Surveying Instruments on the Views of Science

Physics Education Group Seminar
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Motivation

Expectations and School Performance

- Prior achievement vs. Academic Self Concept (House)
- Teacher-Student Gender Matching (Sadler and Tai)

Research Question

- Why would most pre-service elementary education students not specialize in science?
- What influence does Concepts of Physics (a reform class) class have on their decision to specialize or not specialize on science?

Instruments

Can Relate to Physics

VOSTS - Views on Science - Technology - Society (1989)
MPEX - Maryland Physics Expectations Survey (1992)
VASS - Views about Science Survey (1995?)
EBAPS - Epistemological Beliefs Assessment for Physical Science (1998)
CLASS - Colorado Learning Attitudes about Science Survey (2003)

Relates to Pre-Service Teachers

TSSI - Thinking about Science Survey Instrument (2002)
VNOS - Views on the Nature of Science (1990)

VOSTS

114 Multiple Choice items

Categories

Interaction of Science, Society and Technology
School Characterization of Science
Characteristics of Scientist
Construction of Scientific Knowledge
Epistemology of Science

Content Validation
Criterion Validation (non-reported)
Construct Validation (empirically produced)

MPEX

34 item Likert-Scale (Agree-Disagree)

Dimensions

Independence
Coherence
Concepts
Reality Link
Math Link
Effort

Content Validation
Criterion Validation (non-reported)
Construct Validation (?) (factor analysis wasn't done)

VASS

Forced-Choice 30 items

Scientific Dimensions

1. Structure
2. Methodology
3. Validity

Cognitive Dimensior

4. Learnability
5. Reflective Thinking
6. Personal Relevance

Content Validation
Criterion Validation (correlating FCI scores with VASS scores)
Construct Validation (?) (factor analysis wasn't done)

EBAPS

Likert-scale (agree/disagree), Multiple choice items, Debate items.

Subscales

Structure of Scientific Knowledge
Nature of Knowing and Learning
Real-Life Applicability
Evolving Knowledge
Source Ability to Learn

Content Validation
Criterion Validation (non-reported)
Construct Validation (?) (factor analysis wasn't done)

CLASS

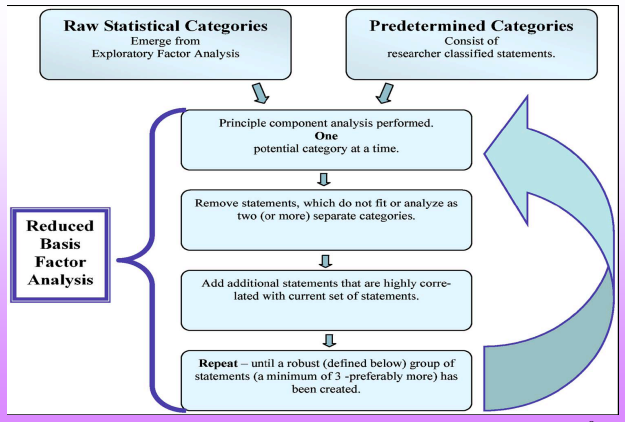
42 item Likert-Scale (Agree-Disagree)

Categories

- Personal Interest
- Real World Connection
- Problem Solving General
- Problem Solving Confidence
- Problem Solving Sophistication
- Sense Making / Effort
- Conceptual Understanding
- Applied Conceptual Understanding

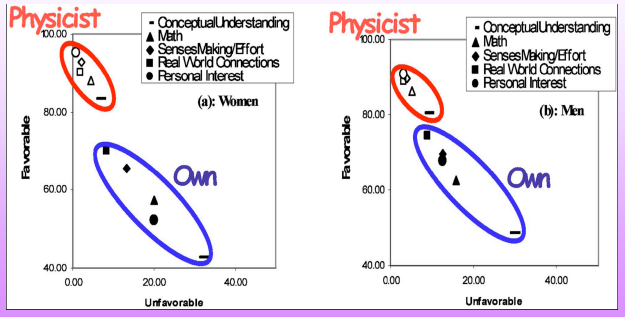
Content Validation
Criterion Validation (Con-current and predictive)
Construct Validation (Rigorous Statistical Analysis)

CLASS cnt'd



CLASS cnt'd

"What would Physicist Say?" "What would you think?"



Women Men

TSSI

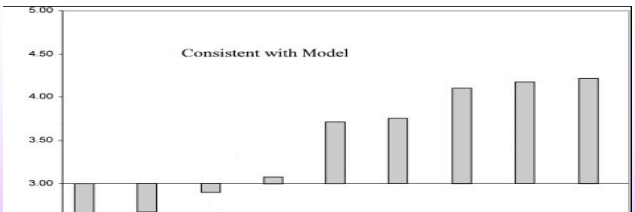
35 item Likert-scale (Agree-Disagree)

Categories

Epistemology
Science and the Economy
Science and the Environment
Public Regulation of Science
Science and Public Health
Science and Religion
Science and Aesthetics
Science, Race and Gender
Science for All

Content Validation
Criterion Validation (non-reported)
Construct Validation

TSSI cnt'd



	POLY	RELIG	EPIST	R & G	BEAUT	ENVIR	ECON	For_All	HEAL
Means	2.43	2.66	2.90	3.07	3.71	3.75	4.10	4.17	4.22
SD	0.696	0.942	0.638	0.878	0.718	0.628	0.529	0.640	0.662

VNOS

Version 3, 10 open-ended questions

Dimensions

- Empirical Nature of Scientific Knowledge
- Observation, Inference, and Theoretical Entities in Science
- Scientific Theories and Laws
- The Creative and Imaginative Nature of Scientific Knowledge
- The Theory Laden Nature of Scientific Knowledge
- The Social-Cultural Embededness of Scientific Knowledge
- Myth of the Scientific Method
- The Tentative Nature of Scientific Knowledge

VNOS cnt'd

Why qualitative?

Forced-choice item problems:

- respondents may not view questions as the developers intended (context)
- instruments reflect the developers' nature of science and biases
- philosophical stances

Open-ended item advantages:

- justification of answers is inherent
- contextualized answers
- assessing small changes

VNOS cnt'd

Content and Construct Validity:

- arts vs science professors
- an ongoing process

Data Interpretation:

- Reaffirm validity of instrument
- Separate analysis of questionnaire and interview
- Check congruency ----> reliability
- Interpretation of all questionnaire

Thank You!

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