

Abstract

This session will describe the theoretical framework of threshold concepts and explore its relevance to the relationship between epistemic and ontological cognitive development (EOCD) and applying systems principles to complex problems. Threshold concepts are defined as concepts that are essential for the mastery of a particular disciplinary framework (Meyer & Land, 2005). Further, they are key concepts that need to be understood before a student can develop beyond the stage of novice.

Studies of personal epistemology focus on “how the individual develops conceptions of knowledge and knowing and utilizes them in developing understanding of the world” (Hofer & Pintrich, 2002, p. 4). These studies are interested in “beliefs about the definition of knowledge, how knowledge is constructed, how knowledge is evaluated, where knowledge resides, and how knowing occurs” (*ibid*). Systems thinking, based on the principles of holism and pluralism, is necessary for dealing with issues of complexity and uncertainty (Bawden, 2007). Both holism and pluralism require complex ontological beliefs and epistemic cognitive skills (Bawden, 2007).

By integrating Reflective Judgment Model (King & Kitchener, 1994) and Model of Epistemic and Ontological Cognitive Development (Greene, Torney-Purta, & Azevedo, 2010), I position EOCD as having the characteristics of a threshold concept for systems thinking; however, I argue further that the term *threshold process* is a more accurate descriptor for EOCD in relation to systems thinking. I will present pedagogical activities for promoting EOCD and developing systems thinking competencies. You will have the opportunity to discuss your own practices relative to teaching about systems.

The Role and Value of Epistemic and Ontological Cognitive Development in ESD

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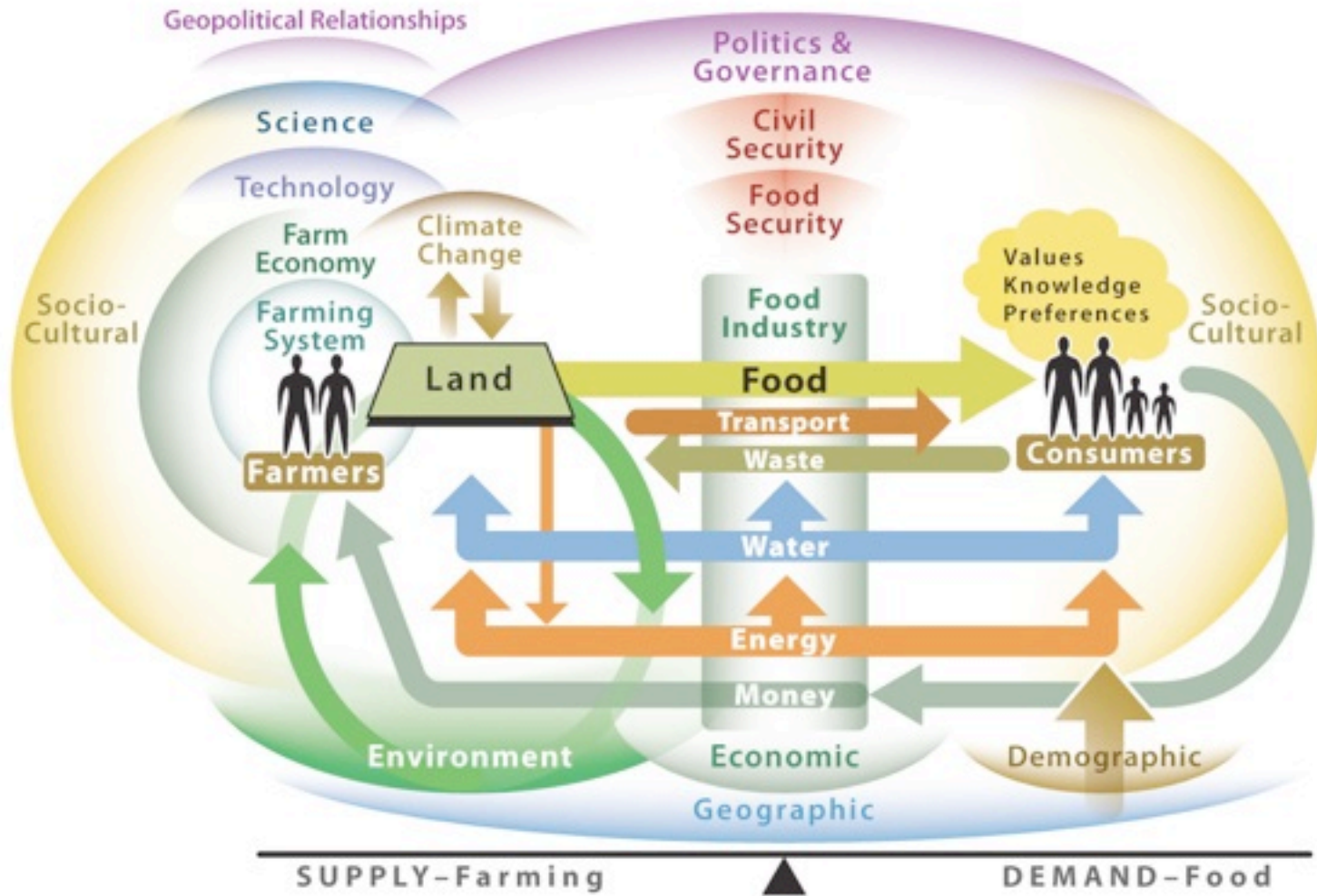
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This Session

- Context: **Modern Food Systems as Context for ESD**
- Definition: **Systems Principles**
- Theoretical Frameworks
 - **Epistemic and Ontological Cognitive Development (EOCD)**
 - **Threshold Concepts**
- Propose
 - EOCD as **Threshold Process** for understanding & applying systems principles



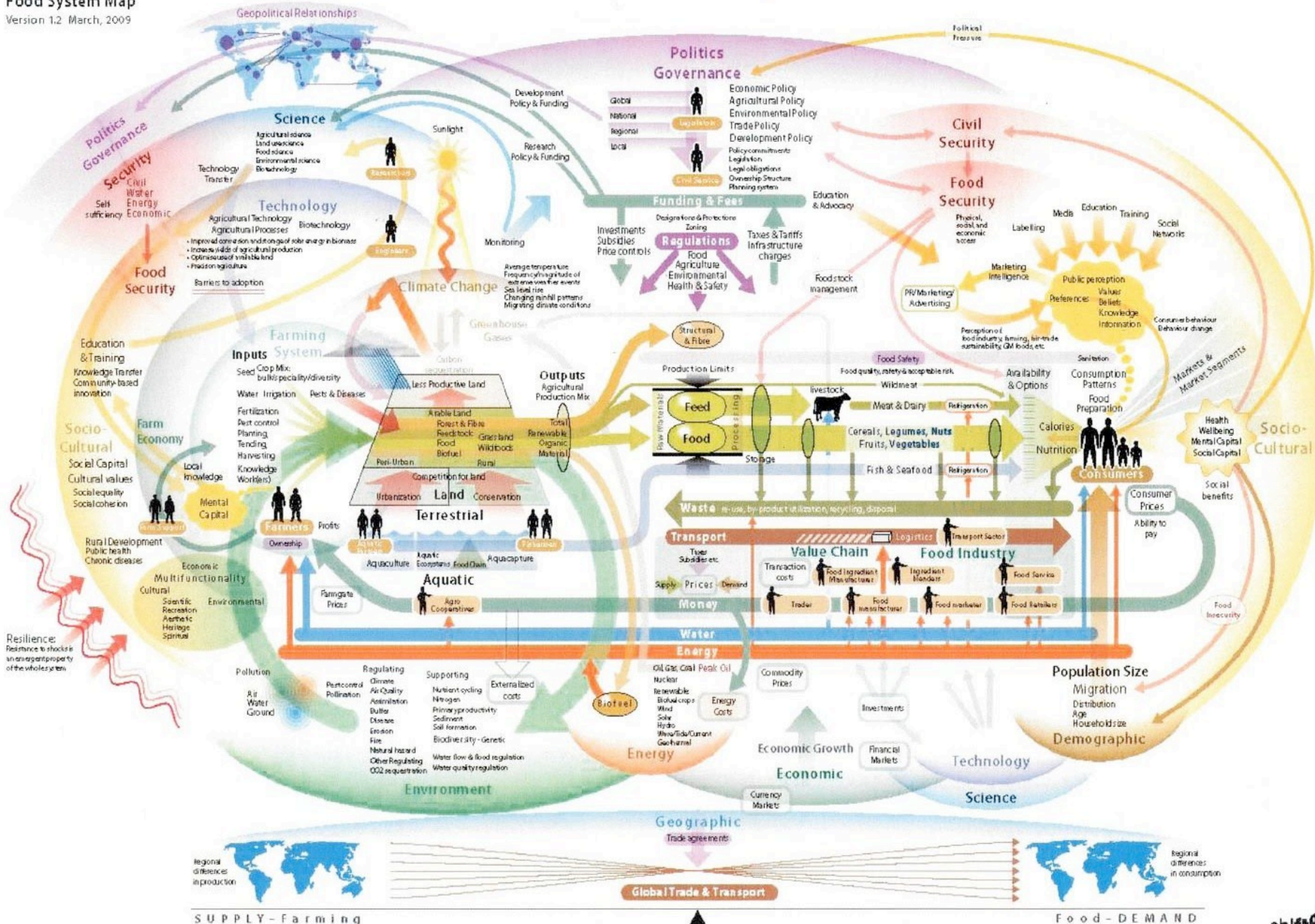
Food System Map – Basic Elements



support in complexity **shift**^o

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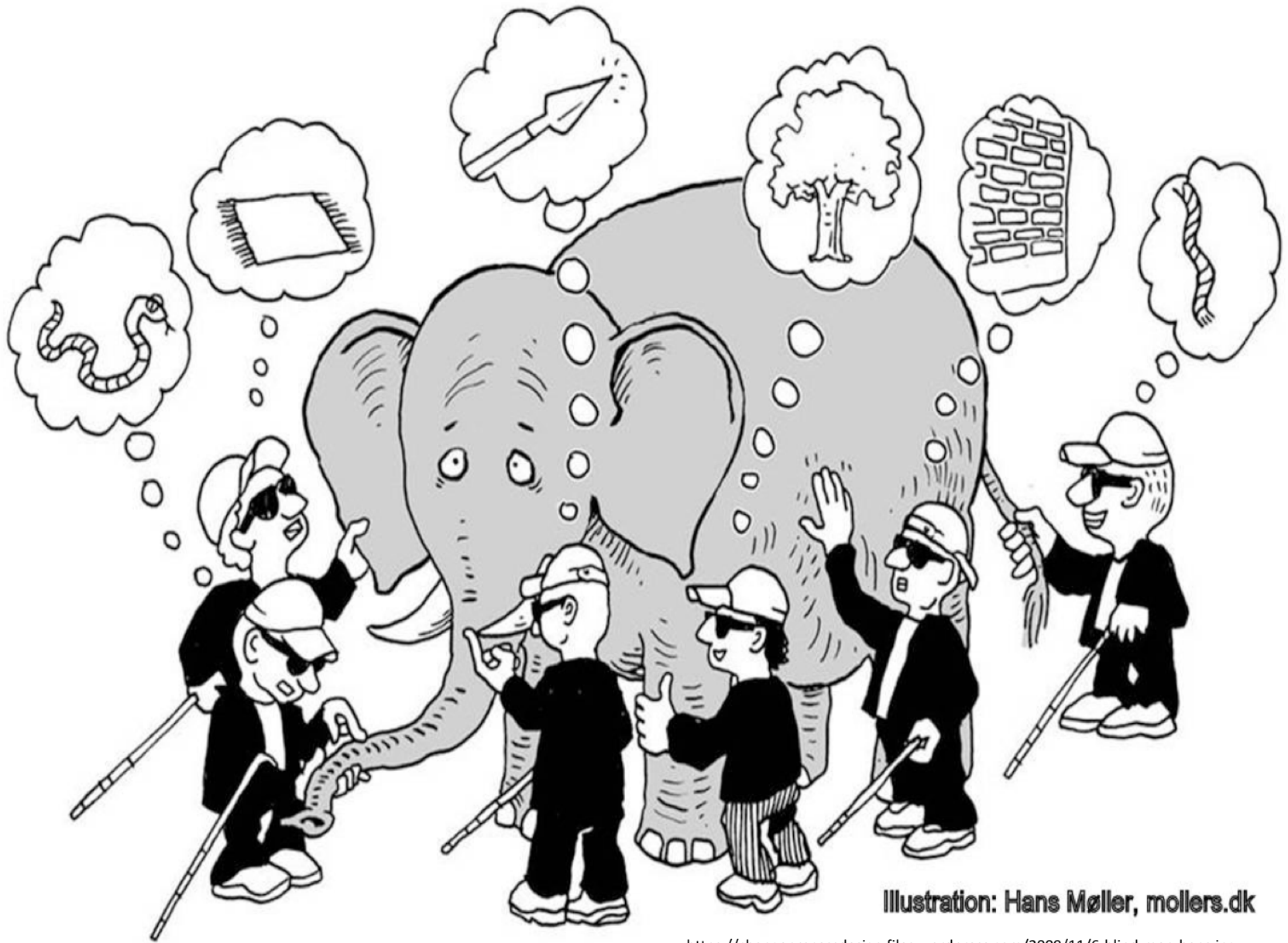


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Systems Principles

Holism

- Shift attention to interactions & relationships between component parts in order to understand whole
- Awareness of nested levels, boundaries, and contextual factors that surround and impact a system

Pluralism

- Take into account diversity of perspectives held by individuals and groups embedded in system

Reynolds, M., & Holwell, S. (Eds.). (2010). *Systems Approaches to Managing Change: A Practical Guide* (1st Edition.). Springer.
Williams, B., & Hummelbrunner, R. (2010). *Systems Concepts in Action: A Practitioner's Toolkit*. Stanford, Calif: Stanford Business Books.

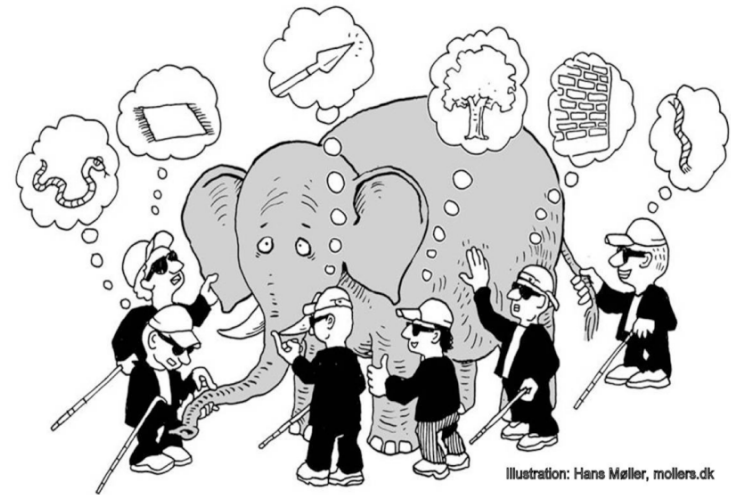
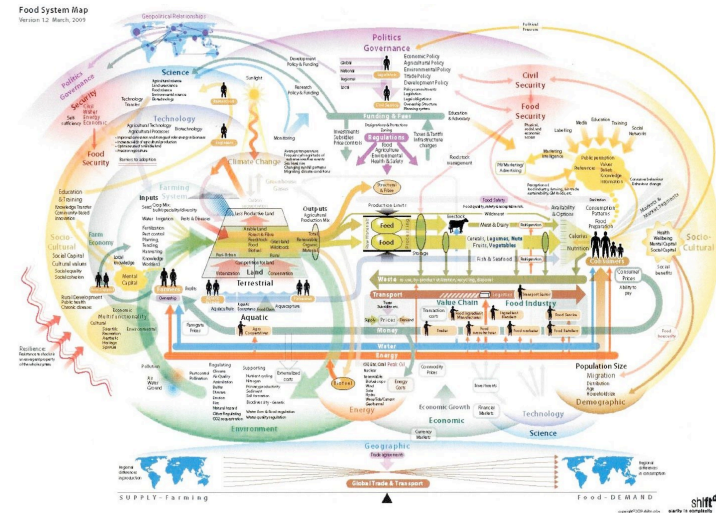


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Expectations of Students in Context of ESD

- Be comfortable with uncertainty and complexity
- Shift between reductionist & systems approaches
- Collaboratively identify, evaluate, & integrate evidence from diverse perspectives
- Learn to perform under conditions where knowledge is limited yet actions must be taken



How do you know what you know?



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Epistemic & Ontological Cognitive Development

Study of how individual

- Develops conceptions of knowledge and knowing
- Utilizes them in developing understanding of world

Determine beliefs about

- Definition of knowledge
- How knowledge is constructed
- How knowledge is evaluated
- Where knowledge resides
- How knowing occurs

Hofer, B. K., & Pintrich, P. R. (2004). *Personal epistemology: the psychology of beliefs about knowledge and knowing*. Routledge.



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Integration of Two Models

- Model of Epistemic and Ontological Cognitive Development (Greene et al, 2010)
- Reflective Judgment Model (King & Kitchener, 2004)

	Dimensions		
Position	Simple & Certain	Authority	Personal Experience
Realist	Strong	Strong	Strong
Dogmatist	Weak	Strong	Weak
Skeptic	Weak	Weak	Strong
Pre-Evaluativist*	Weak	Moderate	Moderate
Evaluativist	Weak	Moderate	Moderate

* Individual able to relate and compare evidence but cannot draw a reasoned conclusion

Greene, J. A., Torney-Purta, J., & Azevedo, R. (2010). Empirical evidence regarding relations among a model of epistemic and ontological cognition, academic performance, and educational level. *Journal of Educational Psychology, 102*(1), 234.

King, P., & Kitchener, K. S. (2004). Reflective Judgment: Theory and Research on the Development of Epistemic Assumptions Through Adulthood. *Educational Psychologist, 39*(1), 5–18.



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Threshold Concepts

- Concepts that are essential for the mastery of a particular disciplinary framework
- Key concepts that need to be understood before a student can develop beyond the stage of novice
- **Characteristics**
 - Transformative
 - Irreversible
 - Integrative
 - Troublesome

Meyer, J. H. F., & Land, R. (2005). Threshold concepts and troublesome knowledge (2): Epistemological considerations and a conceptual framework for teaching and learning. *Higher Education*, 49(3), 373–388.



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Threshold Process

- Characterizing EOCD as a **threshold process** for the application of systems principles acknowledges the **temporal** nature of cognitive transformation taking place
- **Implications**
 - Target EOCD through pedagogical strategies
 - Requires scaffolding across degree program
 - Create curricular space for experiencing and resolving confrontation with previously held values, beliefs, and assumptions about knowledge



Through learning to identify **why** one thinks the way one does rather than **what** one thinks, students can “generate their own syntheses and arguments in support of their value positions” (Salner, 1986, p. 231).

SFSE + ESD students will only accidentally solve complex problems that have their roots in epistemic cognition if teaching strategies in these programs fail to consciously develop these higher level cognitive skills (Salner, 1986).



Assessment Strategies

- Nature of Problem? Ill- or Well-Structured
- Process of **Justification** when addressing ill-structured problems
- Evidence of Systems Thinking / Adopting a Systems Perspective
 - Applying holism
 - Applying pluralism
- Criteria for evaluating evidence
 - Origin
 - Limits
 - Nature



Questions?

Thank you.



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