



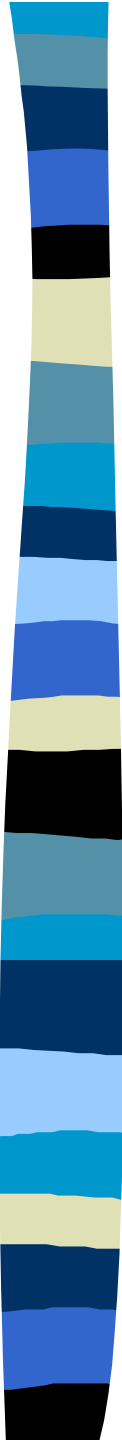
Gender Differences and the Culture of Science and Engineering

Advisory Board Meeting

April 18, 2001



Memorial University of Newfoundland
NSERC/PETRO-CANADA CHAIR
Women In Science and Engineering



Are the differences important?

Do we need to talk about them?

Hesitation in pointing out differences:

Women want to succeed on their own merit;

Lingering tension between quality and style.



Outline

- Differences
- Quality science & thinking styles
- Effects of not talking
- Introduce discussion question



Diversity: Changing Paradigms

- Discrimination and fairness
- Access and legitimacy
- Learning and effectiveness

Thomas, D. A. and R. Ely (1996). “Making differences matter: A new paradigm for managing diversity.”
Harvard Business Review (September-October): 79-90.



Gender Differences

- Abilities - NO
 - test scores - maybe
- Motivations - YES
 - affective influence
 - value of contribution
 - work-life balance
- Thinking styles - YES



Thinking style affects ...

- Communication
- Information handling
- Problem solving
- Learning and teaching



Thinking Styles

Hierarchical

- Progression
- Axiomatic
- Pure math
- Structured program
- Highly specialized

Relational

- Patterns
- Intuition
- Applied Math
- Bricolage *
- Interdisciplinary

*Levi-Strauss, *The Savage Mind*



Axiomatic Tradition

- Legacy of the Greek schools
- Legitimacy through argument & proof
- Concept is primary; experience is secondary
- Progression is hierarchical



Relational Thinking

- Characteristic of the arts
- Legitimacy through observation & experience
- Relationships are primary; formalism is secondary
- Application & extension are continuous

learning



Relational Learners in Axiomatic Environment

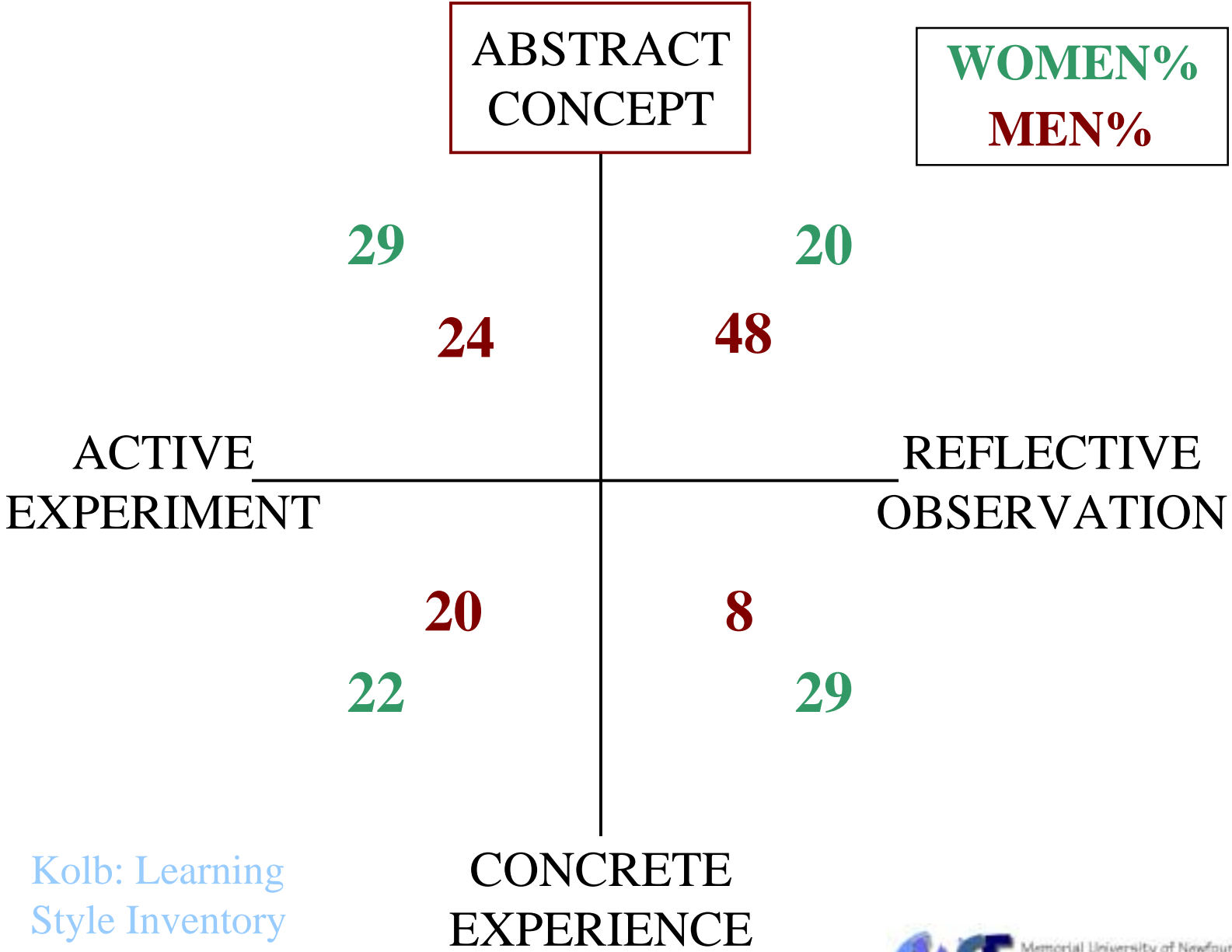
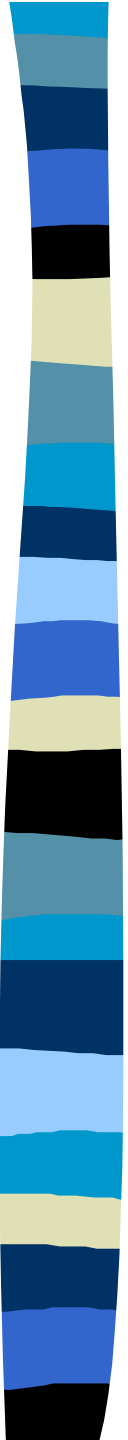
- Question legitimacy
- Question motivation & relevance
- Anxiety due to missing legitimacy
- Miss steps in progression
or are slower initially

(Booth and Brooks 1985)



Thinking (Learning) Styles

- Culture & age effects
- Language influence
- Brain maps (Wilder Penfield)
- Thinking paths are neural networks
- Styles can be learned - bimodal

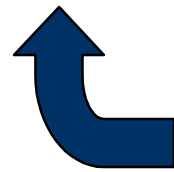


Kolb: Learning Style Inventory



Scientific Process

Discovery → Legitimacy → Validity



Impact



Scientific Process

STAGE	DISCOVER		LEGIT		VALID
AXIOM	★	→	★	→	★
RELATE			⊘		



Some Relational Thinkers

“ ... it was necessary to continue the development of the picture as the method, before the mathematics could really be done.”
- Richard Feynman

“The way the two triple sets of axioms are contrasted in (the book) is not at all the way things happened in the process of actual thinking. This was merely a later formulation of the subject matter.” - Albert Einstein

Creative Process

STAGE	DISCOVER	LEGIT	VALID
AXIOM		★ →	★
RELATE	★ →	★ ↑	★



Scientific Validity (Truth)

Axiomatic validity is necessary,
but not sufficient.

Result must also be consistent
with all **related** observations and
results.



Scientific Validity (Truth)

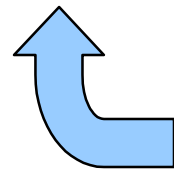
Consistency with all **related** observations and results is necessary, but not sufficient.

Axiomatic argument must lead to equivalent result.

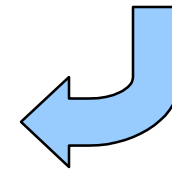


Scientific Process

Discovery → Legitimacy → Validity



Impact



Innovation Process



Do we need to talk about gender?

- Different styles - gender trends
- Recognize value of different styles
- Legitimacy of different styles
- Stereotype threat
- Real life example



Stereotype Threat:

The threat of being viewed through the lens of a negative stereotype; the fear of doing something that would confirm the stereotype

Steele, C. M. (1999). Thin Ice: "Stereotype Threat" and Black College Student. The Atlantic Monthly **284**(2).



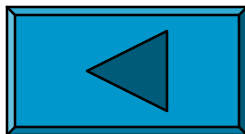
Stereotype Threat

- Response to perceived external attitude, not self-evaluation
- Defense may be disassociation and withdrawal
- Affects more serious students on tests
 - inefficient, poor judgement
 - increased blood pressure



Reduce Stereotype Threat

- Instill confidence that system is unbiased
- Explicitly remove stereotype
- Transition year critical
 - encouragement and mentoring
 - teaching and tutoring





Summary

- Differences are important
- Quality of Science not compromised
- Successful 'diversification' requires changes in the culture

Question: How do we talk about it?