Future Elementary Teachers’ Epistemic Beliefs and Views About the Nature of Science

N. Sanjay Rebello
Kansas State University

Research Questions
What are future elementary teachers’... epistemic beliefs regarding the physical sciences?
- How do these epistemic beliefs change after they complete a physical science course?
views about the nature of science?
- How do these views change after they complete a physical science course?

Research Participants & Context
- Elementary Education Majors
  - N = 108
  - 95% women
- Conceptual Physics Course
  - Almost no students have high school physics
- Pedagogy: Learning Cycle
  - Exploration: 1st half of week in Activities Center
  - Concept Introduction: Lecture with Peer Instruction
  - Application: 2nd half of week in Activities Center

Data Sources
Pre-Post comparisons of scores on...
- Epistemic Beliefs in the Physical Sciences (EBAPS) Survey
  - A 30-question multiple choice questionnaire
- Views about Nature of Science (VNOS) Survey
  - A seven-question open-ended questionnaire

Interpreting EBAPS
Four Dimensions
- Structure of Knowledge
  - Coherent vs. Pieces
- Nature of Learning
  - Propagated from authority vs. Self constructed
- Real-Life Applicability
  - Applicable vs. Non-applicable to the real world
- Source of Ability to Learn
  - Innate vs. Acquired

EBAPS Results
- Structure of Knowledge
- Nature of Learning
- Real-life Applicability
- Evolving Knowledge
- Source of Ability to Learn

Means and standard errors for pre and post scores:
Conclusions
Future elementary teachers’ epistemic beliefs in the physical sciences are...
- Non-expert like (EBAPS score below 3) both before and after completion of a physical science course.
- Change in some dimensions after taking the physical science course.
  - Statistically significant ($p < 0.05$) change in “Nature of Learning,” “Real-Life Applicability” and “Source of Ability to Learn” dimensions
  - Only the “Real-Life Applicability” dimension shows a significant change (Effect Size = 0.43)

Limitations of Study
Inherent limitations in the instruments
- EBAPS:²
  - Teasing Epistemology vs. Expectations
  - Teasing Beliefs vs. Goals
  - Inferring students’ sophistication
  - Inviting stock responses from students
- VNOS:³
  - Validity of open-ended responses need follow-up interviews

Future Work
- Confirm the validity of VNOS open-ended responses
  - Do students’ responses to interview questions agree with their open-ended responses to VNOS questions?
- Examine correlations between EBAPS scores and course performance
  - Do students with more sophisticated epistemic beliefs perform better in the course?
- Investigate connections between epistemic beliefs and views about the nature of science
  - Do students with more sophisticated epistemic beliefs also have more sophisticated views about the nature of science?

THANK YOU
For information please contact srebello@ksu.edu