How the Storm Begins:
Cultural Stereotypes, Identity Formation and Principles of Child Development

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Rising Above the Gathering Storm, Revisited (2010)

"In order of assigned importance, the four recommendations can be summarized as follows:

Rising Above the Gathering Storm, Revisited (2010)

"I. Move the United States K-12 education system in science and mathematics to a leading position *by global standards.*

III. Encourage more United States citizens to pursue careers in mathematics, science, and engineering."

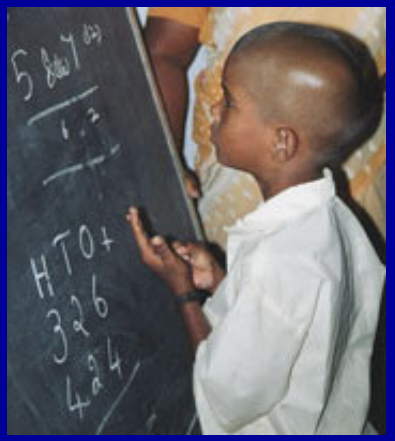
Plato, on education…

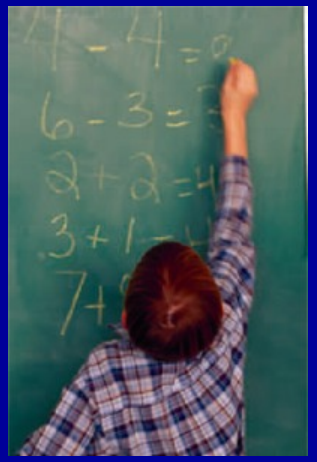
" What will their education be?.....You know, don't you, the beginning of any process is the most important, especially for anything young and tender? It's at that time that it is most malleable and takes on any pattern one wishes to impress on it"

– Plato, *Republic*, Book II

Academic Stereotypes in Children

Math–Gender Stereotypes in Elementary School Children





University of Washington
Department of Psychology

Percent female – 43%

University of Washington
Department of Mathematics

Percent female – 13%

Stanford University

- **Department of Psychology:**
  - Percent female faculty = **29%**
- **Department of Mathematics:**
  - Percent female faculty = **3%**

Few women in advanced math careers -- Why?

"Three possible factors":

- Willingness to do high-powered intense work
- Discrimination during hiring/promotion and socialization
- Men might have higher math aptitude

Lawrence Summers

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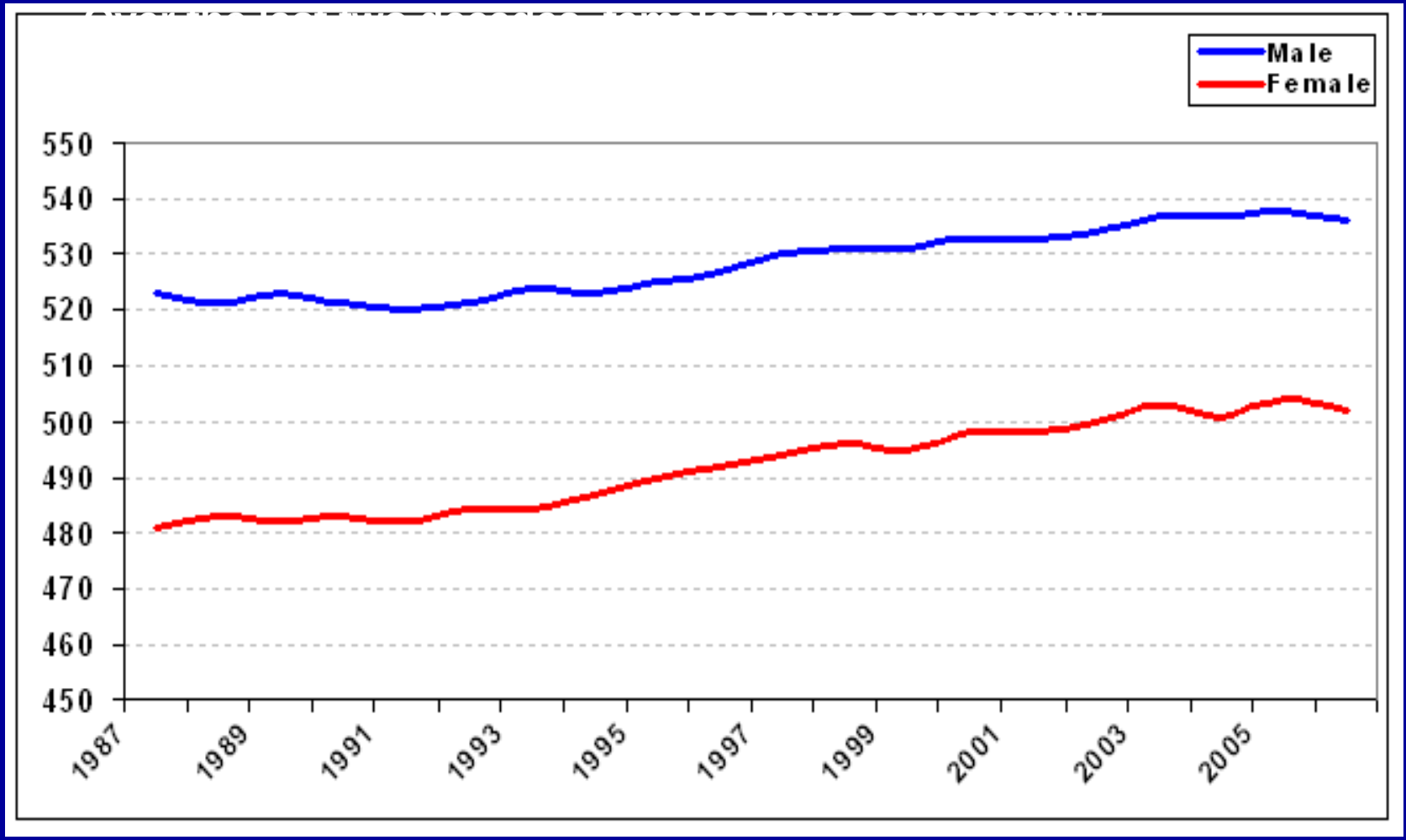
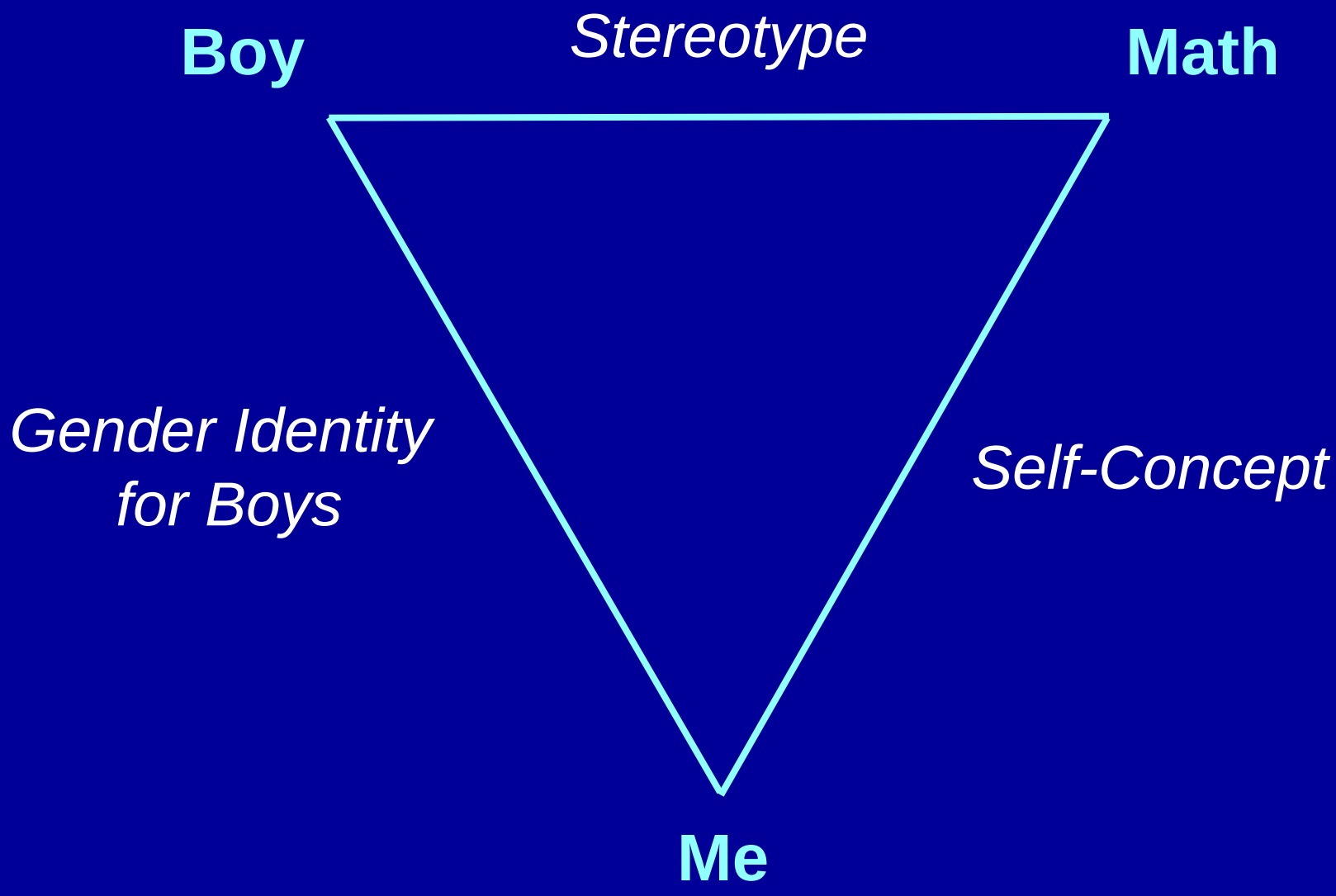
Males score higher than females on SAT-M



Innate Aptitude or Cultural Influence?

Conceptual Distinctions



Research Shows that Adults Have a Stereotype

Most American adults think:

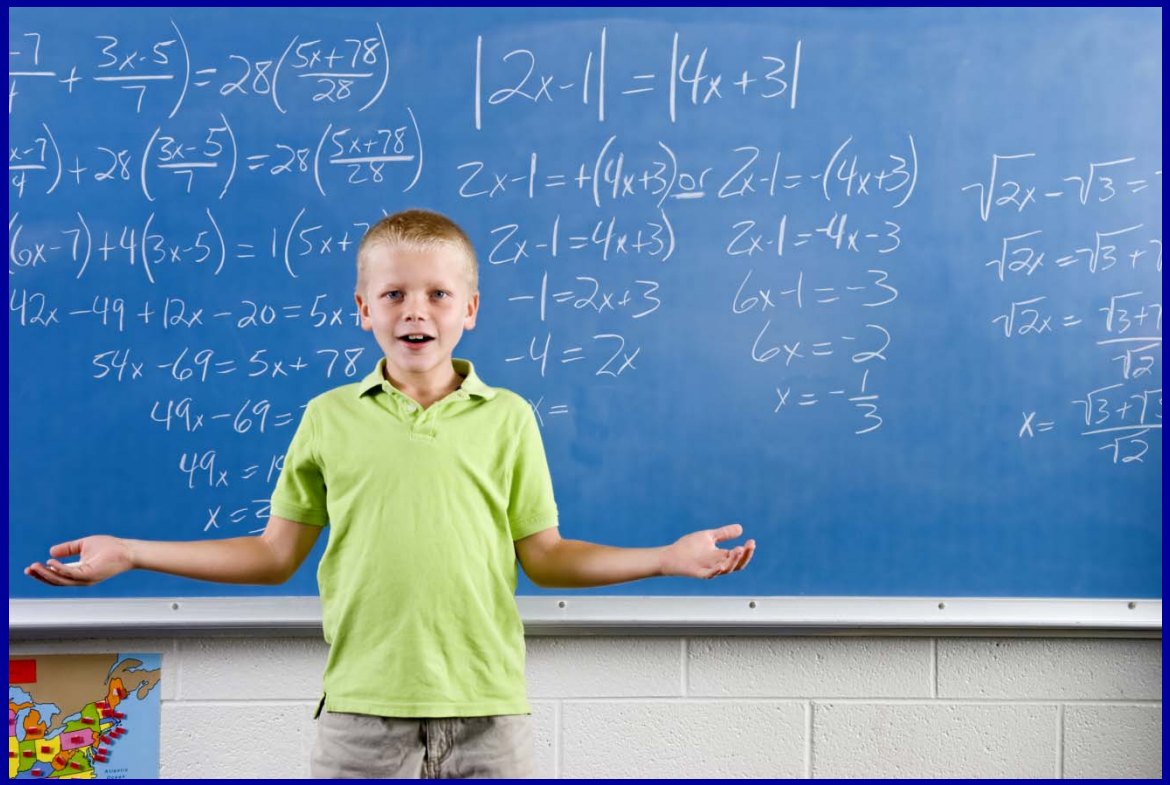
- Math is a male thing
- Reading is a female thing

Stereotype:

Boys = math

Stereotype:

Boys = math



Stereotype:

Girls = reading

Stereotype:

Girls = reading

Children

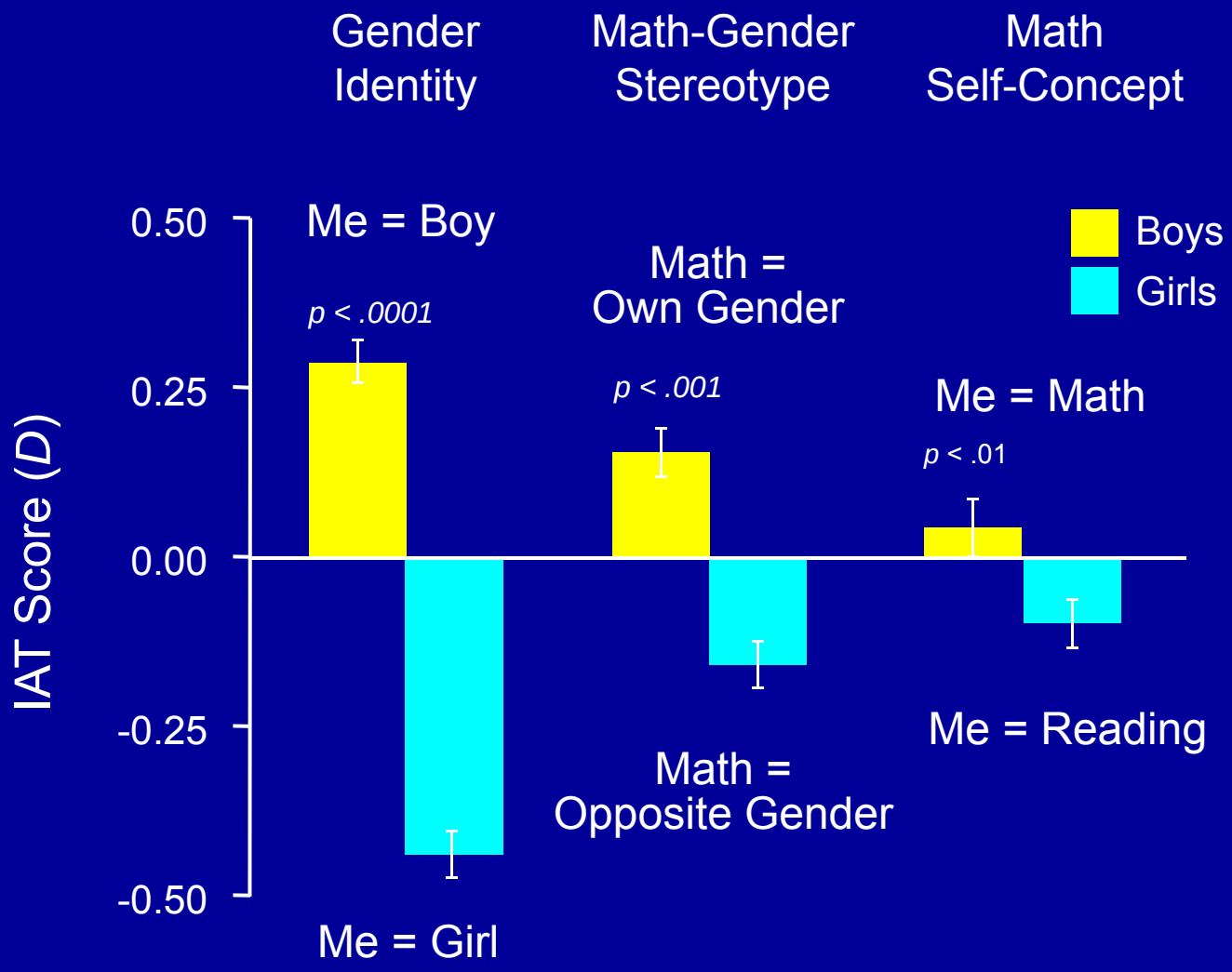
247 participants

~50 children in each grade 1st - 5th

Tests

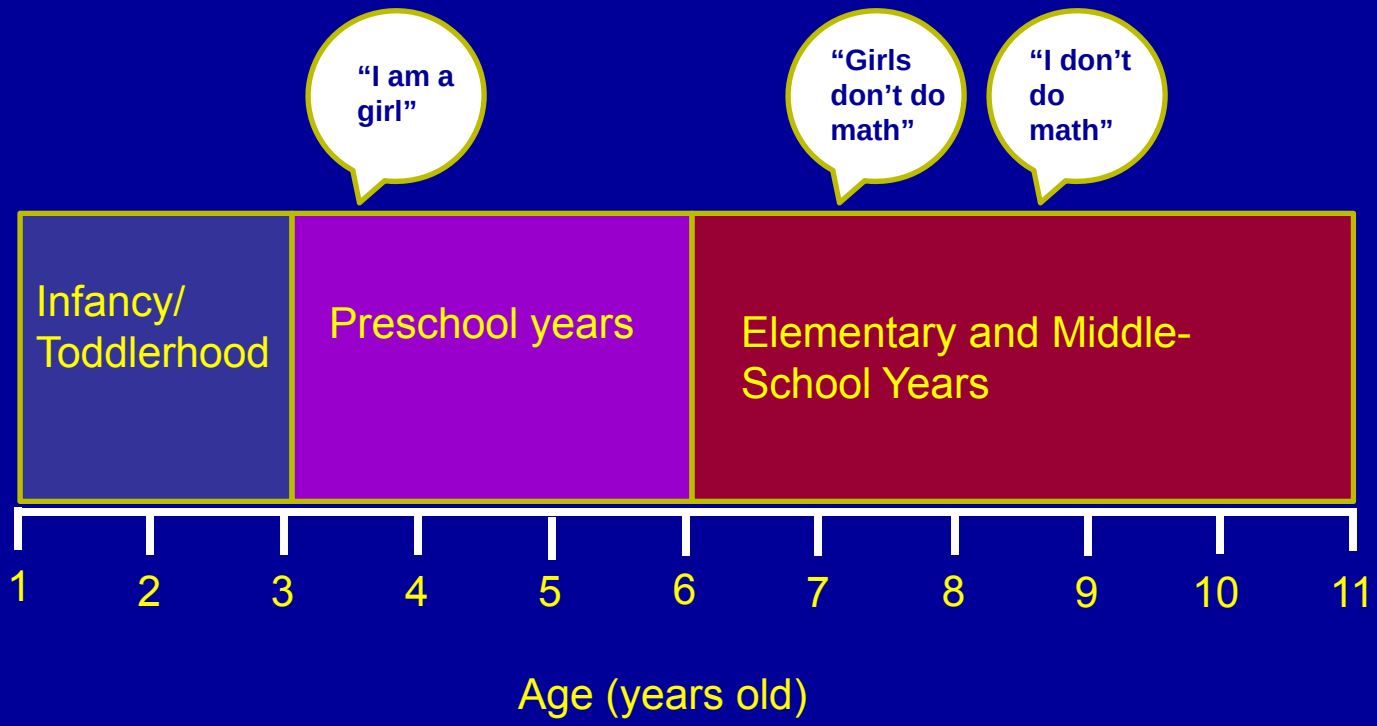
We used 2 tests, one self-report measure and one implicit association test (IAT) adapted for children

Results Summary: Implicit Measures



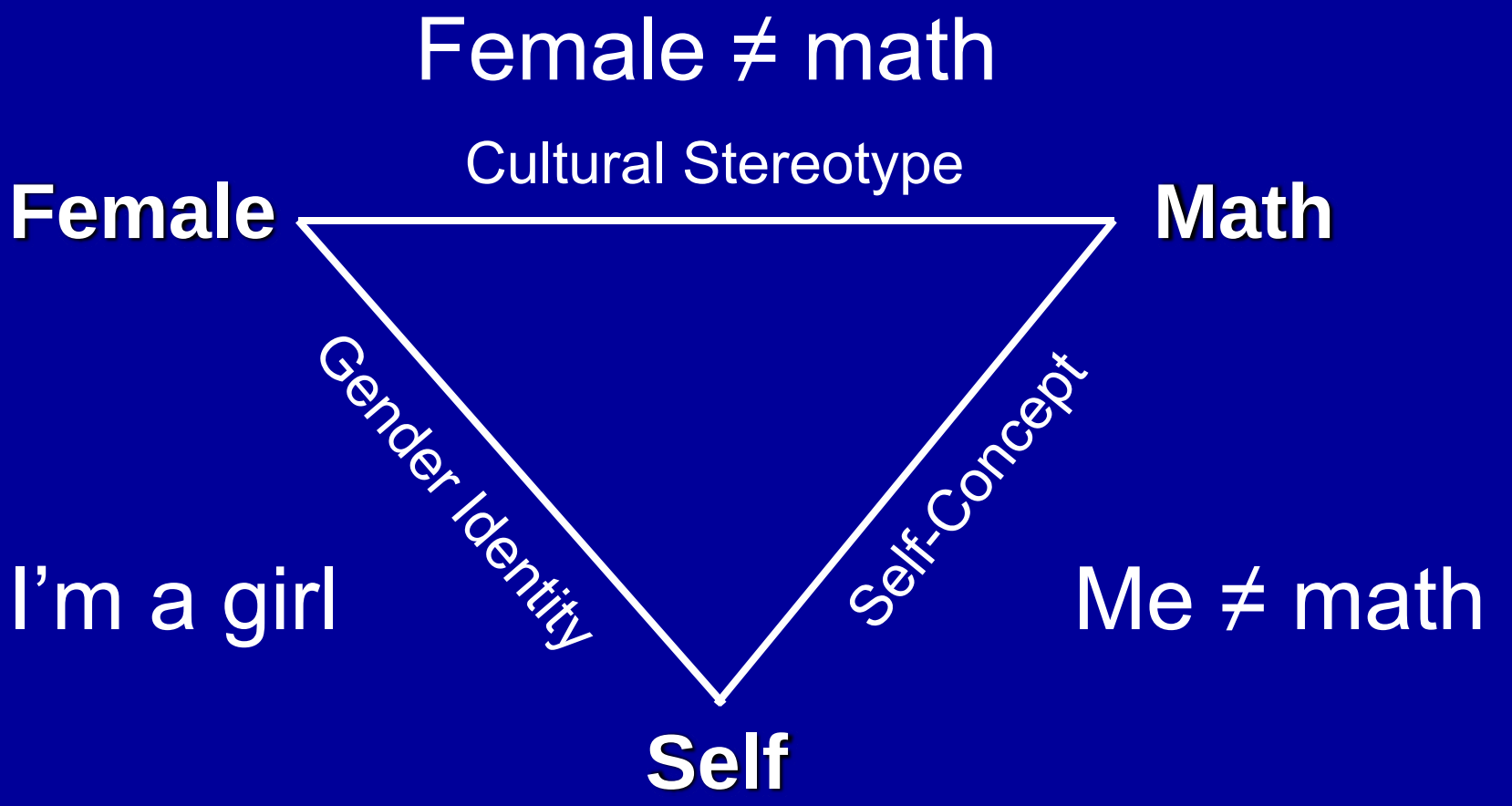
Cvencek, Meltzoff, & Greenwald
Child Develoment (2011)

Child Development Timeline



Cvencek, Meltzoff, & Greenwald
Child Development (2011)

Psychological Process



Cvencek, Meltzoff, & Greenwald
Child Development (2011)

Future Directions

Extensions:

- Cross-cultural studies. Cultures differ. Test scores.

Origins/Development: What are sources?

- Media, Parents, Peers, Teachers

Individual differences: Not binary ‘on/of’

- Individual girls can excel in math; Implications?
- Role models at home

Next Week

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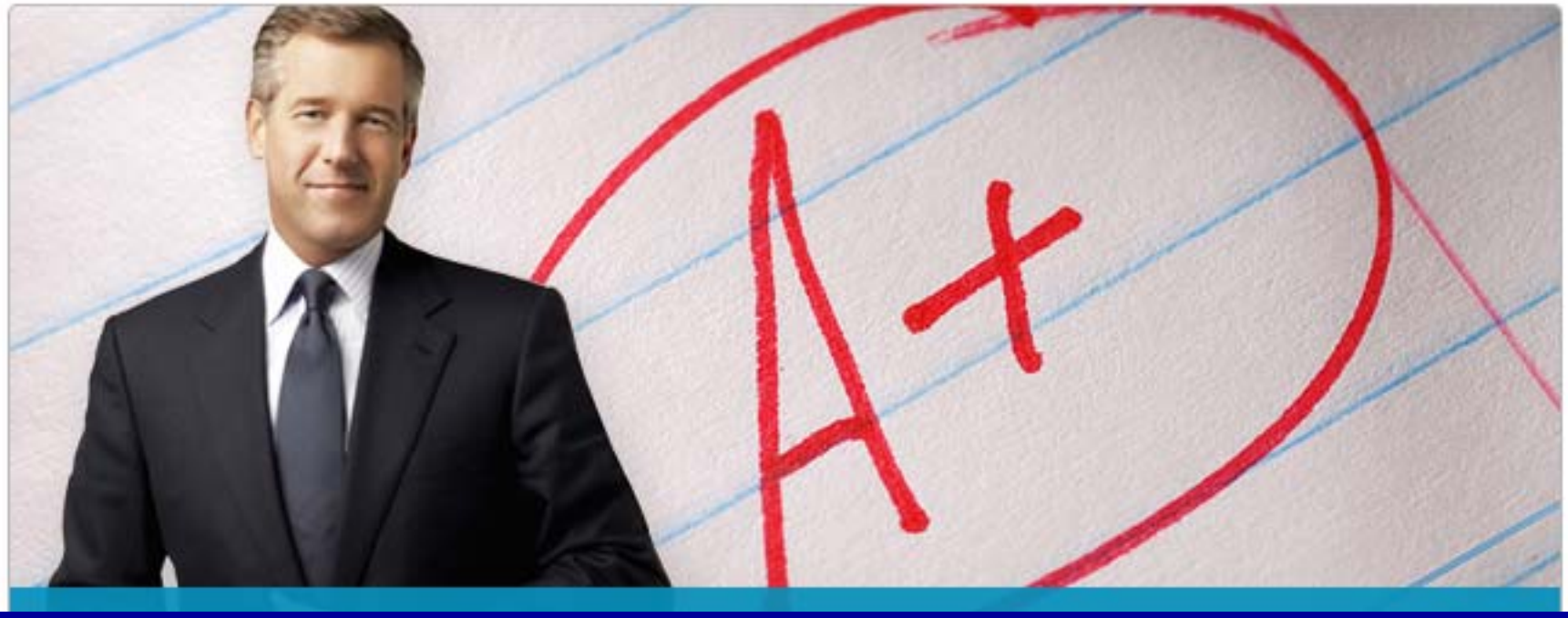


Tie to Early Learning, Even Preschool

- Stereotyping has roots earlier
- Theoretically, children primed to pay attention to ‘social others’, what others are doing, acting, like and they want to be like others.

1 min film

Developmental Neuroscience (neural mirroring systems)

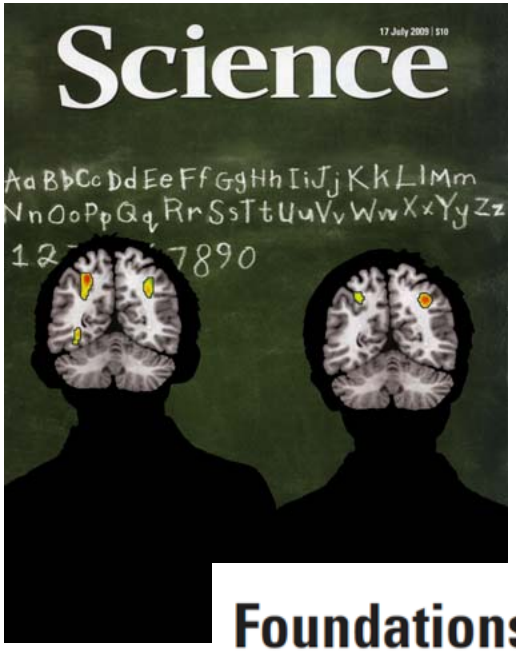
Marshall & Meltzoff,
Dev Cog Neuroscience, 2011

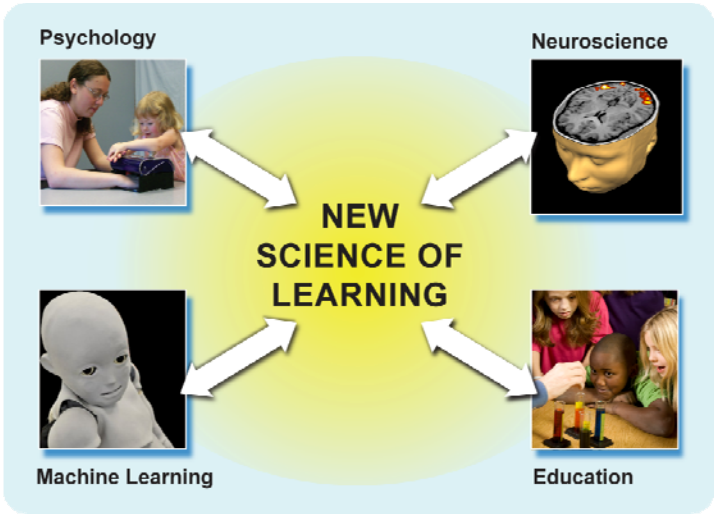
Developmental Change

- For infants: Imitation of a *person's motor* behavior
- For elementary-school children: Take on the attitudes & attributes associated of the *group*

  - With gender identity, children establish 'Like me' class. Based on that, the way culture treats other 'like me' people has implications for the child's development.

Science of Learning





Foundations for a New Science of Learning

Andrew N. Meltzoff,[1,2,3]* Patricia K. Kuhl,[1,3,4] Javier Movellan,[5,6] Terrence J. Sejnowski[5,6,7,8]

Human learning is distinguished by the range and complexity of skills that can be learned and the degree of abstraction that can be achieved compared with those of other species. *Homo sapiens* is also the only species that has developed formal ways to enhance learning: teachers, schools, and curricula. Human infants have an intense interest in people and their behavior and possess powerful implicit learning mechanisms that are affected by social interaction. Neuroscientists are beginning to understand the brain mechanisms underlying learning and how shared brain systems for perception and action support social learning. Machine learning algorithms are being developed that allow robots and computers to learn autonomously. New insights from many different fields are converging to create a new science of learning that may transform educational practices.

Meltzoff, Kuhl et al., *Science*, 2009

Aristotle, on search for meaning…

"He who thus considers things *in their first growth and origin*…will obtain the clearest view of them."

– Aristotle, *Politica, Book I*

Thank you