

Development and Validation of an Instrument to Measure Teacher Knowledge of Inquiry

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Background

- Instrument developed as part of national survey of elementary teacher professional development
 - Professional development characteristics, teacher knowledge, teacher practice
- 19-item multiple-choice measuring teacher knowledge of:
 - Scientific inquiry
 - Classroom inquiry
 - Pedagogical content knowledge

Development Process

- Review of existing instruments
- Drew questions from:
 - Assessing PCK on Inquiry Science Teaching (Schuster, Cobern, Schwarts, Velom, & Applegate)
 - Evolving Inquiry (Doll, Bruning, Horn, & PytlikZillig)
- Developed new items
- Table of specifications developed

Table of Specifications


	Reference Source	No. of Questions
Scientific inquiry	The diverse ways in which scientists study the natural world and propose explanations based on the evidence derived from their work (NSES, pg. 23:)	6
Inquiry pedagogy	[Schuster, et al.]	8

	Source	Source	Source	No. questions
Classroom Inquiry	K-4 NSES Standards	Essential features of classroom inquiry	NRC Inquiry Activities	3
	Ask questions about objects, organisms, and events	Engage in scientifically oriented questions	Define questions from current knowledge	5
	Plan and conduct an investigation		Propose preliminary explanations	1
	Gather data	Give priority to evidence	Gather evidence	3
	Use data to construct explanation	Formulate explanation from evidence	Explain based on evidence	2
		Connect explanation to knowledge	Consider other explanations	1

Development Process

- Focus group sessions with pre-service teachers to identify confusing questions and wording
- Resulting pilot assessment had 29 questions
- Pilot test with 164 teachers from two Midwestern states in early 2010 (convenience sample)

Pilot Test Results: Classical Test Theory

- Item difficulty .09 - .99;
 - Discrimination .00 - .43
 - Item-total correlations -.05 to .34
 - Alpha = .54;
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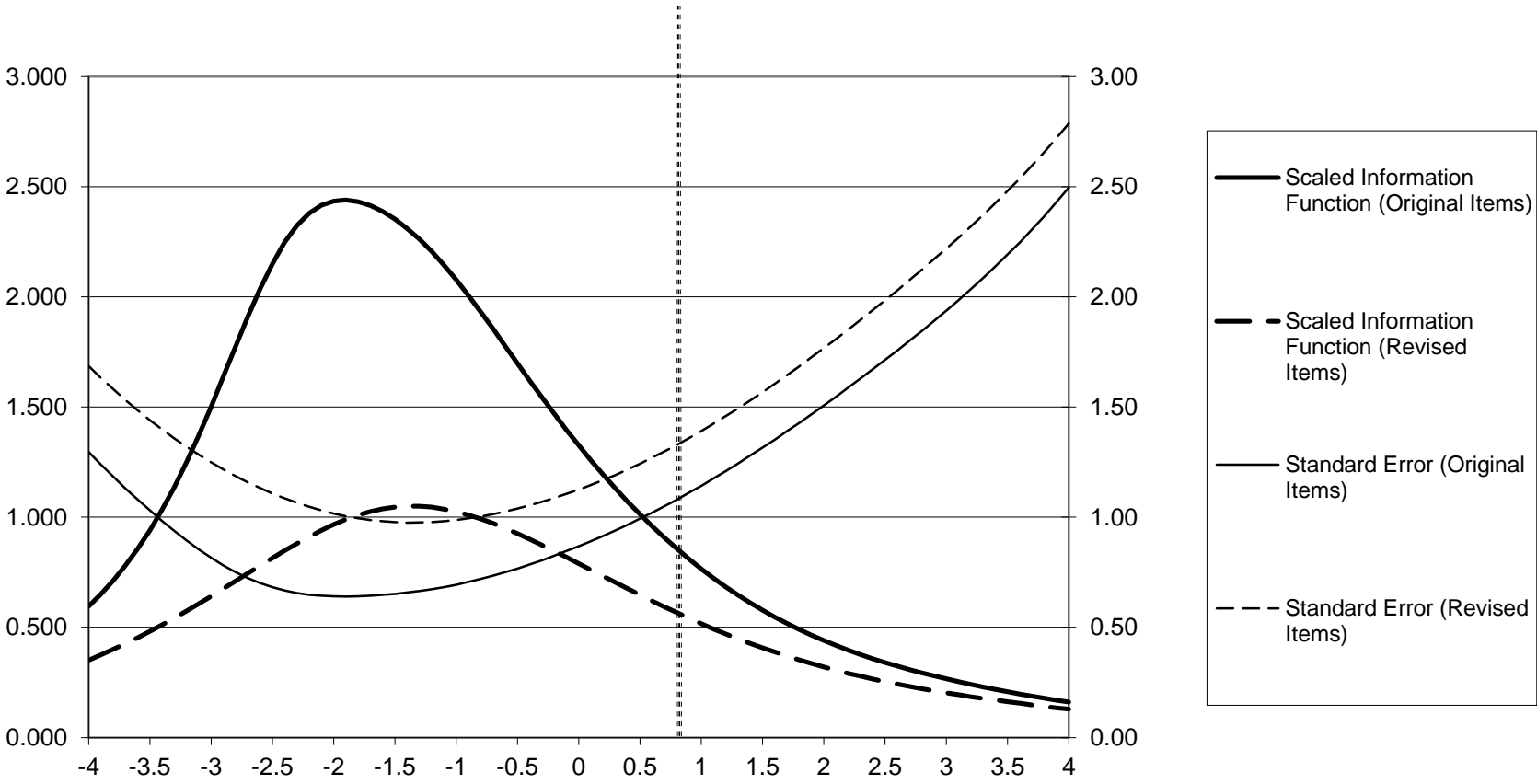
Final Instrument

- Had to balance content coverage, length, and psychometric properties
- Final version had 5 scientific inquiry; 7 classroom inquiry; and 7 PCK questions
- Some retained items were revised based on pilot results.

Psychometrics Comparison: Classical Test Theory

Statistic	Pilot Items	Retained Items
Difficulty	.09 - .99	.09 - .91
Discrimination	.00 - .43	.01 - .36
Item-total correlation	.05 - .34	-.06 - .32
Alpha	.54	.54

Psychometric Comparison: IRT



Procedures for Final Survey Administration

- National survey was stratified random sample
- Mail survey conducted spring, 2010 through early spring, 2011
- Participants received mailed survey introduction, scan-form survey, and post card reminder
- Each teacher randomly assigned math, reading, or science version in equal numbers

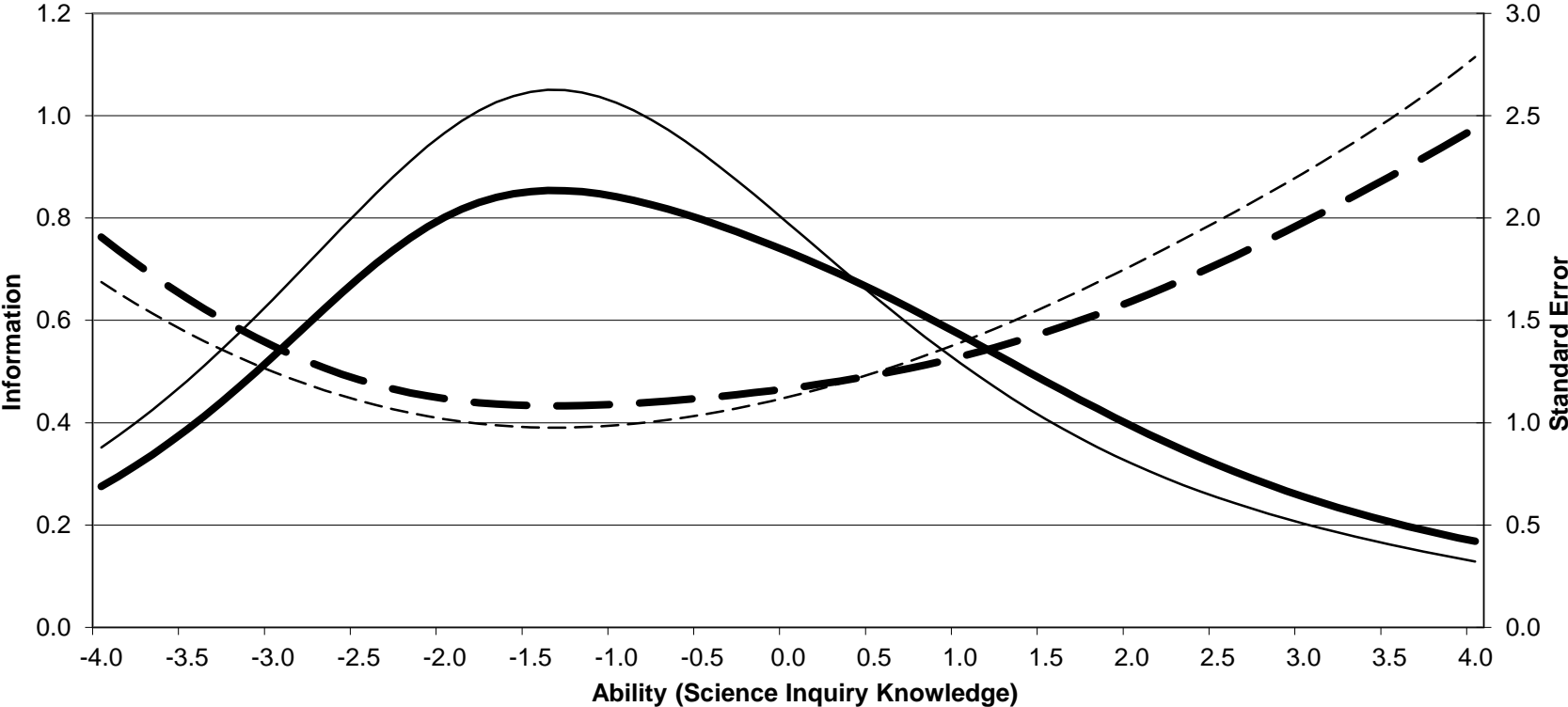
Final Results from National Survey

- Overall return for all subject areas was $n = 595$
- Teachers taking science measure ($n = 142$) scored 56% correct overall
 - Scientific inquiry 48% correct
 - Classroom inquiry 63%
 - Pedagogical content knowledge 55%

CTT Comparison

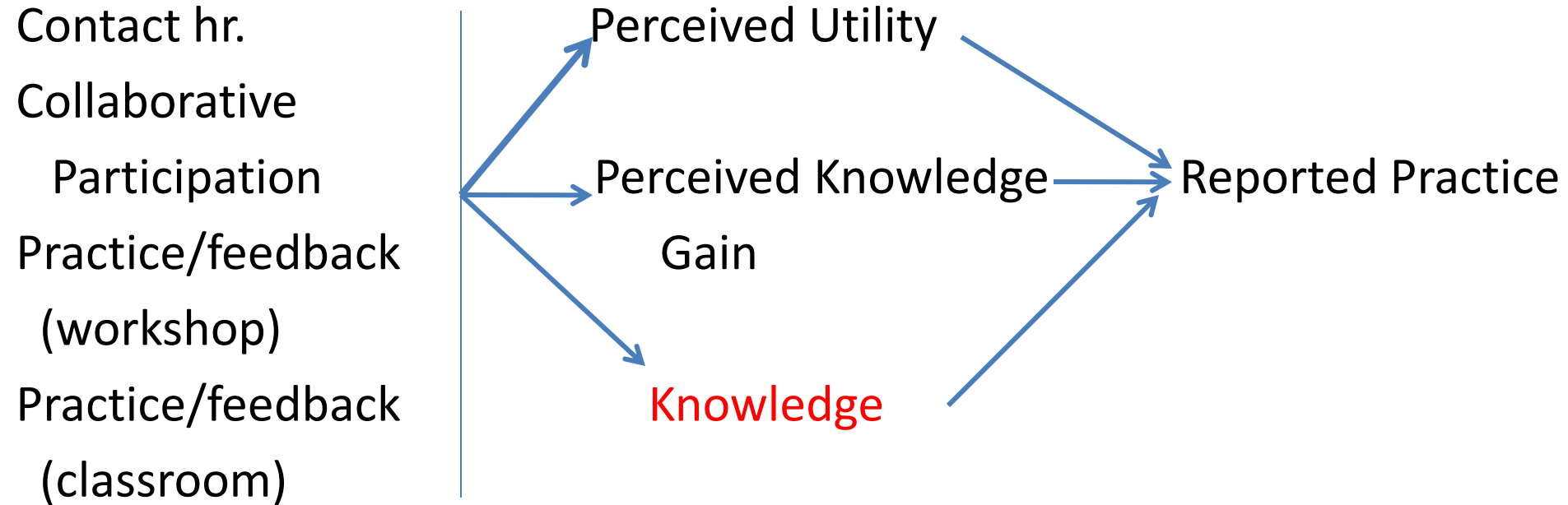
Statistic	Pilot Items	Retained Items	Final Results
Difficulty	.09 - .99	.09 - .91	.05 - .91
Discrimination	.00 - .43	.01 - .36	.12 - .41
Item-total correlation	.05 - .34	-.06 - .32	-.03 - .34
Alpha	.54	.54	.54

IRT Comparison



— Revised: Information — Pilot: Information - - - Revised: SE - - - Pilot: SE

Future Directions: Data Analytic Model



Future Directions

Knowledge measure will be one of the dependent variables for randomized control trial examining impacts of guided inquiry professional development, including coaching.

Final Results from National Survey

Presentation Wednesday, March 6 at 2:45 in
Curacao 8

Contacts

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