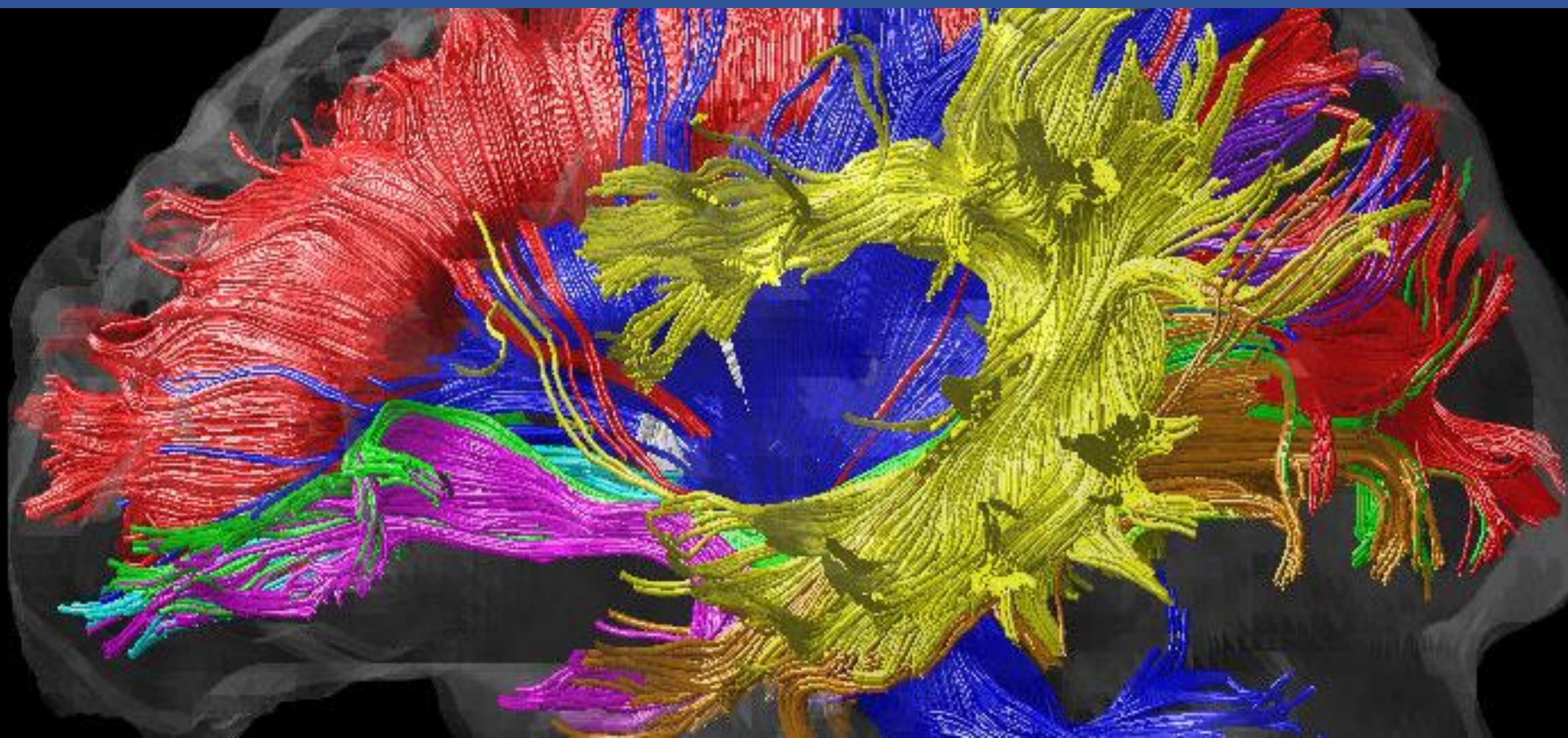


**The Beauty of the Reading Brain
and Its Challenges in a Digital Culture**
Maryanne Wolf, UCLA





THE MISSION

Literacy is a basic human right.

Across all learners,
all ages, all
backgrounds.

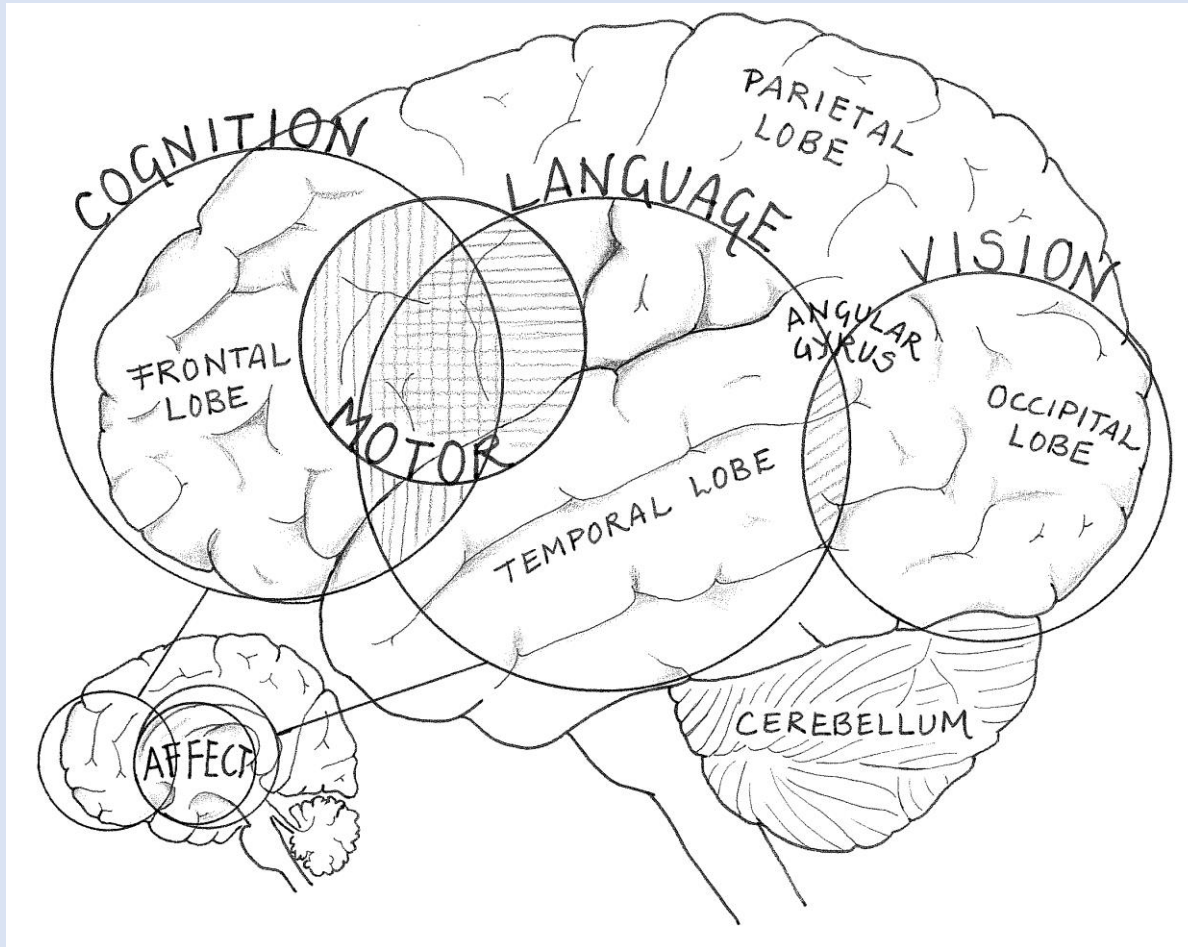
Why Neuroscience and Education?

“Parents and educators must have a better understanding of what reading changes in a child’s brain. I am convinced that increased knowledge of these circuits will greatly simplify the teacher’s task.”

Stanislas Dehaene



Let's Begin with the Reading Circuit



The human brain was never born to read.

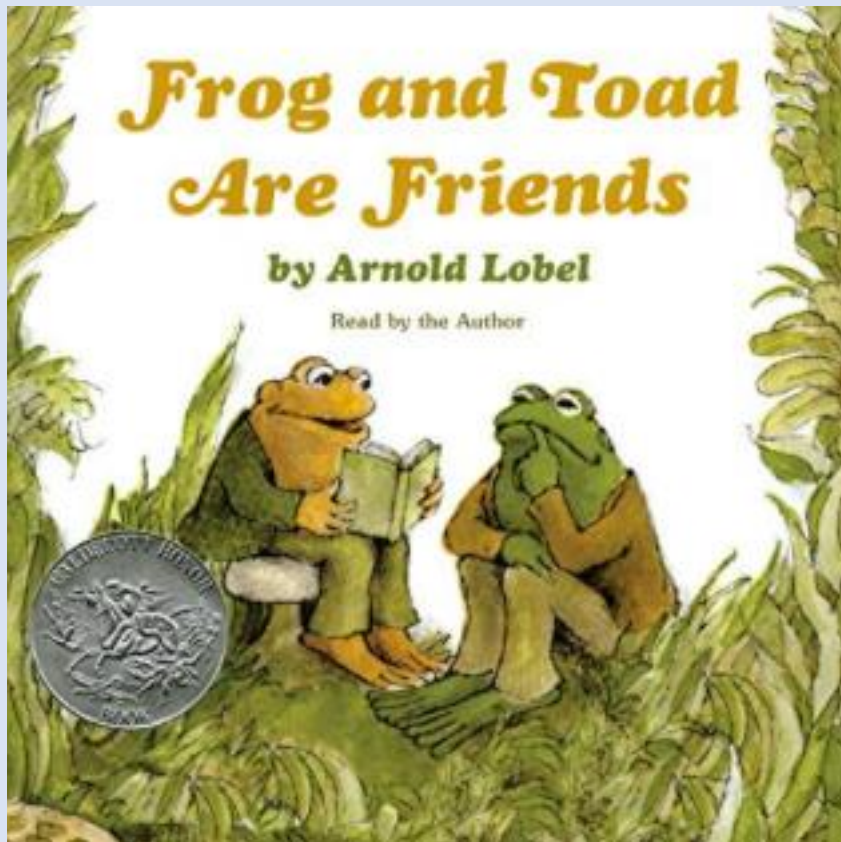
Each reader creates a new, *plastic* reading circuit from older cognitive and linguistic structures.

How Does the Young Brain Learn to Read?

Each new reader must
create a
new reading circuit
that connects older
linguistic, perceptual,
cognitive, and affective
networks.



Developing Emotional and Social Development: The Origins of Empathy



Every story introduces the child to a new piece of information about how others think and feel, and a chance to try this on for themselves without fear.

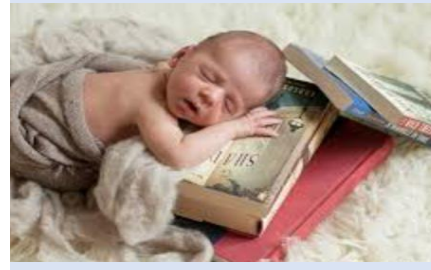
Stories as the Birthplace of “Compassionate Imagination” (Martha Nussbaum)



**An evolving
understanding of
”others” is the
foundation for a future
on an increasingly
connected planet.**

Books From Birth

AAP Literacy Recommendations



Shared reading...

“stimulates optimal patterns of brain development
which, in turn, builds language, literacy, and social-
emotional skills that last a lifetime.”

Examples: Reach Out and Read; Bring Me a Book

Deep Reading

Background Knowledge

Perspective Taking/Empathy

Critical Analysis

Novel Thought

Inference,
Deduction/Induction,
Analogical Thinking

Imagery

Insight & Reflection



Going beyond the
wisdom of the
author.

A photograph of two hands, one from a darker-skinned person and one from a lighter-skinned person, reaching towards each other to form a heart shape. The background is a warm, golden sunset over a field of tall grass. The text is overlaid on the left side of the image, enclosed in a light green rectangular box.

Empathy and Perspective-Taking

“Here is the Golden Key. It is the capacity to pass over to others and come back to ourselves. We all have the capacity, but we do not all discover it, come to use it, learn to pass over. “

Fr. John S. Dunne

Fiction Increases Empathy (Oatley and Mar)



“What’s a piece of fiction, what’s a novel, what’s a short story...? It’s a piece of consciousness being passed from mind to mind..

(Oatley, 2018)

”

Critical Analysis as Prerequisite to Contemplation

**Connects what is read
and what is known
with inferences;
evaluates our hypotheses;
and discerns truth value.**





The Deep Reading Brain

....requires both **milliseconds** during the reading act and years of formation to connect **critical thought and empathy** to insight.

It is never a given.

Reading as the 'Canary in the Mind'

- Literacy changes the brain, which changes the individual, which changes society, which changes the future of the species.

- This has all begun to change.

漢字

na	a	ša	šu	gal	ki	mu	ma
bi	an, dingir	kám	im	ú	ši	bad	ri
ir	ra	ud	dím	ni	aš	hal	mug
zu	su	šun	ka	ba	la	ád	gu, kú
bal	zadmin	búl	tar	iti	aššur	arad	ush



The Reading Circuit Reflects the Medium



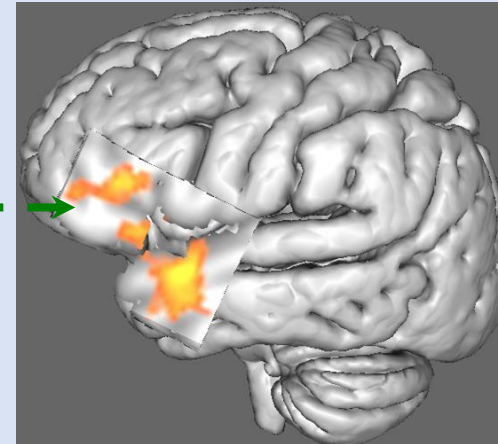
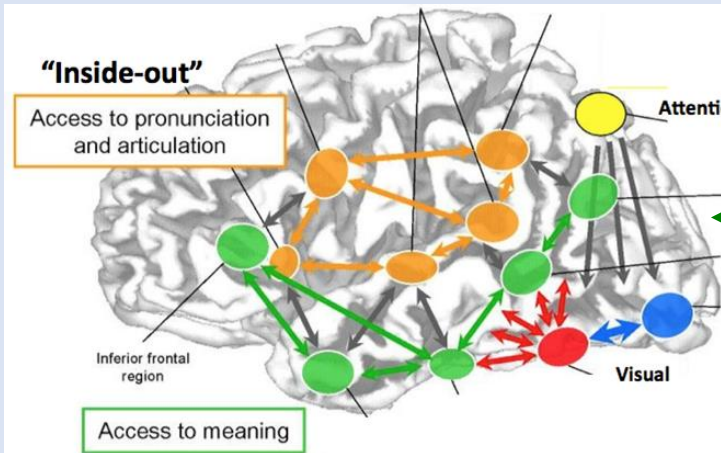
“Every medium has its costs and weaknesses... the cost (in the digital medium) seems to be to deep processing.”

-Patricia Greenfield, 2009

The “Goldilocks” Effect in Mediums

Parent Book Reading > Audio Book > Animated Story

-John Hutton



- Expressive language
- Complex language processing
- Social-emotional integration
- Working memory/attention

1. Adapted from S. Dehaene, “Reading the Brain,” 2010.
2. Hutton, et al. *In Submission*, 2016; presented at PAS 2016.

Evidence in Youth: Attention Changes



**Continuous partial attention with
and Multi-tasking and Distraction**

**Needs higher levels of stimulation:
dopamine lollipops**

**Differences in white matter
connectivity with screen use**

Evidence in Young Adults: How we read is changing

(E-Read Network, Delgado, Salmeron, Baron, Rhinehart)

**Over 50 studies from
2000 to 2017**

171,055 Participants

**Print superior to screen
for comprehension**



Evidence from European Cooperation in Science and Technology's E-Read Network

Changes in attention in youth

Comprehension of text and sequencing of details better in print than on digital screens

Mangen & van der Weel, 2016

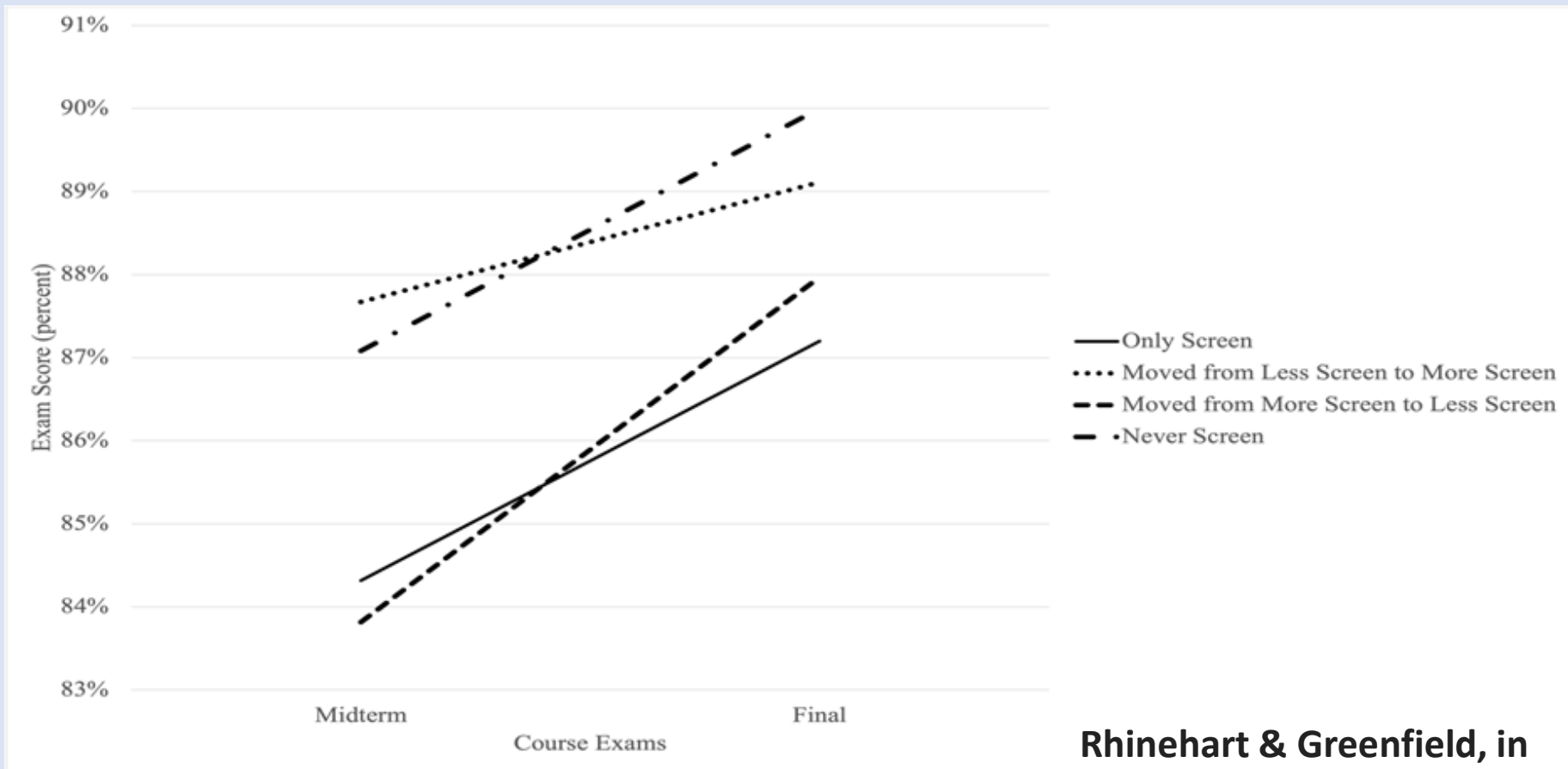
Guernsey & Levine, 2016

Baron, 2015; Katzir, 2018;

Barzillai, Thomson & Mangen, 2018



Undergraduate Performance With or Without Screen



Rhinehart & Greenfield, in
press

Evidence in Adults: How We Read Changes

EVIDENCE

1

Skimming,
browsing,
keyword spotting;
F or Z pattern

(Liu, 2005, 2009, 2014)

2

Less concentrated
reading; more
distractions

3

Decreased
attention and
memory

(Baron, 2021)



Implications for Reader

- If reading largely changes to adapt to digital characteristics:

we will reduce **deep reading**

with less time

to grasp **complexity**,

to understand another's **feelings**,

to perceive **beauty**, and

to appreciate our shared **cultural heritages**

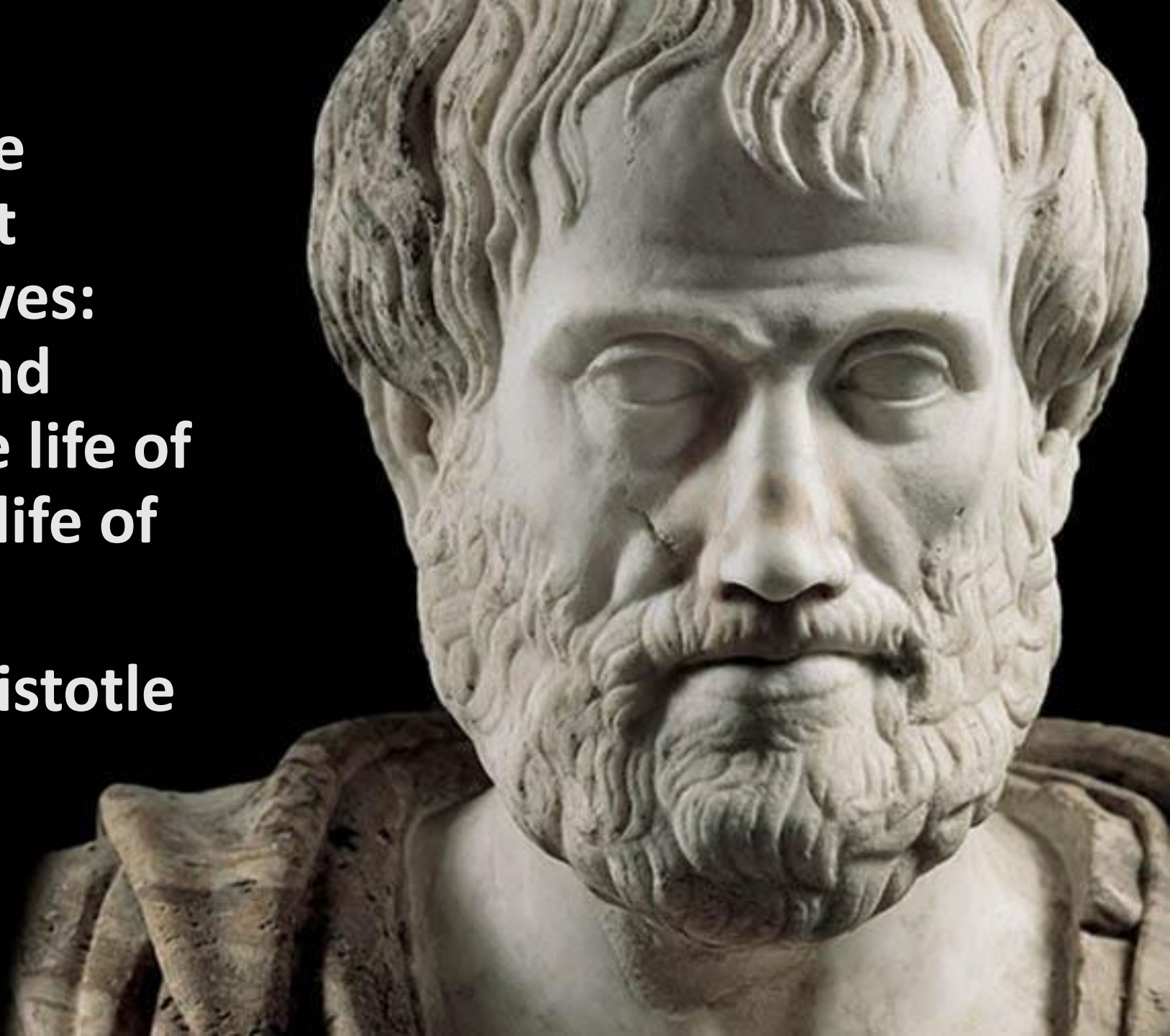
Implications for Reader and Society

Less time to understand
complexity and to learn empathy;
more susceptibility to false
information false fears, false
hopes,
and demagoguery:
all threaten a **democratic society**



“A culture can be judged by how it pursues three lives: life of **activity** and **productivity**, the life of **enjoyment**, the life of **contemplation**.”

-Aristotle



The Third Life of the Good Reader


Reading is an act of contemplation...
an act of resistance in a landscape of distraction.
It returns us to *a reckoning with time.*”

-David Ulin

Stewards of the Next Generation

“It would be catastrophic to become a nation of technically competent people who have lost the ability to think critically, to examine themselves, and to respect the humanity and diversity of others.”

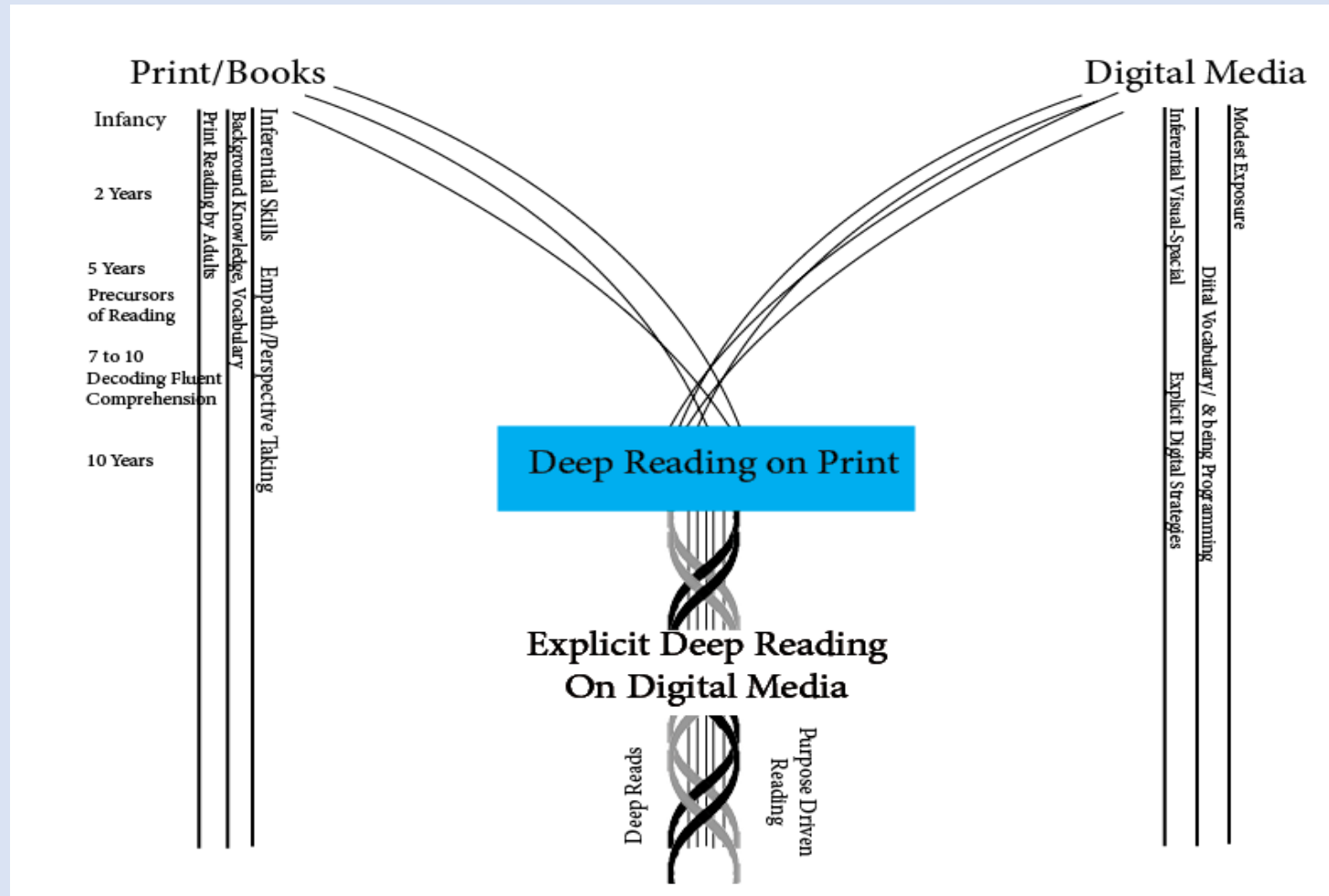
-Martha Nussbaum

A photograph of two young children, a boy and a girl, sitting on a white bed. The boy, on the left, is wearing a black long-sleeved shirt and is looking down at a tablet. The girl, on the right, is wearing a grey long-sleeved shirt and has her hair in two pigtails; she is also looking down at a tablet. Both children are barefoot. The background is a plain, light-colored wall. Overlaid on the right side of the image is a block of text in a bold, black, sans-serif font.

**We can not go back,
but we can not go
forward without
knowing what is lost
and gained in each
medium for future
generations.**

The Development of the Biliterate, Deep Reading Brain:

PRESERVE and EXPAND



Our GOALS

To develop a biliterate brain capable of knowing when to skim and how to read deeply across mediums

To design digital learning that redresses present weaknesses and propels empathy, critical thinking, and reflection.



THE ROLE OF BOOKS IN OUR LIVES



A biography of any literary person ought to deal at length with what he read and when, for in some sense, we are what we read...

--- Joseph Epstein