Brain Science: How Early Experiences Shape the Brain

Sarah R. Lytle, Ph.D.
Director of Outreach and Education
I-LABS Mission

To be the foremost generator of new scientific discoveries about human learning, particularly in the first five years of life.

To translate research findings in relevant and actionable ways to the early learning community.
Same or Different?
<table>
<thead>
<tr>
<th>Same or Different?</th>
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<tbody>
<tr>
<td>English</td>
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<tr>
<td>Spanish</td>
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<tr>
<td>Hindi</td>
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Learning Before Birth

Moon, Lagercrantz & Kuhl (2013)
Brain: Biology + Experience
2,000 Days of Brain Growth

- Birth: 25%
- 1 year: 70%
- 3 years: 85%
- 5 years: 92%
- 7 years: 95%
- 10 years: 98%
- Adult: 100%
Neurons Make Connections
Connections Drive Brain Growth
Blooming

Pruning

Thriving
Bursts of Great Growth

Development

Plasticity

Sensory

Language & motor

Higher Cognitive
Looking Inside the Brain (MEG)
Building a Coordinated Brain

<table>
<thead>
<tr>
<th></th>
<th>Speech Perception Area</th>
<th>Speech Production Area</th>
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<tbody>
<tr>
<td>Newborn</td>
<td><img src="image1" alt="Newborn Brain Image" /></td>
<td><img src="image2" alt="Newborn Brain Image" /></td>
</tr>
<tr>
<td>6-month-old</td>
<td><img src="image3" alt="6-month-old Brain Image" /></td>
<td><img src="image4" alt="6-month-old Brain Image" /></td>
</tr>
<tr>
<td>12-month-old</td>
<td><img src="image5" alt="12-month-old Brain Image" /></td>
<td><img src="image6" alt="12-month-old Brain Image" /></td>
</tr>
</tbody>
</table>

Imada et al., 2006
Specializing Based on Experiences

Bilinguals

Monolinguals

Strength of Brain Response

Ferjan Ramirez et al., 2016
Experiences Impact Brain Processing

Socio-Economic Status

Lower SES  Higher SES

Brain Processing

More Efficient  Less Efficient
Types of Stress

- TOXIC
- TOLERABLE
- POSITIVE
Relationships Build the Brain
The Anatomy of an Interaction
The Anatomy of an Interaction
Children’s Learning

The Science of Learning

Actively Involved
Engaged
Socially Interactive
Meaningful

Hirsh-Pasek et al., 2015; Zosh et al., 2017
Do infants learn to discriminate Mandarin sounds?

Kuhl, Tsao, Liu, 2003
Parentese Boosts Language

↑ Infant-Directed Speech
↑ Babbling

↑ Infant-Directed Speech at 12 m
↑ Vocabulary at 24 m

Garcia-Sierra et al., 2011; Ramírez-Esparza et al., 2014
Sort cans of fruit from cans of vegetables

“How do we like to cook asparagus?”

“Squash”
“Dairy”
“Eggplant”

“How do we like to cook asparagus?”

“Milk comes from a cow. What else comes from a cow?”

Language Rich
Turn-Taking Interactions

Back-and-forth

Roseberry et al., 2014
Exploration for Learning

Bonawitz et al., 2011
Language Intervention Study
Language Intervention Study
Language Intervention Study

English vocalizations

Age groups (months)

7-14
14 - 20.5
20.5 - 27
27 - 33.5

Intervention
Control

Ferjan Ramirez & Kuhl, 2017
Creating Lifelong Learners

- red
- blue
- purple

- ABCs

- 123s
Creating Lifelong Learners

- Take turns & seek help
- Solve Problems
- Lead and follow in play
- Self-regulate
- Control impulses
- Shift attention well
- Is aware of emotions
- Understands routines
- Explore the environment
From Science...

...to Practice
I-LABS Training Modules

The latest research

modules.ilabs.uw.edu

About the youngest minds

Free resources

Also available in Spanish, Somali, and Vietnamese.
I-LABS Online Modules

- **Module 1**: Introduction to I-LABS
  - Time to Complete: 10 minutes

- **Module 2**: Why the First 2,000 Days Matter: A Look Inside the Brain
  - Time to Complete: 20 minutes

- **Module 3**: The Importance of Early Interactions
  - Time to Complete: 20 minutes

- **Module 4**: The Power of Learning through Imitation
  - Time to Complete: 20 minutes

A Forest of Brain Connections

Institute for Learning & Brain Sciences
University of Washington
Tạo ra một bộ não biết phối hợp

Vùng nhận biết tiếng nói
Vùng tạo ra tiếng nói

Sơ sinh
6 tháng
12 tháng

Nghe âm thanh

Los Niños Aprenden Siguiendo las Miradas

El adulto establece contacto visual con el pequeño
El adulto volteo para ver algo en el cuarto
El niño sigue la mirada para ver que ve el adulto

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Transcripción +