Considering Epistemological and Theoretical Frameworks*

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* This is adapted from the presentation of Dr. Heidi Carlone, who did this workshop at the Sandra K. Abell Institute in Colorado Springs, CO.

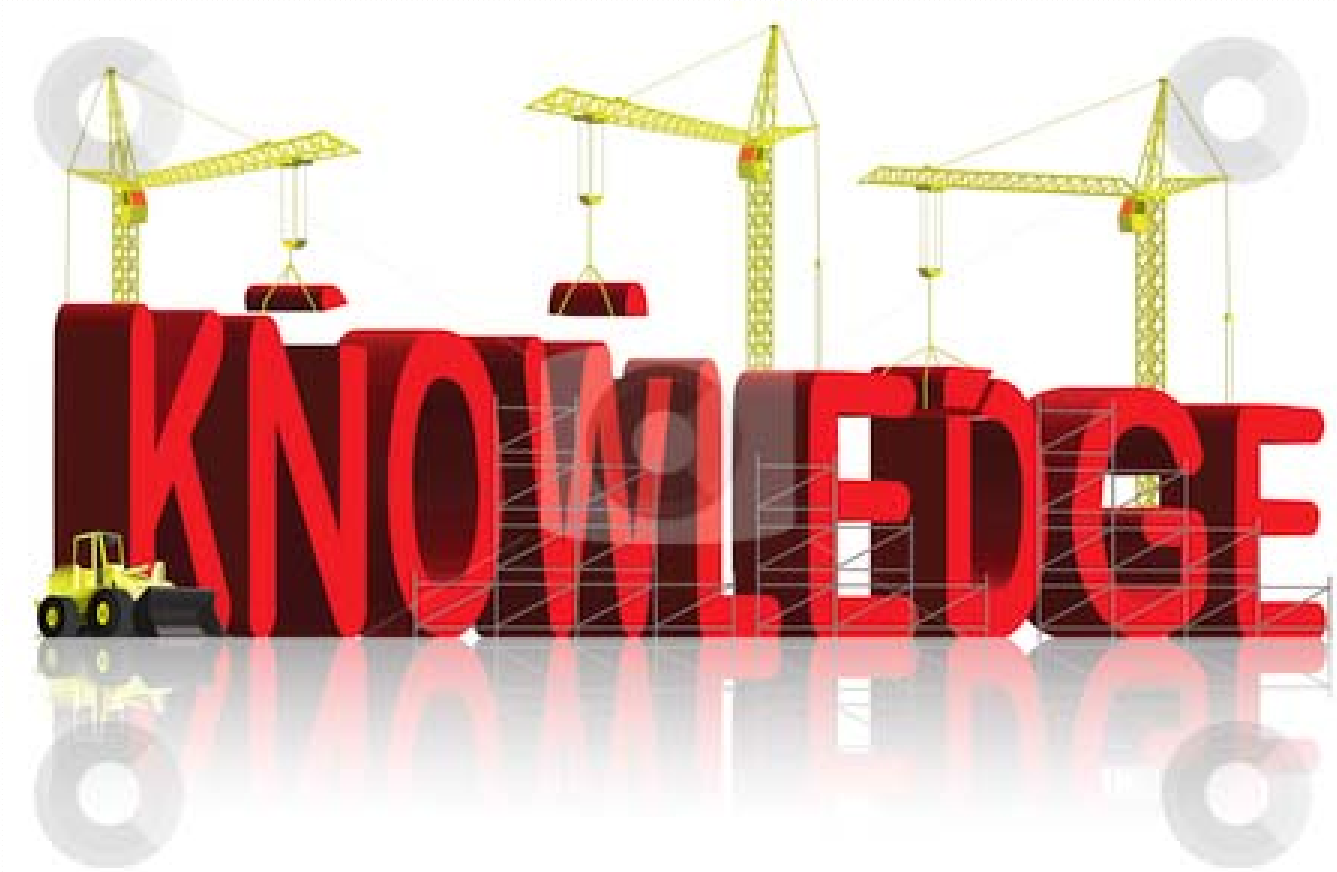
Goal: Consider your own epistemological and theoretical stance

What assumptions do you have about knowledge creation in your study?

Four graduate students were talking about their epistemological/theoretical frameworks in their studies. Who do you agree with most?

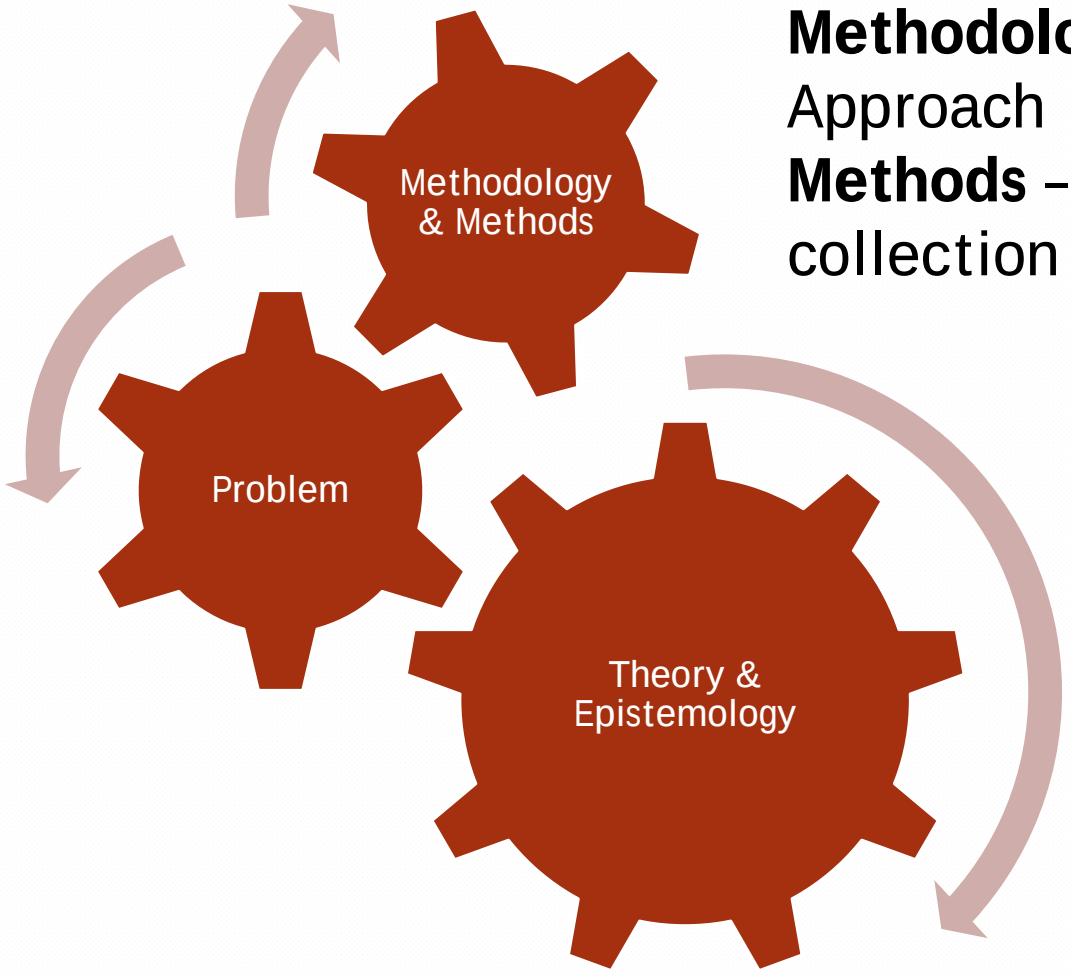
- Audrey: It influences how we analyze our data.
- Block: Epistemology/theoretical frameworks are about creating knowledge. It's important that I create new knowledge.
- Cindy: Different frameworks have different assumptions. These assumptions impact all aspects of my study.
- Demetri: What's an epistemology or theory?

Creating knowledge!



You know what knowledge you would like to contribute the field!

- Area of interest
- Literature review



Methodology – Approach
Methods – Data collection and analysis

Theory – Gives meaning
Epistemology – Assumptions about knowledge

Different approaches to building knowledge (Methodology)

- Quantitative –studies that explore, test, and predict
- Qualitative – studies that describe and uncover meaning
- Mixed Methods – combines the two approaches

Epistemology is…

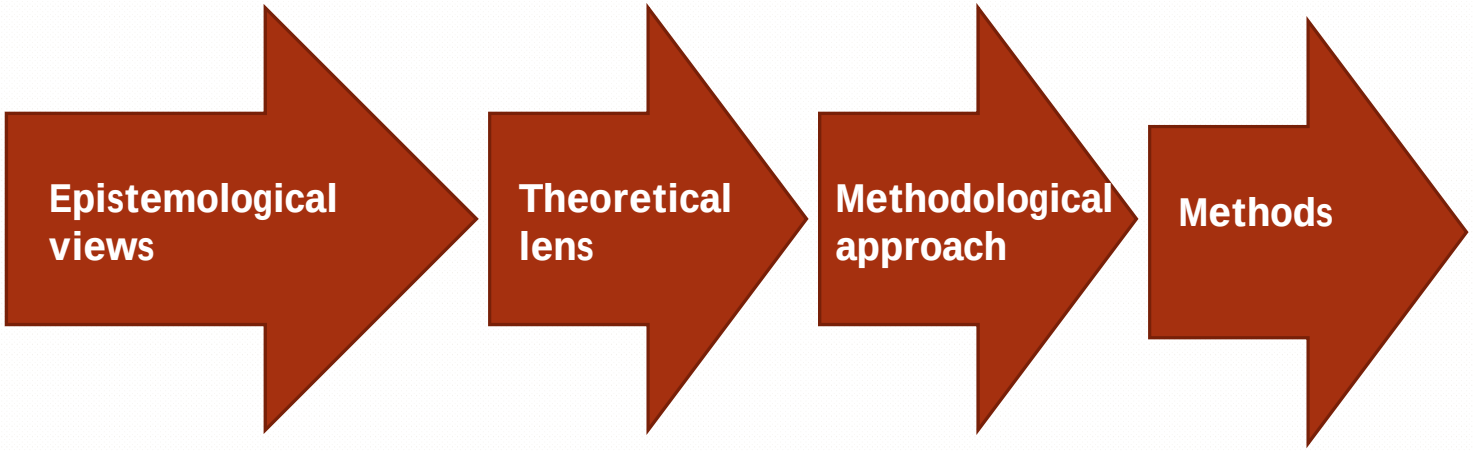
- The nature of knowledge
- A way of seeking knowledge or engaging in inquiry
- A way of understanding and explaining how we know what we know
- The relationship between the knower and the would-be known

Positivism

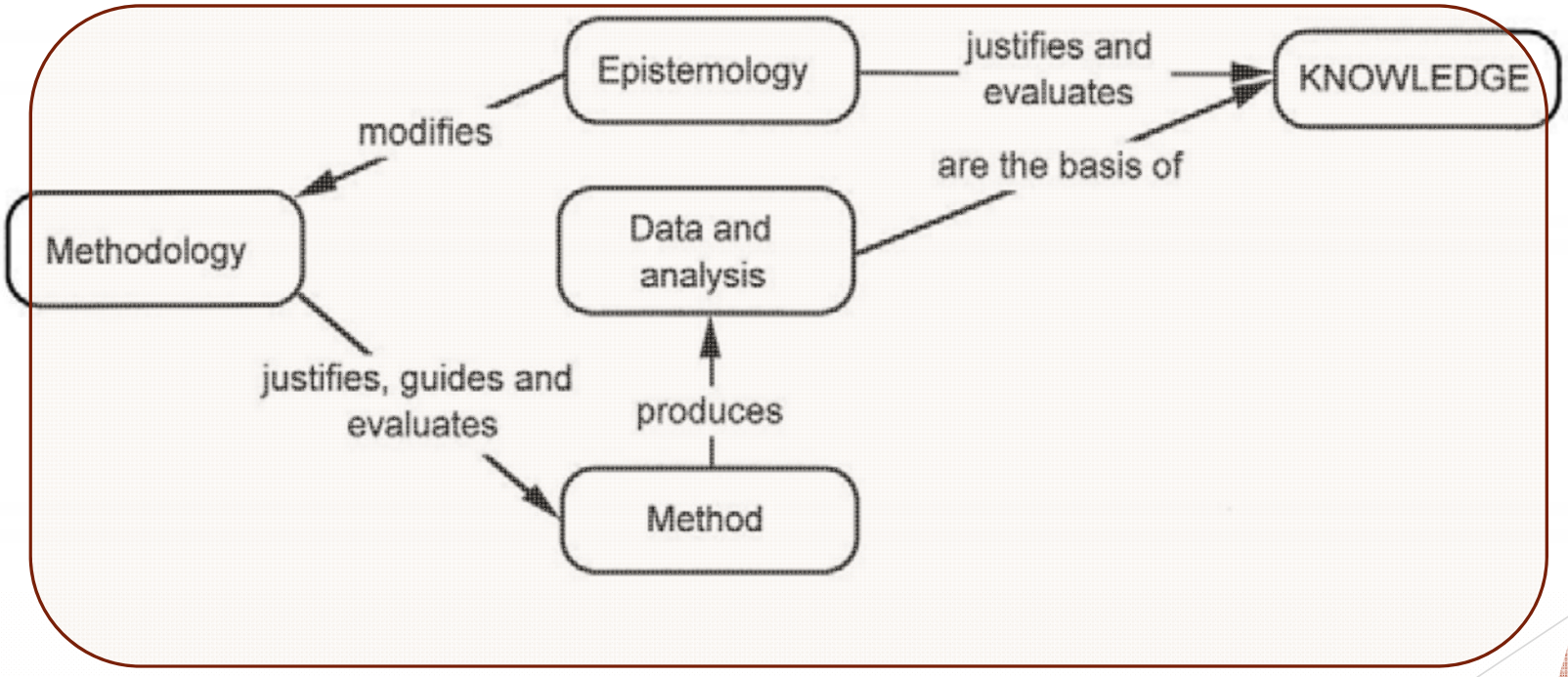
- One reality to be understood
- Objective
- Goal is to get at the truth
- There is a right way to understand

- **Example: Observation of a classroom**

Crotty's development of a research study



Creswell's approach to a research study



What sorts of epistemological approaches are there?

Positivism

- One reality to be understood
- Objective
- Goal is to get at the truth
- There is a right way to understand

- **Example:** Teacher knowledge assessment

Primary Teachers' Particle Ideas and Explanations of Physical Phenomena: Effect of an in-service training course

Papageorgioua, Stamovlasisa and Johnson , *IJSE*, 2010

This paper presents a study concerning Greek primary school teachers' (*n* = 162) ideas about the particulate nature of matter and their explanations of physical phenomena. The study took place during an in-service training course where the effectiveness of a specially designed intervention was tested. A key feature was an approach based on the concept of a substance and its states rather than "solids, liquids, and gases". Pre-intervention, the teachers held misconceptions similar to those of pupils. Also, there seemed to be some relationship between the teachers' particle model ideas and their explanations of phenomena. Post-intervention, the teachers' descriptions and explanations were found to be significantly improved, with almost zero correlation between pre and post-intervention scores. Implications for science education are discussed.

Interpretivism

- *is* interpretation
- requires the engagement of one's biases
- is participative, conversational
- is produced and constructed, rather than discovered
- focuses on the meanings of the research participants
- is achieved through empathetic understanding
- **Example:** Understanding experiences

Teachers' Collaborative Inquiry and Professional Growth: Should We Be Optimistic?

Nelson, *Science Education*, 2009

As professional learning communities (PLCs) are proliferating as a form of teacher professional development, it is important to understand what "PLC work" is and how it impacts teacher learning. This article reports on secondary science and mathematics teachers' participation in PLCs and engagement in collaborative inquiry. The PLC provide a structure for coming together; their inquiry questions focused their attention on gaps between a shared vision for student learning and student achievement. Qualitative data from three in-depth cases are analyzed in three categories: (1) collective activities, (2) questions raised, and (3) knowledge generated. The cases show different trajectories of teachers' PLC work and reveal the difficulties teachers had in asking critical questions about their practices.

Critical theory

- Knowledge is historically and culturally situated
- Knowledge is always “partial”
- The nature of power serves as an orienting framework
- **Example:** Studies of power, inequities

The Culture of Power and Science Education: Learning from Miguel

Calabrese-Barton & Yang, *JRST,* 2000

In this paper, there is a discussion about the need for science educators to understand the relationship between culture and socioeconomic issues and inner city students. We explore the lack of opportunity for science from lower socioeconomic enclaves. We follow Miguel, who is provided limited opportunities to engage in science. Through our analysis of a homeless family, we explore the representation of science through culture, socioeconomic status and cultural capital.

Code these statements

P =Positivism

I=Interpretivism

C=Critical theory

Critique – Pick one in your group

- What question would you pose as an interpretist who is skeptical of a positivist study? How might the positivist respond?
- What question would you pose as a positivist who is skeptical of a critical theory study? How might the critical theorist respond?

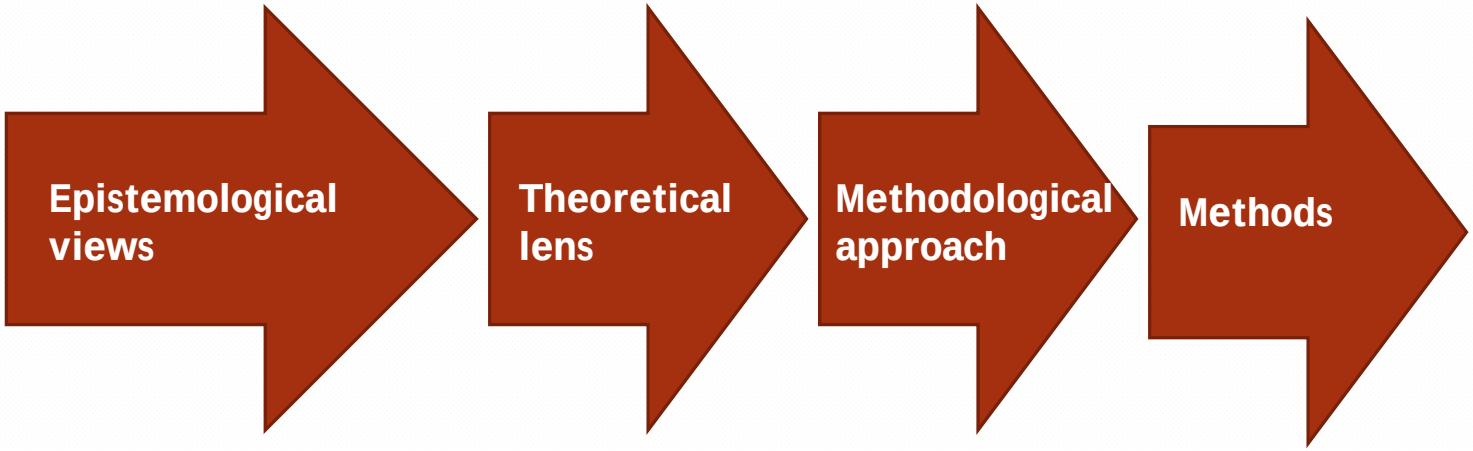
Critique

- What question would you pose as an interpretist who is skeptical of a positivist study? How might the positivist respond?
- I: How do you know how your subjects really understand?
- P: I have suggested what is means to understand, and my analysis shows how the subjects understand.
- I: How do you know you account for the context of the participant?
- P: I have assigned a score for the context, and participants are grouped by context scores.

Critique

- What question would you pose as a positivist who is skeptical of a critical theory study? How might the critical theorist respond?
- P: How do you know if something is true, verifiable?
- CT: It is not important to understand truth, but to understand how the status quo is dominating and oppression.
- P: How do you test an idea in order to convey your findings to improve education?
- CT: My goal is not to test an idea to in order to perpetuate the status quo. I want to look for meaning of the participants

Crotty's development of a research study



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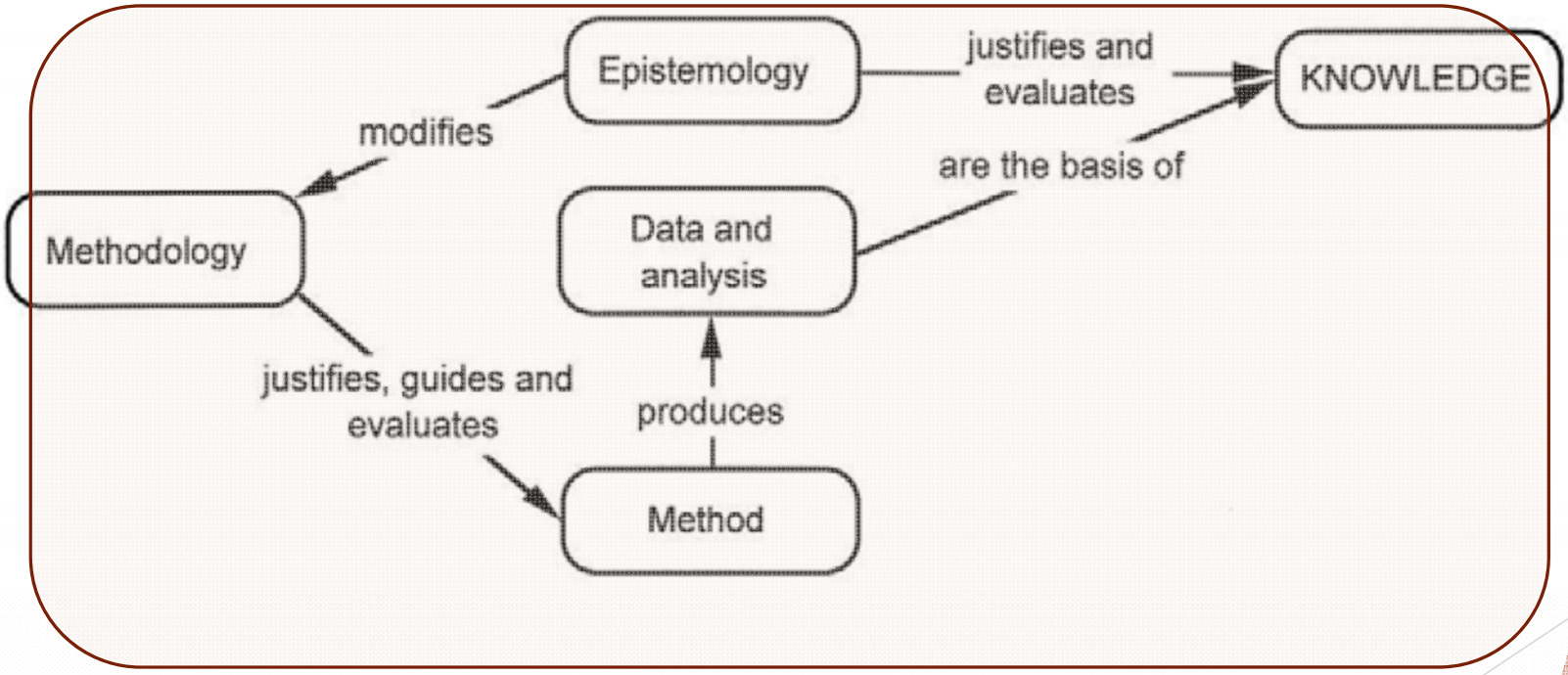

Theoretical Framework

- Pertain to a phenomena
- Vary in breadth
- Marco, meso, micro
- Have different descriptors depending upon knowledge assumptions
- Can include epistemological orientations (qualitative work)

What are some theories?

- Transformative learning theory
- Motivational theory
- Theory of planned behavior
- Cultural Historical Activity Theory (CHAT)
- Professional development of teachers

So what about this study?

How do newly hired science teachers in US and SA make instructional decisions? What is the role of policy?

Interviewed and observed newly hired teachers as they taught three days of lessons pertaining to biological and chemical phenomena. Qualitative observational and interview data.

Theory: Institutional theory

Epistemological framework: ?

Different epistemological views

- Positivism- New teachers followed state policies more than national policies when making their instructional decisions.
- Interpretism – Teachers struggled to enact the instruction because of the policies kept changing. They were, however, more impacted by the local policies than the national policies.
- Critical theory –Schools with high numbers of students in poverty were consistently constrained in enacting the instruction envisioned by local or national policies.

So what about this study?

Do undergraduate science students have a motivation to learn science?

Glynn, Taasoobshirazi, & Brickman, JRST 2009

770 students conceptualized their motivation to learn science in terms of five dimensions: intrinsic motivation and personal relevance, self-efficacy and assessment anxiety, self-determination, career motivation, and grade motivation. Women and men had different profiles on these dimensions, but equivalent overall motivation to learn science.

Epistemological framework: ?

Methodological framework: ?

Theory: ?

Evaluating Your Own Research

- Talk to the person next to you.
- Share your research questions and a bit about your epistemological framework and your theoretical framework.
- Have a dialogue about the epistemological assumptions associated with your work.
- What are critiques of your assumptions? How can you address these?

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Onward and do good work!