Wiring the Child’s Brain for Life-long Success

Laura Justice
The Ohio State University
justice.57@osu.edu
A walk across the college campus
Part 1.

NEUROSCIENCE
What leads to synaptogenesis?

*Experience-Expectant Plasticity*
At birth, the baby’s brain is hard-wired to lay the pathways for all cognitive functions. It needs/expects experiences to lay these pathways.
36 weeks gestation  Newborn  3 months  6 months  2 years

Synapse formation
Why are the early years so important?
36 weeks gestation

Newborn 3 months 6 months 2 years 4 years 6 years

Synapse formation

Synapse pruning

Brain Development

D2 CONTROL STRIATA (m & f)
2.2% LOSS PER DECADE (<0.002)

upper limit for adults

Synaptic Density

At birth

6 years old

14 years old

Source: Rethinking the Brain, Families and Work Institute, Rima Shore, 1997; Founders Network slide
Part 2.

DEVELOPMENTAL PSYCHOLOGY
Nature and Nurture
Nature and Nurture

Can experience serve as a buffer against biology?
Twin Studies are used to help us answer the question of “nature vs. nurture.” Because identical twins share the same genetic makeup, we can assume that differences between them are due to environmental factors.
Twin Studies

Monozygote – share environment and genes

Dizygote – share environment
The environment matters more for certain skills than genes – especially ‘kindergarten readiness skills’
Biology And Environment Co-Mingle

Structural Brain Changes due to Early Experiences

Healthy Brain

Deprivation

“The Two Year Window”
A Brain on Poverty

The travails of an impoverished upbringing reduce the surface area of some parts of the cortex more than others. The affected regions (*pink*) participate in various forms of mental processing. The researchers demonstrated the connection by plotting collected measures of the affected regions (referred to as the cortical surface area) by socioeconomic status.

**Areas of Vulnerability**

- Cingulate region
- Precuneus
- Inferior frontal region
- Inferior temporal region
- Right superior frontal region
Nature and Nurture

High-quality experiences (nurture) are crucial for buffering the effects of early adversity on the child’s brain.
Quality Early Care and Education

Promotes resilience in children, offers a ‘positive’ to offset challenges
Part 3.

LINGUISTICS
Vocabulary

One of the most important achievements in the early years is acquiring a vocabulary, or lexicon.
The brain is engineered to acquire millions of words in the early years, but is completely dependent on experience.
Vocabulary is an “Emergent Structure”
Synaptogenesis
Vocabulary

→ Sensitive period of development is 0-5

→ Crucial for meeting needs and wants

→ Key ‘readiness’ skill: foundational to social competence, reading comprehension, mathematics, and most of the curriculum
Vocabulary

Gaps observed in vocabulary size largely a product of experience: the hardware is there, the input needs to be optimized.
To Know A Word

Blah

Blue
A Word in the Lexicon

Blue

What does it mean?
How does it sound?
How is it spelled?
How is it used grammatically?
Can affixes be added to it?
All of this information about ‘blue’ gets wired over time as it is heard in multiple, informative contexts.

I feel blue.
Let’s watch Blues Clues.
My favorite color is blue.
Make it blue.
The blue ball.
Love that bluebird.
What does it take to know a word deeply?

Repeated exposures that are Highly informative
Classrooms Should be Noisy

**Remember**: The hardware is in place (experience-expectant plasticity). What is needed is *input*. 
The Hardware

Glennen & Masters, 2002
Part 4.

EDUCATION
Language Acquisition

In the early years, dependent on interactions with others

Expressions, gestures, intonation, pauses, and loudness provide important cues for learning
Serve and Return
SERVE AND RETURN:
Develops the brain circuitry/pathways
The Serve

A Communicative Bid
Communicative Bids

Long pauses with expectant look.
Comments: *I am going to look at this book.*
Cloze statements: *That bird is __________.*
Open questions: *What is going to happen?*
Reminiscing: *Yesterday was a great day.*
Communicative Bids

Long pauses with expectant look.
Comments: *I am going to look at this book.*
Cloze statements: *That bird is __________.*
Open questions: *What is going to happen?*
Reminiscing: *Yesterday was a great day.*
Serve and Return

- Adult: that bird is a robin.
- Child: robin.
- Adult: a robin with a big belly.
- Child: look at that.
- Adult: oh, it’s another bird.
- Child: and that.
- Adult: I think that’s called a chickadee.
- Child (laughs): not a chicken.
- Adult: chickadee. chickadee.
- Child: chickadee. Chickadee.
Serve and Return

• Adult: that bird is a robin. SERVE
• Child: robin. RETURN
• Adult: a robin with a big belly. SERVE
• Child: look at that. RETURN
• Adult: oh, it’s another bird. SERVE
• Child: and that. RETURN
• Adult: I think that’s called a chickadee. SERVE
• Child (laughs): not a chicken. RETURN
• Adult: chickadee. chickadee. SERVE
• Child: chickadee. Chickadee. RETURN
• Adult: that bird is a robin.
• Child: robin.
• Adult: a robin with a big belly.
• Child: look at that.
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• Child (laughs): not a chicken.
• Adult: chickadee. chickadee.
• Child: chickadee. Chickadee.

1. The adult ALWAYS serves again.

2. Every adult serve is ALWAYS contingent on the child’s return.

3. The conversation last five turns
• Adult: that bird is a robin.
• Child: robin.
• Adult: a robin with a big belly.
• Child: look at that.
• Adult: oh, it’s another bird.
• Child: and that.
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• Child (laughs): not a chicken.
• Adult: chickadee. chickadee.
• Child: chickadee. Chickadee.
## Monitoring Serve & Return

Place a checkmark over each number for a 5-turn serve and return

<table>
<thead>
<tr>
<th>Name</th>
<th>Numbers</th>
<th>Status</th>
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<tbody>
<tr>
<td>Billy Parsons</td>
<td>1 2 3 4 5 6</td>
<td>ABSENT</td>
</tr>
<tr>
<td>Joseph Miller</td>
<td>1 2 3 4 5 6</td>
<td>ABSENT</td>
</tr>
<tr>
<td>Sam Parker</td>
<td>1 2 3 4 5 6</td>
<td>ABSENT</td>
</tr>
<tr>
<td>Evan Prince</td>
<td>1 2 3 4 5 6</td>
<td>ABSENT</td>
</tr>
<tr>
<td>Jenna Murphy</td>
<td>1 2 3 4 5 6</td>
<td>ABSENT</td>
</tr>
<tr>
<td>Ross Fleming</td>
<td>1 2 3 4 5 6</td>
<td>ABSENT</td>
</tr>
</tbody>
</table>
Thank you!

Enjoy the 1st Annual Summer Institute

Laura Justice
justice.57@osu.