

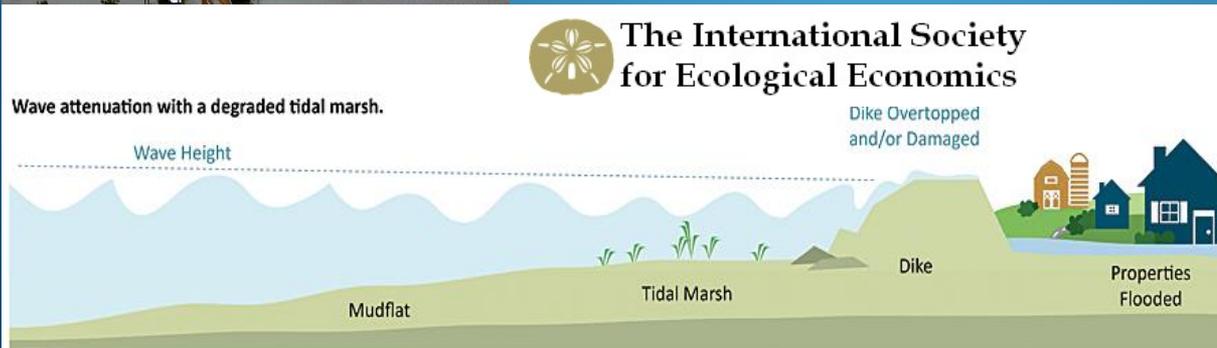
An Epistemic Cognitive Approach to Ecological Economics & Science

A Case Study of Participatory Planning of Coastal City Resilience & Equity

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International Society for Ecological Economics

UDC, Washington DC, June, 2016





ABSTRACT: Towards an Epistemic Cognition Approach to Ecological Economics ISEE 2016

Investigations of epistemic cognition of ecological economics would be most helpful to understand how individuals and communities of practice think and act about ecological economics, whether they are aware of it or not.

An epistemic cognitive approach has the promise of revealing some of the differences between conventional economics and ecological economics as they are manifested in social interaction of actual communities of practice producing local situational knowledge. Communities of practice are “groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly” (Lave & Wenger, 1991).

We report on an investigation of epistemic cognition of ecological economics from qualitative data generated by a case study of an urban coastal city in a post-disaster situation planning for resilience against future storm surge flooding (Ruppert, 2015), and ethnographic notes being collected on an ongoing basis as a new set of socio-economic and political factors emerge and take on greater importance and conflicts over cost and justice issues arise.

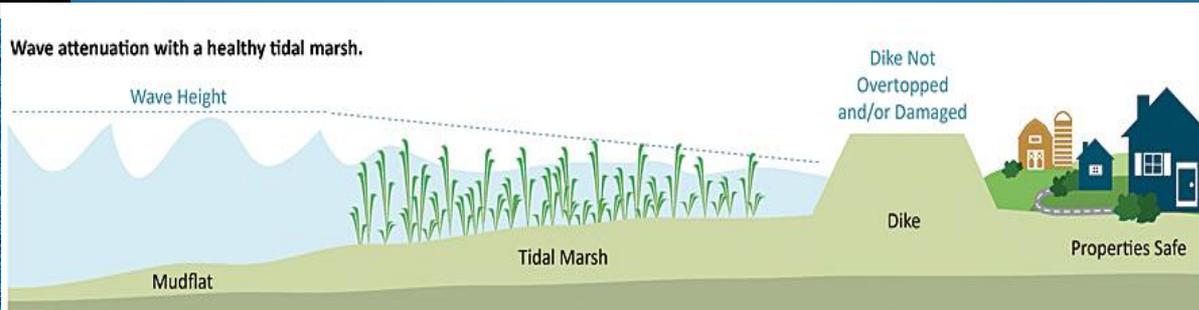
Our qualitative data collection and analysis are guided by educational psychologists Chinn, Rinehart and Buckland (2014) AIR model (Aims and value, epistemic Ideals, and Reliable processes for achieving epistemic aims) which allows us to investigate how competing aims, both epistemic and non-epistemic, as well as ideas about science evidence and processes are used to construct evidence to track and characterize patterns of community engagement and identify factors that lead to these different patterns of engagement.

The challenge is to adapt this model developed by educational psychologists and philosophers to trans-disciplinary ecological economics in a social political setting where epistemic virtues and vices illuminate and obfuscate. This is an investigation of knowledge of ecological economics knowledge, hence a meta-study, an attempt to become more self-aware. The presentation is meant to provoke thought and discussion on new directions for ecological economics to develop, communicate, and educate.

Ecosystem Services

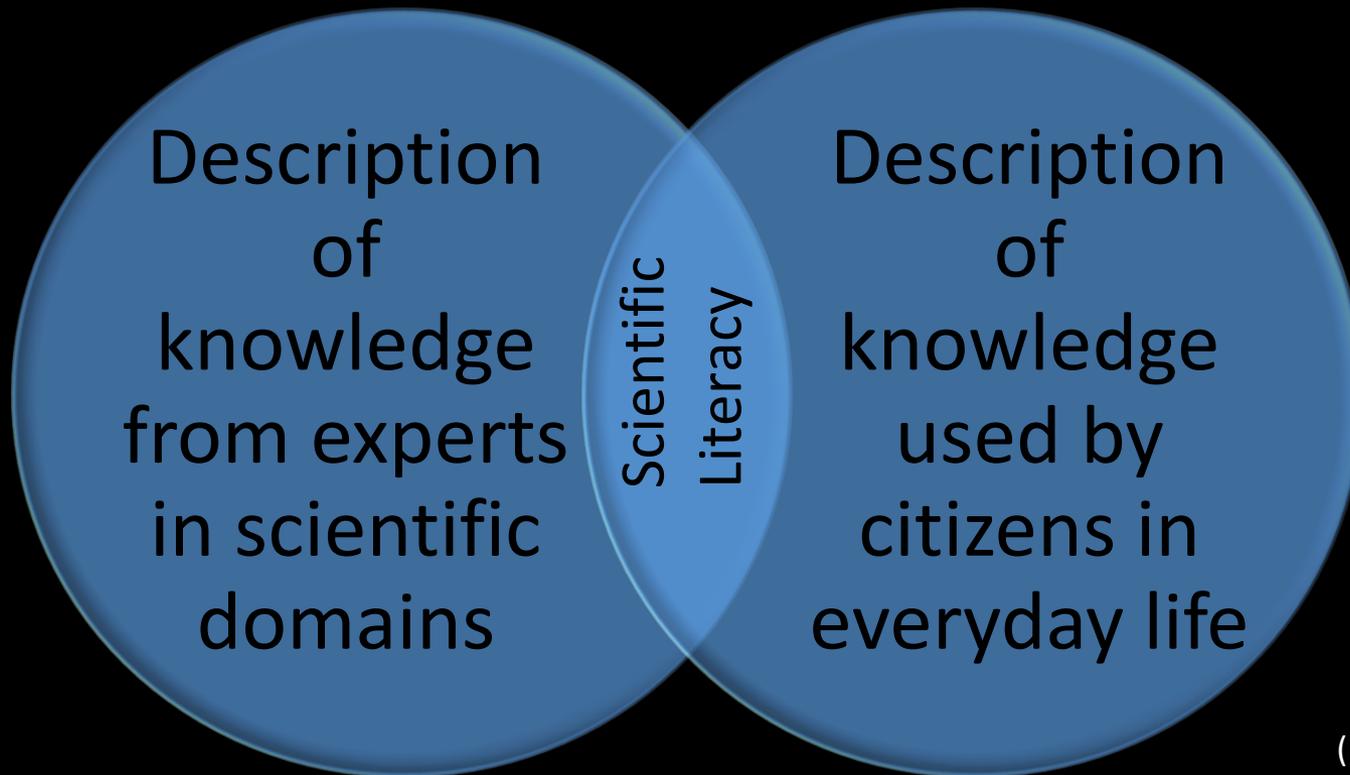


-MA, 2005; Costanza, et al. 1991



Ruppert 2015

Empirically Characterizing Important Knowledge for Scientific Literacy



(Feinstein, 2011)

Note: Ruppert (2015)
Findings Modifies
This Diagram



What does one need to know in order to be scientifically literate about Ecosystem Services?

-Feinstein, 2014

Competent Outsiders

People who have learned to recognize when science has some bearing on their needs and interests and learned to interact with sources of expertise in ways that help them achieve their goals.

(Feinstein, 2011)

Outsider-Specific/Situated Knowledge

*Issue: Uncertainty application of scientific knowledge in actual situation

Different Types of Knowledge for Competent Outsiders Investigated

Conceptual

- Facts or principles
- Static information
- Theory in a domain

Epistemic

- Sources of knowledge
- Valid ways of developing knowledge
- Knowing differences between knowledge sources.

Strategic (for engagement)

- Sequences of activities
- Driving Questions
- Inquiring Activities and Practices

(Chinn, Reinhart, & Buckland, 2014; deJong & Ferguson-Hessler, 1996; Greeno, 1978; Muis, Bendixen & Heerle, 2006; NRC, 2012)

Competent Outsiders: Science & Economics? Problematic!

People who have learned to recognize when science (& economics?) has some bearing on their needs and interests and learned to interact with sources of expertise in ways that help them achieve their goals.

(Feinstein, 2011)

Case Study Context

Better results when not hypothetical



Town flooded by hurricane-induced storm surge.

Town hired a design team to develop a *resiliency* plan.

At time of study, design team presented green infrastructure plan to residents at a public forum.

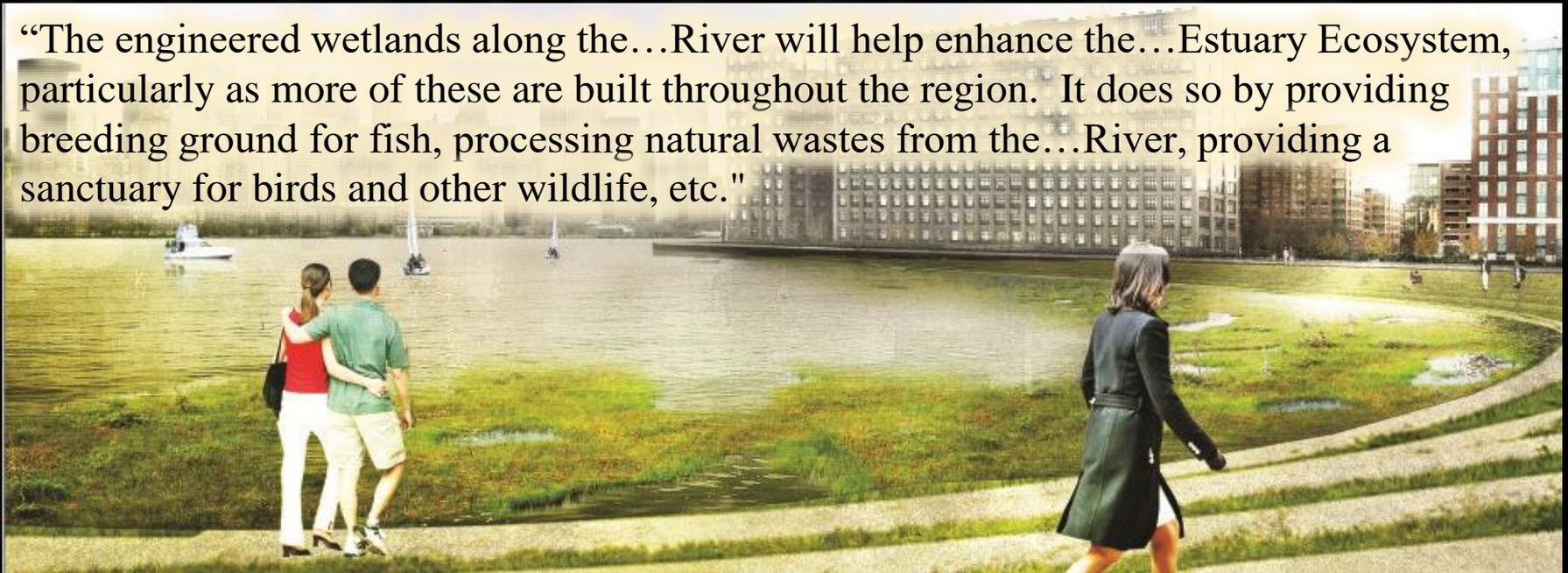
Case Study Context

Terraced Wetland System with a Band of Tidal Wetlands



Ecosystem Claims

“The engineered wetlands along the...River will help enhance the...Estuary Ecosystem, particularly as more of these are built throughout the region. It does so by providing breeding ground for fish, processing natural wastes from the...River, providing a sanctuary for birds and other wildlife, etc.”



Competent Outsiders: Interviews

“The engineered wetlands along the...River will help enhance the...Estuary Ecosystem, particularly as more of these are built throughout the region. It does so by providing breeding ground for fish, processing natural wastes from the...River, providing a sanctuary for birds and other wildlife, etc.”

14 Candidate Competent Outsiders

- Citizens who were active in local decision-making about variety of issues including environmental.
- Semi-structured interview protocol

Theoretical Framework Epistemic Cognitive Psychology & Philosophy of Science (Chinn, Reinhart & Buckland 2014)

Characterizing engagement

Aims

- Goals of engagement
- **Epistemic and Non-epistemic**

Ideals

- Criteria for good evidence and epistemic products

Reliable Processes

- Driving Questions
- Inquiring Practices
- Constructing Explanations

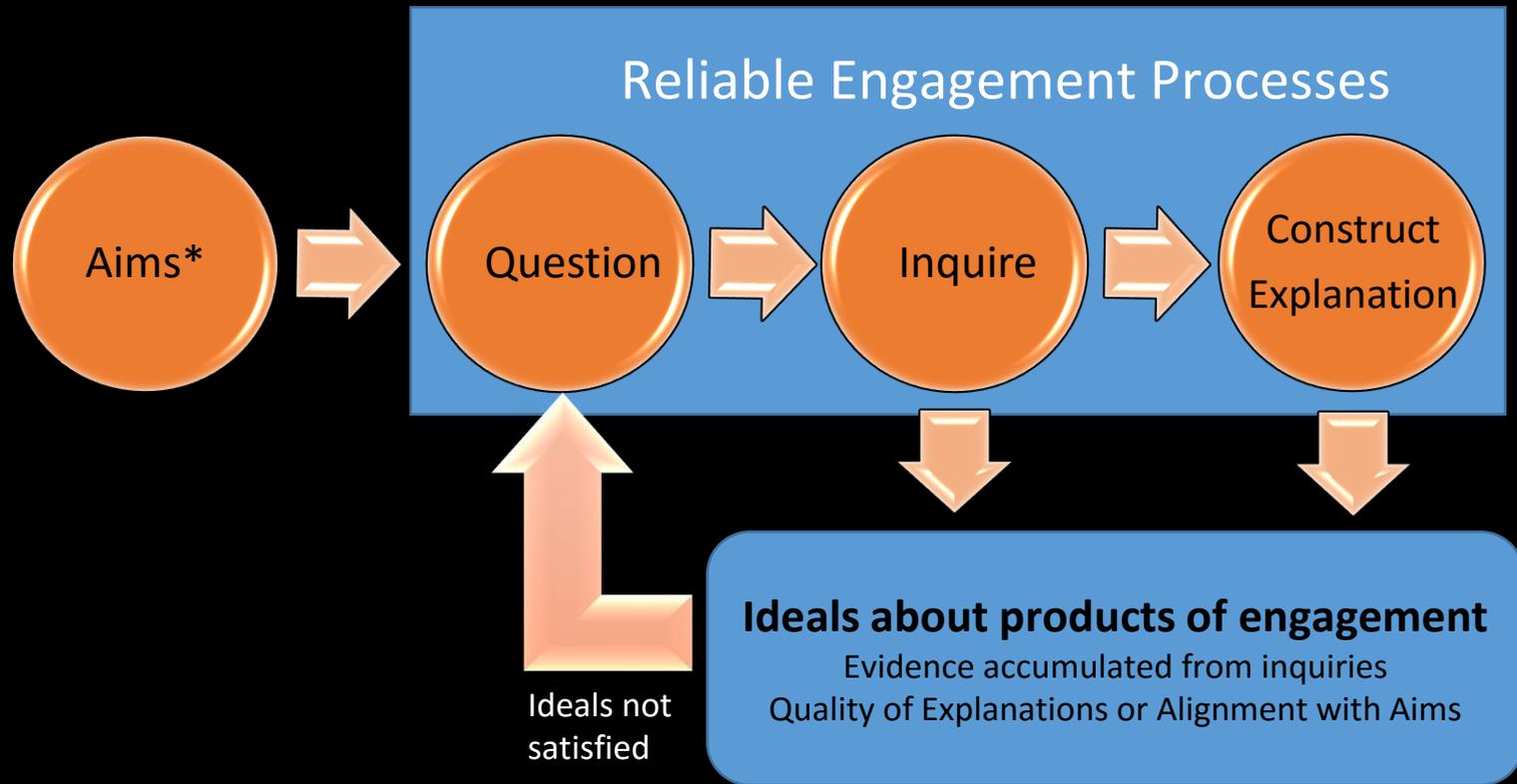
(Chinn, Reinhart, & Buckland, 2014)

+ Theoretical Framework: Feinstein (2014)

Characterizing engagement

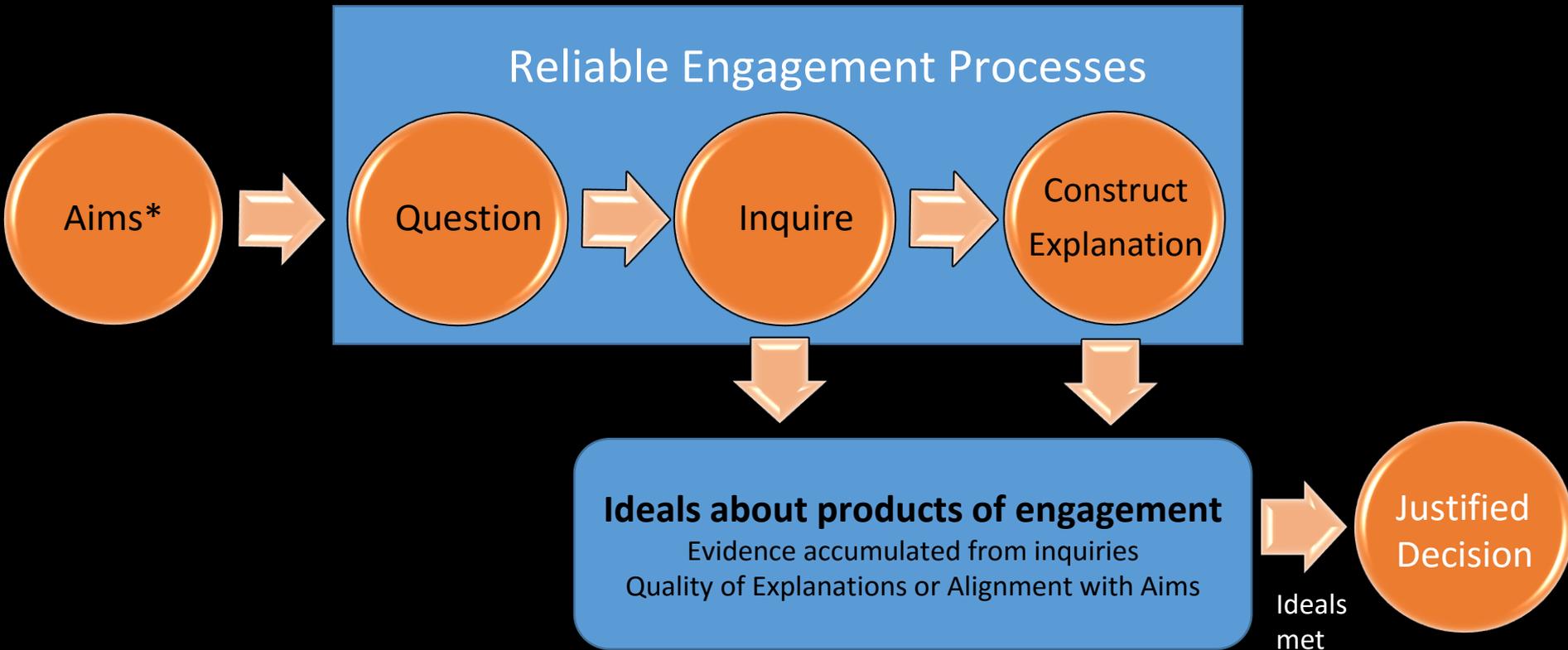


The Questioning Cycle



* Aims: Epistemic & Non-Epistemic

The Definitive Justification



* Aims: Epistemic & Non-Epistemic

Competent Outsiders: Science & Economics? Environmental Justice? Problematic!

People who have learned to recognize when science (& economics?) has some bearing on their needs and interests and learned to interact with sources of expertise in ways that help them achieve their goals.

(Feinstein, 2011)

-> Develop Theoretical Framework of Epistemic Cognition of Ecosystem Science to Include Economics and Environmental Justice:
Feinstein, Chinn, et al., & Ruppert.

Current Epistemic Cognition Ecosystem Science

Investigations: Economics & Communities of Practice

- a) Investigate engagement of **economics and science** of ecosystem services.
- b) Investigate economic knowledge types and qualities.
- c) Distinguish epistemic and non-epistemic aims in regards to economics of ecosystem services.
- d) Develop theoretical framework for interview questions, observations, and data coding for engagement with economics of ecosystem services.
- e) New round of interviews of experts & competent outsider candidates with economic questions. Expand to focus groups and ethnographic observations to look at social dimensions of cognition and knowledge. Analyze and code public meeting records.
- f) Analyze scientific and political economic context of case study.



References

- Chinn, C.A., Reinhart, R.W. , Buckland, L.A. (2014). Epistemic cognition and evaluating information: Applying the AIR model of epistemic cognition. In D. Rapp and J Braasch (Eds.), *Processing Inaccurate Information: Theoretical and applied perspectives from cognitive science and the educational sciences* (pp 425-253). Cambridge, MA: MIT Press.
- Covitt, B.A., Tan, E.,Tsurusaki B.K., & Anderson, C.W. (2009). Students' use of scientific knowledge when making decisions in citizens' roles. Paper presented at the Annual Conference of the National Association for Research in Science Teaching, Garden Grove, April 7-21.
- deJong, T., Ferguson-Hessler, H.G.M. (1996). Types and qualities of knowledge. *Educational Psychologist*, 35, 105-113.
- Feinstein, N. (2011). Salvaging scientific literacy. *Science Education*, 95, 168-185.
- Feinstein, N. (2014). Making sense of autism: progressive engagement with science among parents of young, recently diagnosed autistic children. *Public Understanding of Science*, 23, 592-609.
- Greeno, J.G. (1978). Understanding and procedural knowledge in mathematics instruction. *Educational Psychologist*, 12, 262-283.
- Martorella, P. (1991). Consensus building among social educators: a Delphi study. *Theory and Research in Social Education*, 19, 83-94.
- Muis, K.R., Bendixen, L.D., Haerle, F.C. (2006). Domain-general and domain-specificity in personal epistemology research: philosophical and empirical reflections in the development of a theoretical framework. *Educational Psychology Review*, 18, 3-54.
- [NRC] National Research Council (2012). *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Washington, DC: National Academies Press.
- Osborne, J., Collins, S., Ratcliffe, M., Millar, R., & Duschle, R. (2003). What "ideasabout-science" should be taught in school science? A Delphi study of the expert community. *Journal of Research in Science Teaching*, 40, 692-720.
- Ruppert, J. (2015). *Ecosystem Services in Environmental Science Literacy*. Dissertation. Rutgers University.

Towards an Epistemic Cognition Approach to Ecological Economics & Science



The screenshot shows the homepage of the International Society for Ecological Economics (ISEE) 2016 conference. The header includes the society's logo and name, along with navigation links for Home, Organizers, About ISEE2016, Call for Abstracts, and Contact. The main content area features a large banner with the text 'ISEE2016' and the subtitle 'Transforming the Economy: Sustaining Food, Water, Energy and Justice'. Below this, the dates 'JUNE 26 - 29, 2016' and the location 'WASHINGTON, DC' are displayed. At the bottom of the banner, the specific session information 'Session T07 June 27 10:45am Rm 38-106' is provided.

**The International Society
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ISEE2016

Transforming the Economy: Sustaining Food, Water, Energy and Justice

JUNE 26 - 29, 2016
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Appendix: Education Slides

Driving Research Questions

- How do individuals and “communities of practice” think and act about ecological economics, whether they are aware of it or not?
- How is epistemic cognition of ecosystem economics different from ecosystem science?
- What is an cognition approach to ecological economics? How useful?
- How can we better educate and train individuals and communities to engage in ecosystem science and economics?
- What blocks individuals and communities from developing an understanding of ecosystem science and economics, and creating useful & effective situational knowledge?

Driving Research Question: Why Important to Educators

- Guide to what is important in teaching and learning to develop ecosystem cognitive capacity and skills.
- Guide to what content areas are important in teaching and learning to develop ecosystem cognitive capacity and skills.
- Guide to understand developing dispositions/identities and experiences of self-efficacy and collective efficacy to be agents of change for sustainability.
- Understand barriers to learning ecosystem science and economics and how to overcome them.

Driving Research Question

Distinguish from Previous Research

- Build upon and develop the first application of educational psychology AIR epistemic model to ecosystem cognition in practice (Ruppert, 2015)
- Develop new directions of Ruppert (2015):
 - Social-interactive “communities of practice” dimensions.
 - Economic and political dimensions
- Begin to lay groundwork for an area of inquiry of the epistemic cognition of ecological economics. (Only one explicit study found (Tomaselli, 2015))

Driving Research Question

Why Read the Research

- Educators: Improve teaching and learning of ecosystem knowledge. Learn what are the most important cognitive skills and content. Importance of disposition and identity.
- Planners: Guide to facilitate more effective community based planning (“Communities of Practice”).
- Environmental Justice Organizers /Activists: Guide to developing capacities to be “Agents of Systemic Change.”
- Ecological Economists: Guide to how to communicate and education. Groundwork of new subfield of inquiry.
- Scientists: Guide to how to work with economic knowledge.

Key Findings of Literature Review

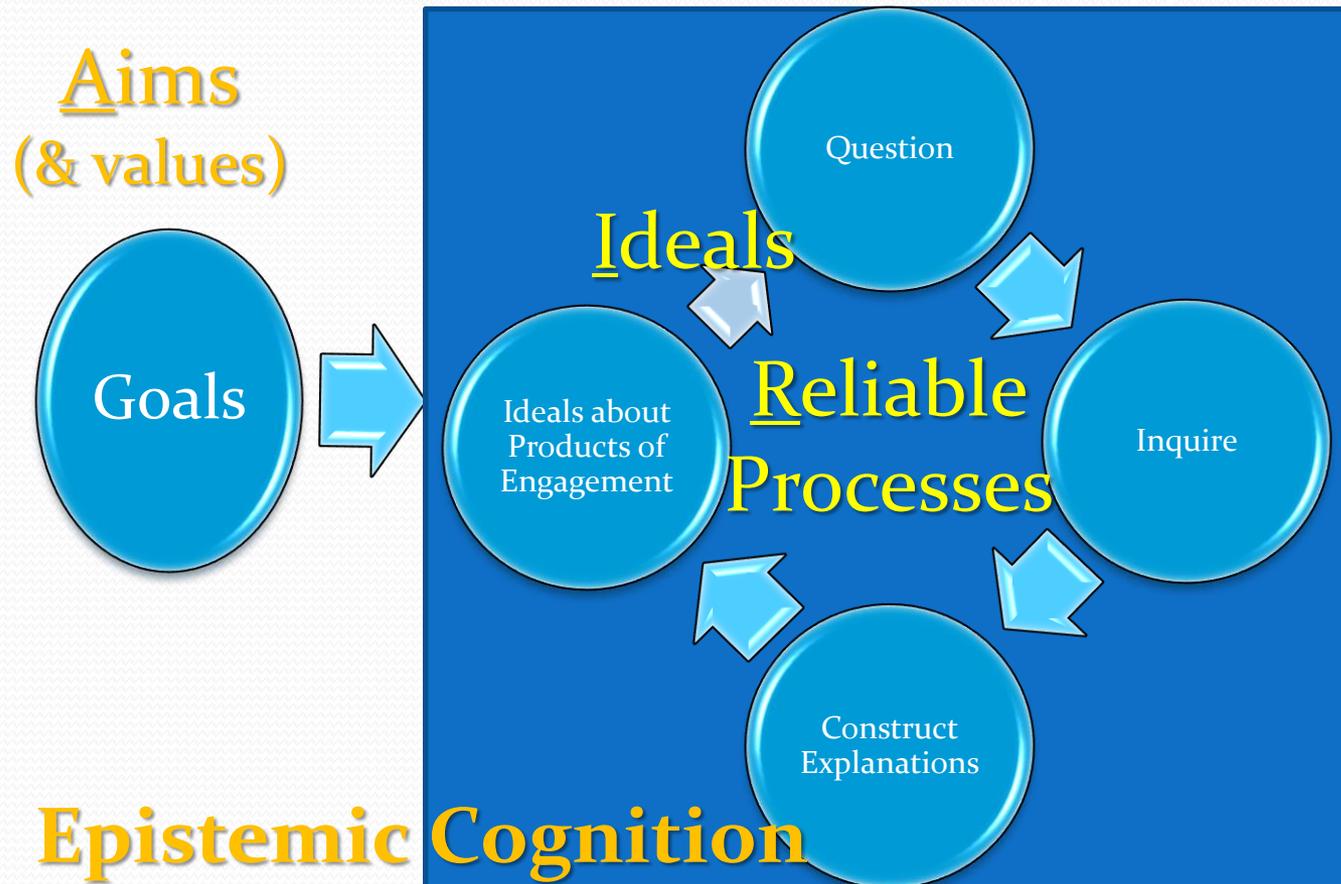
- **Lack of Literature** on Cognition of Ecological Economic (EcolEcon) Knowledge.
- **Environmental Education**, predominantly looks at identity /moral development and outdoor education as path to Ecosystem cognitive development.
NAAEE (Fall 2014, AERA EE SIG member (April 2014, 2015)
- **Ecological Economic Conferences:** Issue & Need to Know Comes Up, But Little Research, Seen as “*Problem of Communication of EE*”
- **Communication Literature:** How to. Values. Framing.
- **Sustainability Literature:** Case Studies. Paradigm framing.
- **Fernanda Tomaseli:** *Towards an ecological economics paradigm: Exploring mental models and public perceptions, CANUSSEE, Vancouver, October 2015*
- **Theology & Social Justice Literature** Suggestion (Dr. Alain)
- “**Communities of Practice**” Back On Table!
- **Behavioral Economics.** As practiced, doesn't include this area or qualitative methods. Aspiration of Gund Institute to combine EE and Behavioral Economics. Future Intersection.

Qualitative Research

- Interview transcripts of individuals and AIR model coding from Ruppert (2015) (see next slide).
- Observing community planning meetings and taking ethnographic notes.
- Collecting artifacts.
- Developing new codes for economic, social, and political dimensions.
- Additional literature search to inform coding.
- Need to develop focus group questions to draw out economic thinking.

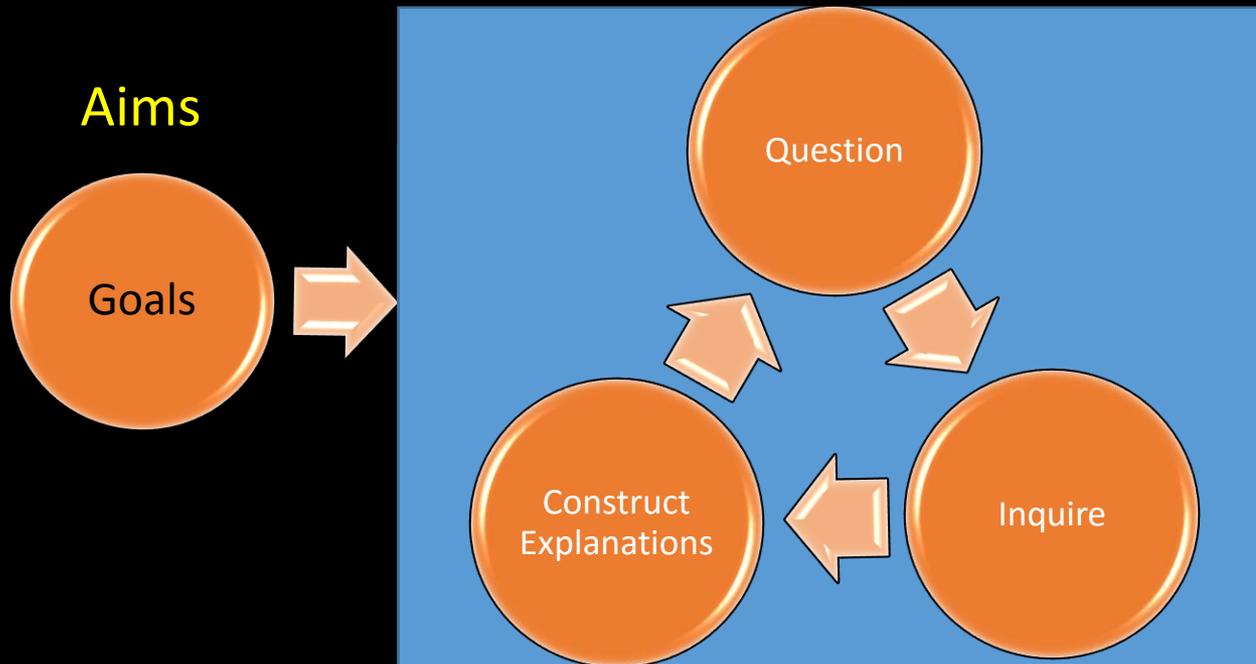
Research Question	Interview (or survey) questions	Analysis or Coding plan

Ruppert (2015) Theoretical Framework for Coding



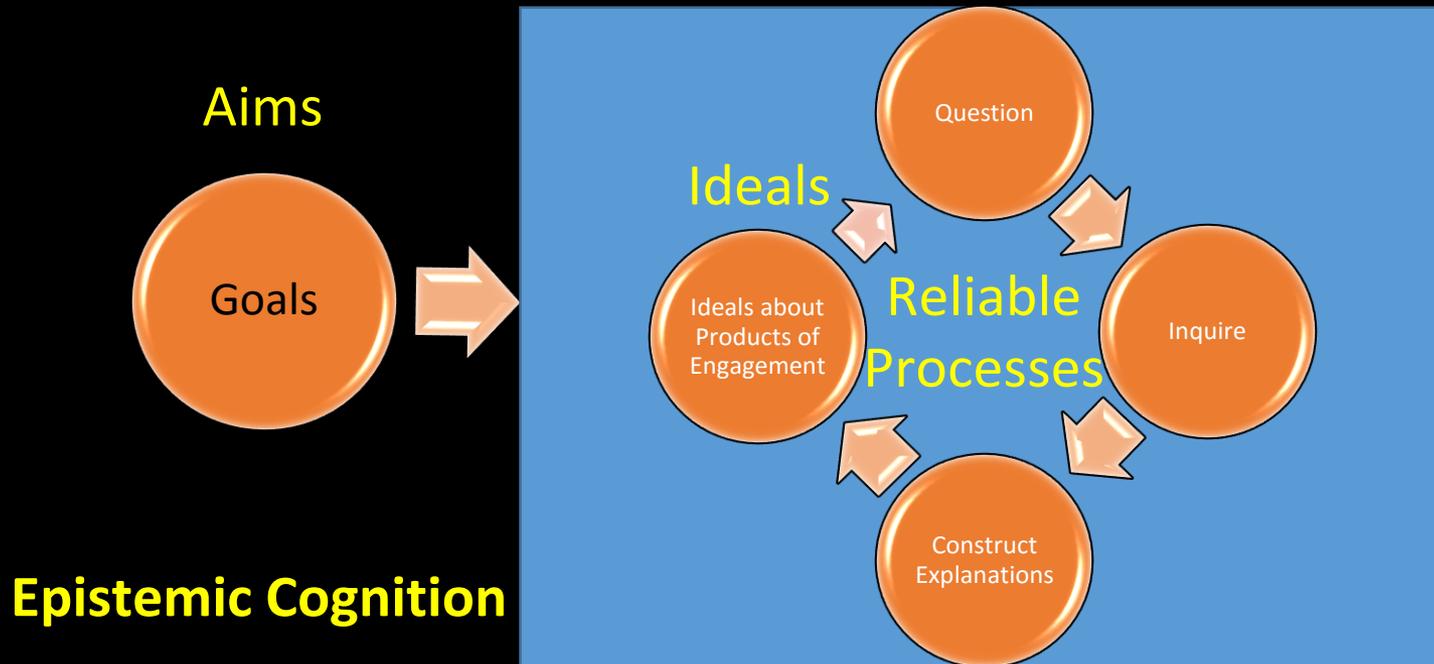
Theoretical Framework Synthesis (Ruppert 2015)

Characterizing engagement



Paper 3 - Theoretical Framework Synthesis (Ruppert 2015)

Characterizing engagement



Findings

Qualitatively Different Patterns of Engagement

