

# **The Discourse of Assessments: Identifying grammatical features of standardized science tests that contribute to their (in)accessibility for linguistically diverse learners**

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# Overview

- Background
  - Policy concerns
  - ONPAR project
  - Discourse perspective on test items
- Cognitive lab and controlled trial findings
  - Generalizations
  - The “Buoyancy” item— a “good” item
  - The “Garden” item—a “poor” item
- Implications

# Policy background

- “Science for all” (AAAS, 1989; NRC, 1996, Lee & Fradd, 1998)
- Populations of ELLs growing (NCELA, 2005)
- Requirements of NCLB
- Language accommodation policies (Kopriva, 2000; Abedi, Leon, and Mirocha, 2003)

# Language of Science

- Language issues in science testing
  - Item type: selected-response versus constructed-response
  - Language of science (Halliday & Martin, 1993; Lemke, 1991; Roth, 2005; Schleppegrell, 2008) versus general language
  - Language related accommodations
  - **Item discourse coherence**

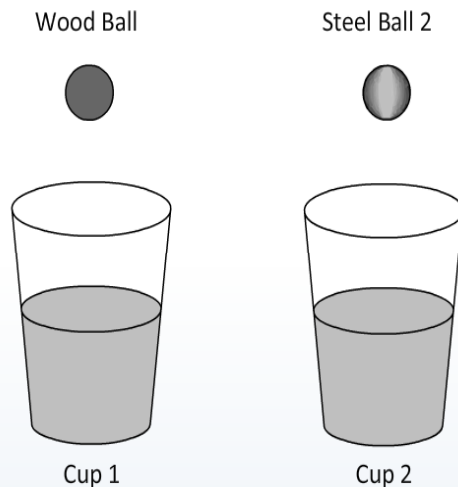
# Why Conduct Discourse Analysis of Test Items?

- Better understand item difficulty and item accessibility
- Support principled creation of multi-semiotic items
- Create professional development opportunities for teachers
- Develop framework for describing particulars of social, general instructional, and academic language registers
- Inform test development process to generate more usable items for greater range of test takers



# Functional linguistic item analysis: Buoyancy item (from 4<sup>th</sup> grade NAEP)

Christina has another ball that is the same size as ball 2, but this ball is made of wood and is hollow.



If she put this hollow ball in one of the cups, do you think the water level would rise more or less than it would if ball 2 were put in the cup?

- More
- Less

Tell why you think so:

Coherence: .65  
P value: .45

**Domain:** Physical science

**Item Perspective:** contrast water displacement of items in respect to composition & density

**Situation:** Christina conducts a trial putting two balls of different composition in cups of water.

**Item Demand:** “Do you think ....more or less than....? Tell why.”

**Response Space:** yes-no & constructed response

**Response:** Written causal explanation

# Aspects of Discourse Coherence

## Parameters of Discourse Coherence

- Explicitness
- Key notion support
- Assertiveness
- Lexical cohesiveness
- Consistency

## Selected Grammatical Supports (Text and Visual)

- Overt relational markers (at clause & sentence levels)
- Contextual links and/or definitions to key notions
- Indicative mood
- Co-referencing to key notions
- Consistent use of tense & voice

# ONPAR Buoyancy

ONPAR Buoyancy  
item shown here

Coherence: .75  
P value: .57









# Garden (from 4<sup>th</sup> grade TIMMS)

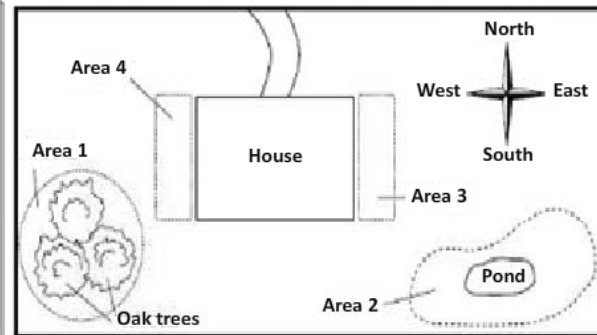
Rebecca wants to plant a garden in her yard. She studied how much sunlight different plants need in a gardening book. Look at the book and the map of Rebecca's yard below.

Coherence: .40  
P value: .33

## Gardening Book

Light needed to grow well		Light needed to grow well	
Fern 	Shade	Shrub 	Afternoon Sun
Rose 	Sun All Day	Shooting Star 	Morning Sun
Wood Rush 	Part Shade	Tomato Plant 	Sun All Day

## Map of Rebecca's Yard



Which correctly shows the **best** places for Rebecca to plant the flowers, shrubs, and plants in her yard?

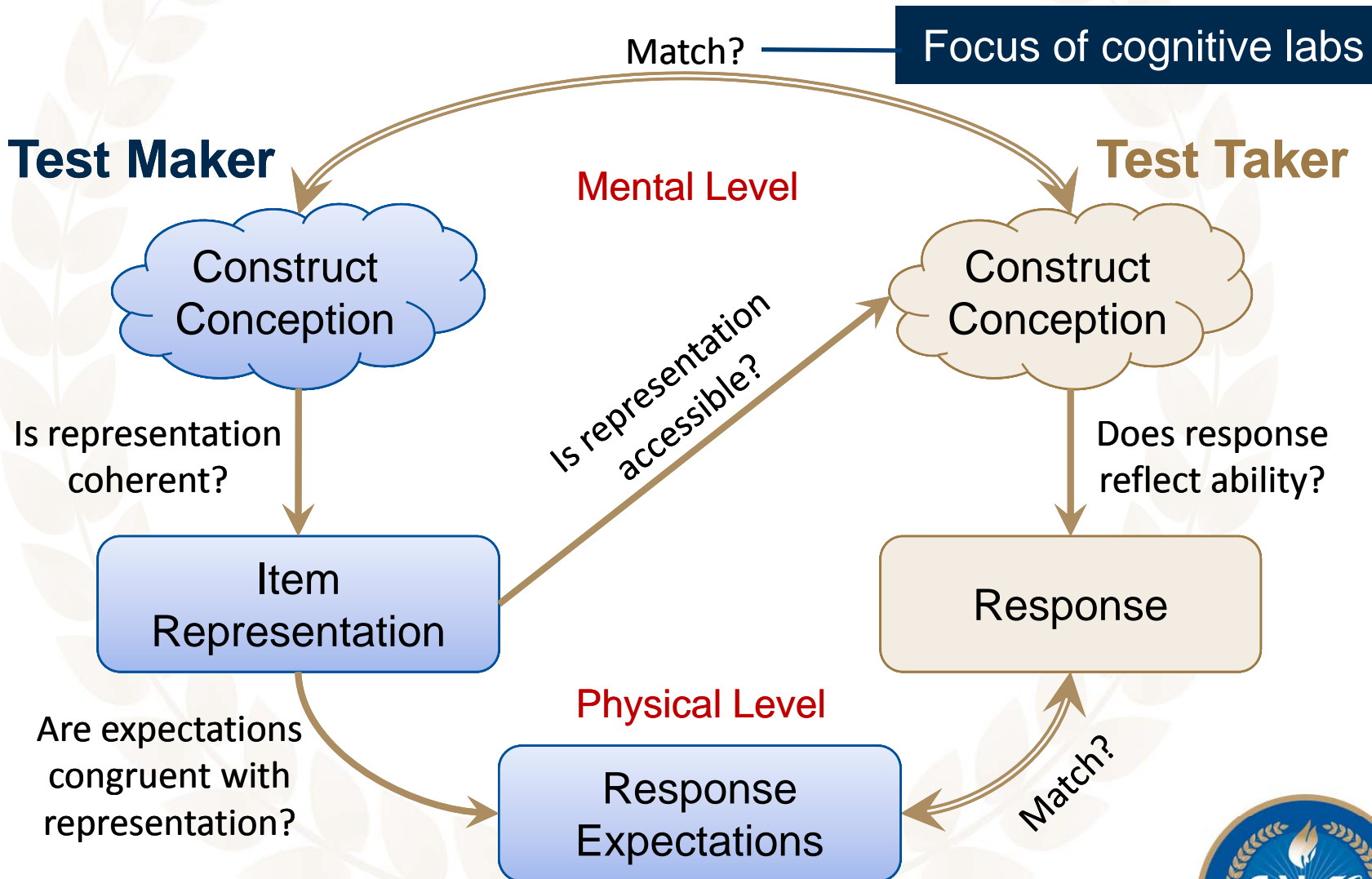
- A Area 1- Wood Rush  
Area 2- Tomato Plant and Shrub  
Area 3- Rose and Shooting Star  
Area 4- Fern
- B Area 1- Shooting Star and Shrub  
Area 2- Fern and Rose  
Area 3- Tomato Plant  
Area 4- Wood Rush
- C Area 1- Fern and Wood Rush  
Area 2- Rose and Tomato Plant  
Area 3- Shooting Star  
Area 4- Shrub
- D Area 1- Shrub  
Area 2- Fern and Wood Rush  
Area 3- Rose and Tomato Plant  
Area 4- Shooting Star

# ONPAR Garden Item

Coherence: .35  
P value: .33

ONPAR garden item  
shown here

# Discourse Level Concerns in a Testing Context



# Research Methods

- Cognitive labs
  - Traditional and ONPAR items
  - Beginning, intermediate, exited ELLs & native speakers (grades 4 and 8)
  - Qualitative findings
  - Iterative labs (5); total N= 58
- Controlled trials
  - Traditional and ONPAR items (2 forms)
  - Beginning, intermediate, exited ELLs & native speakers (grades 4-5 and 8-9)
  - Quantitative findings
  - Total N= 947 students

# Cognitive and Linguistic Findings from Labs

- Traditional items:
  - Reasoning from the text
  - Aspects that hinder coherence: Unfamiliar technical vocabulary (hollow, organisms) in task demand
  - Aspects that help build coherence: Visuals when available
- ONPAR items:
  - Past experience *and* visual reasoning
  - Aspects that hinder coherence: Information overload and missing information (inference load)
  - Aspects that help build coherence: Animations, hyperlinked vocabulary



# Implications

- Item difficulty and accessibility is attributable to more than content; discourse coherence is another important determining factor
- Cognitive labs allow for testing coherence and informing item development process (generate more usable items)
- Multi-semiotic items afford more opportunities to scaffold understanding for ELLs
- Possibility to incorporate visual literacy training for teachers to scaffold student understanding



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