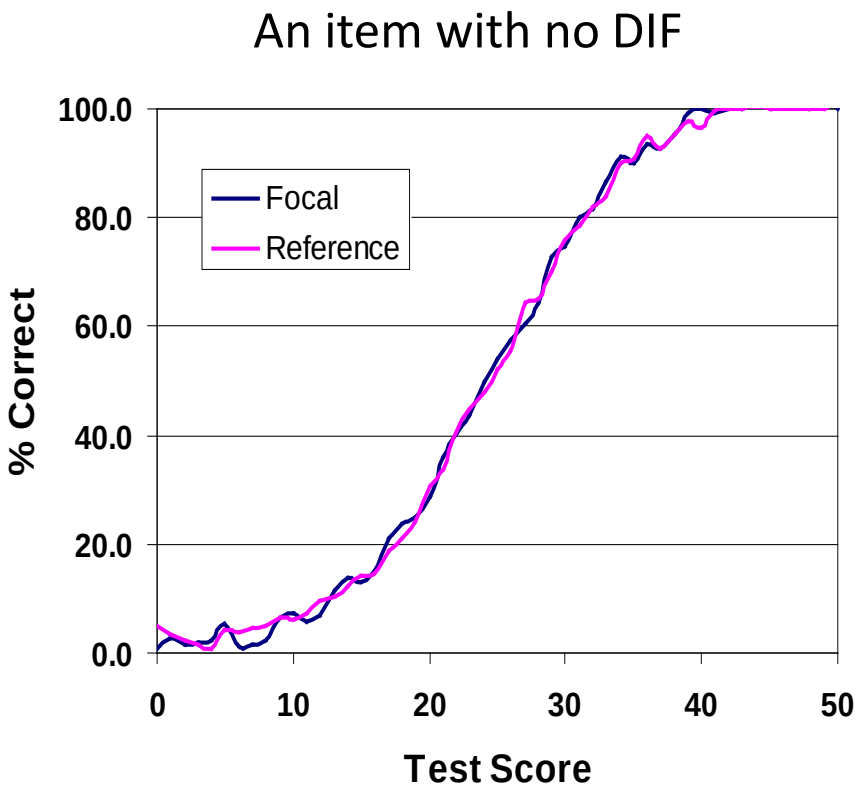
Differential Item Functioning





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Differential Item Functioning

- DIF ≠ *Impact*
  - Impact = difference in performance of two intact groups.
  - DIF = difference in performance of two groups conditioned on ability
  - Impact can often be explained by differences in preparation across groups
- DIF ≠ Item bias
  - DIF is used as one way to evaluate whether there is item bias.
  - Content experts will review and determine if DIF found is due to item bias.

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Converting Raw Scores to Scale Scores

- Scaling
  - Placing a candidate's raw score (number correct) onto the Praxis 100 to 200 reporting scale

- Equating
  - Putting two or more essentially parallel forms on a common scale

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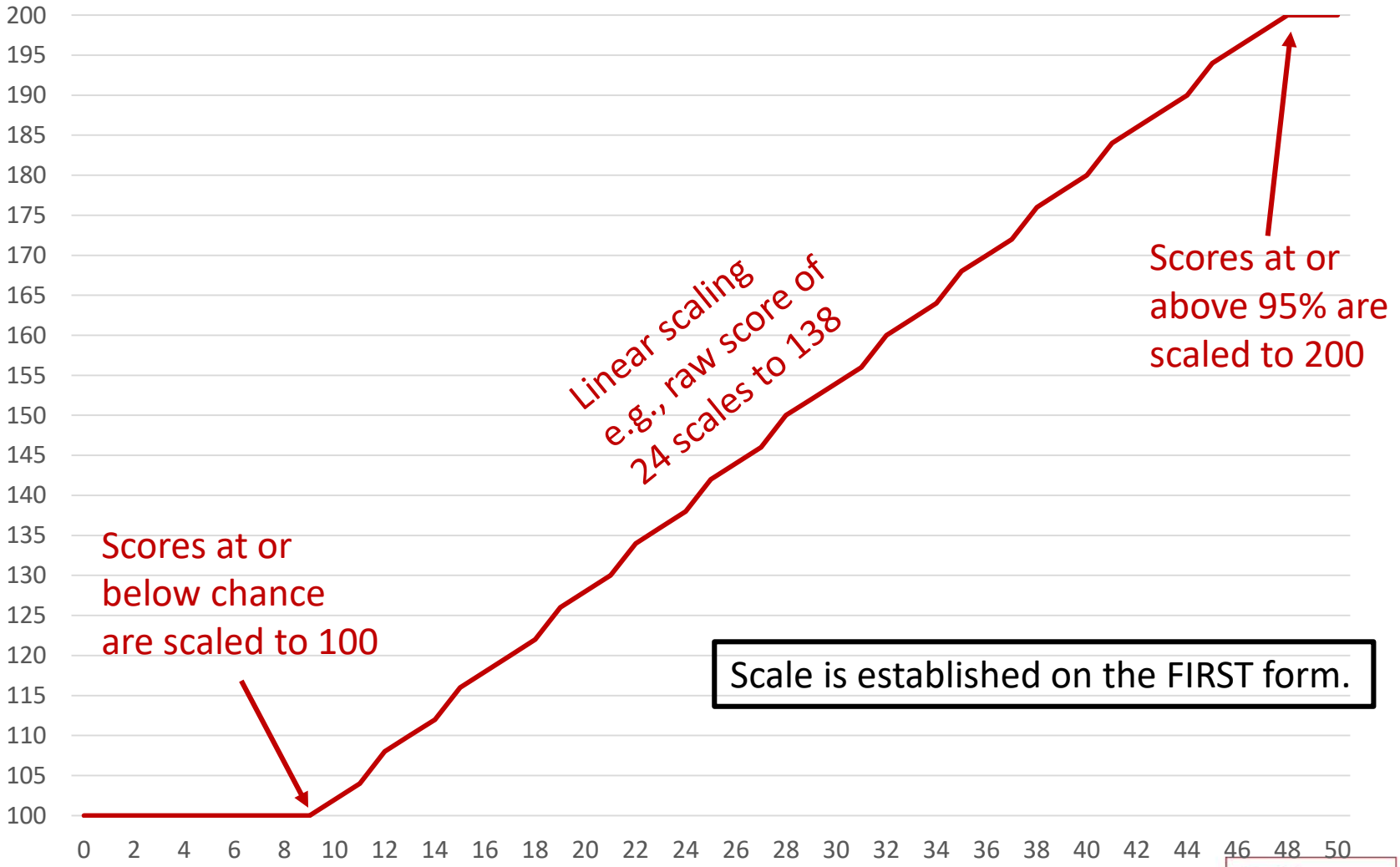
An Illustration of Equating Scaling



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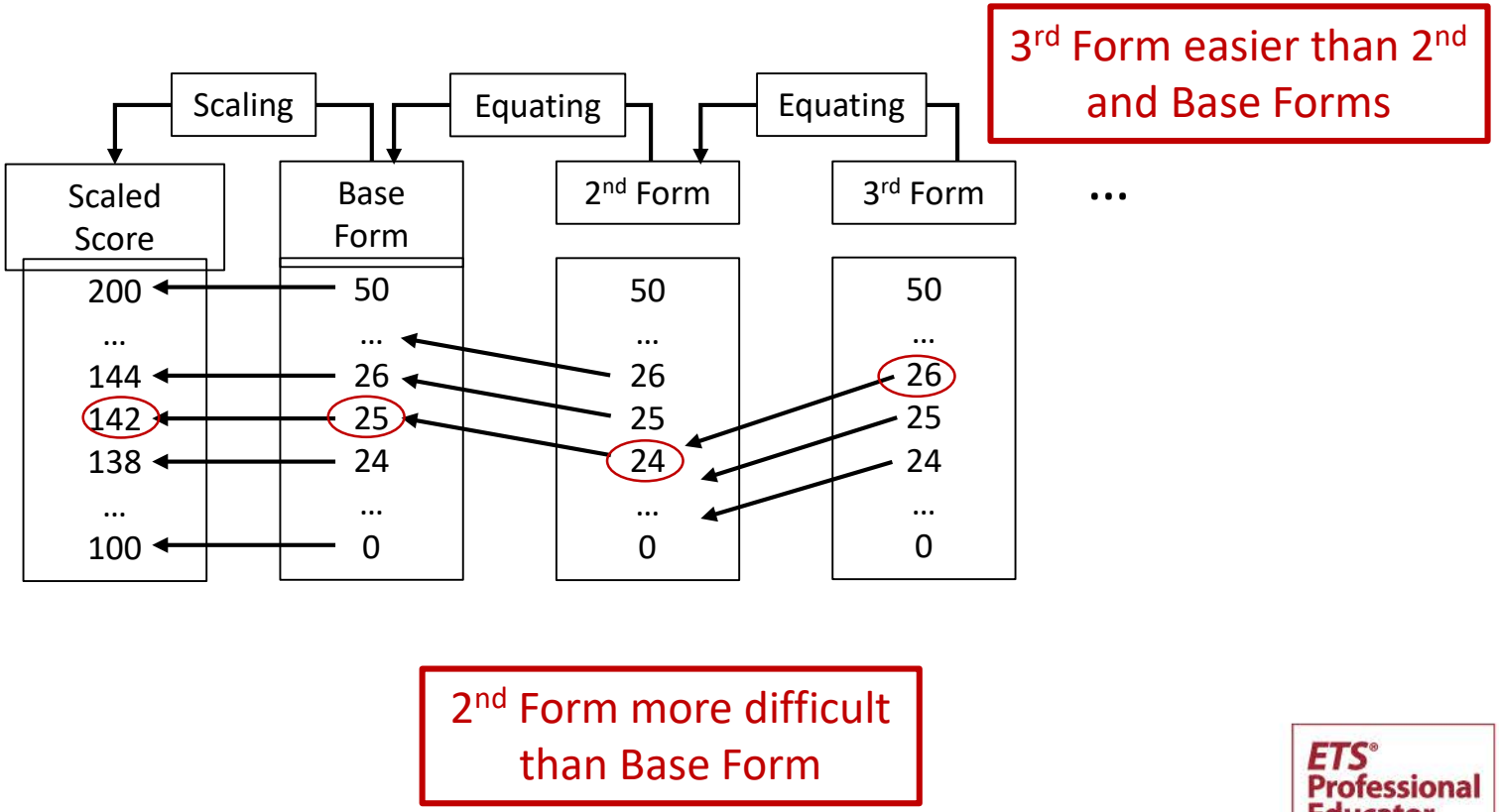
An Illustration of Equating

- Statistical procedure to find equivalent scores on two different forms that may be of different difficulty levels.



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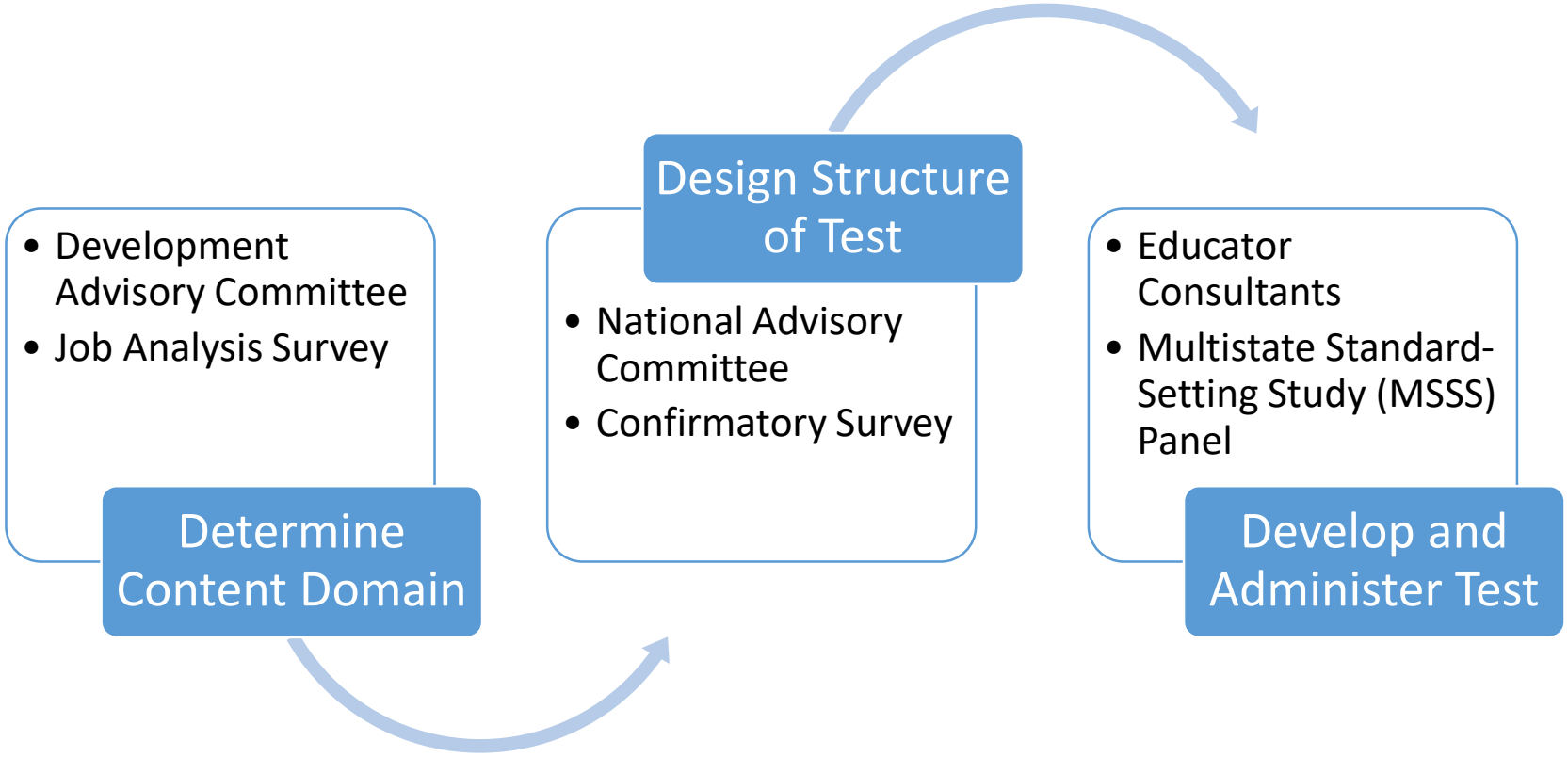

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If you have any Praxis questions, please contact

Kathy Pruner, Tennessee Client Relations Director

kpruner@ets.org

Clyde Reese, PEP Data and Validity Director

creese@ets.org

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