LIVING IN PASTEUR'S QUADRANT:

Navigating the uncharted waters between basic and applied research

Kathy Hirsh-Pasek
Temple University
Brookings Institution

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University of Delaware

Everyone is talking about developmental psychology!

Child care

Brain-based education

High quality preschool

30-million word gap

The Grade Level Reading Campaign

STEM STEAM

STEM

But some of us (many of us) are wary about what they are saying

Take Eric Jensen, for example…

Jensen Learning Brain-Based Teacher Workshops and Teaching Strategies for the Learning Brain...

Founders Diane and Eric Jensen

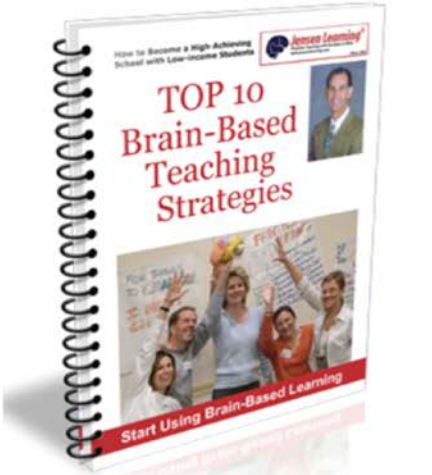
Dear Colleague...

Jensen Learning integrates cutting-edge neuroscience with practical, user-friendly classroom strategies, to overcome challenging teaching environments such as poverty, AD/HD... helping you create a high performance school environment.

On our website you'll find books on **Brain-Based Learning** and **Brain-Based Teaching**, as well as **Eric Jensen's Brain-Based PowerPoint Presentations** to help you deliver a clear concise learning experience and a powerful presentation to your teaching staff...

Please sign up for our **Top 10 Brain-Based Teaching Strategies** (on the right) and we'll add you to our monthly newsletter - called the BrighterBrain®Bulletin.

Jensen Learning Workshops Provide Classroom-Proven, Freshly-Research, 100% Brain-Based Teaching Strategies For The Learning Brain:



Simply Fill In Your Name & Email In The Form Below

Google this to get 412,000 hits in 0.38 seconds!

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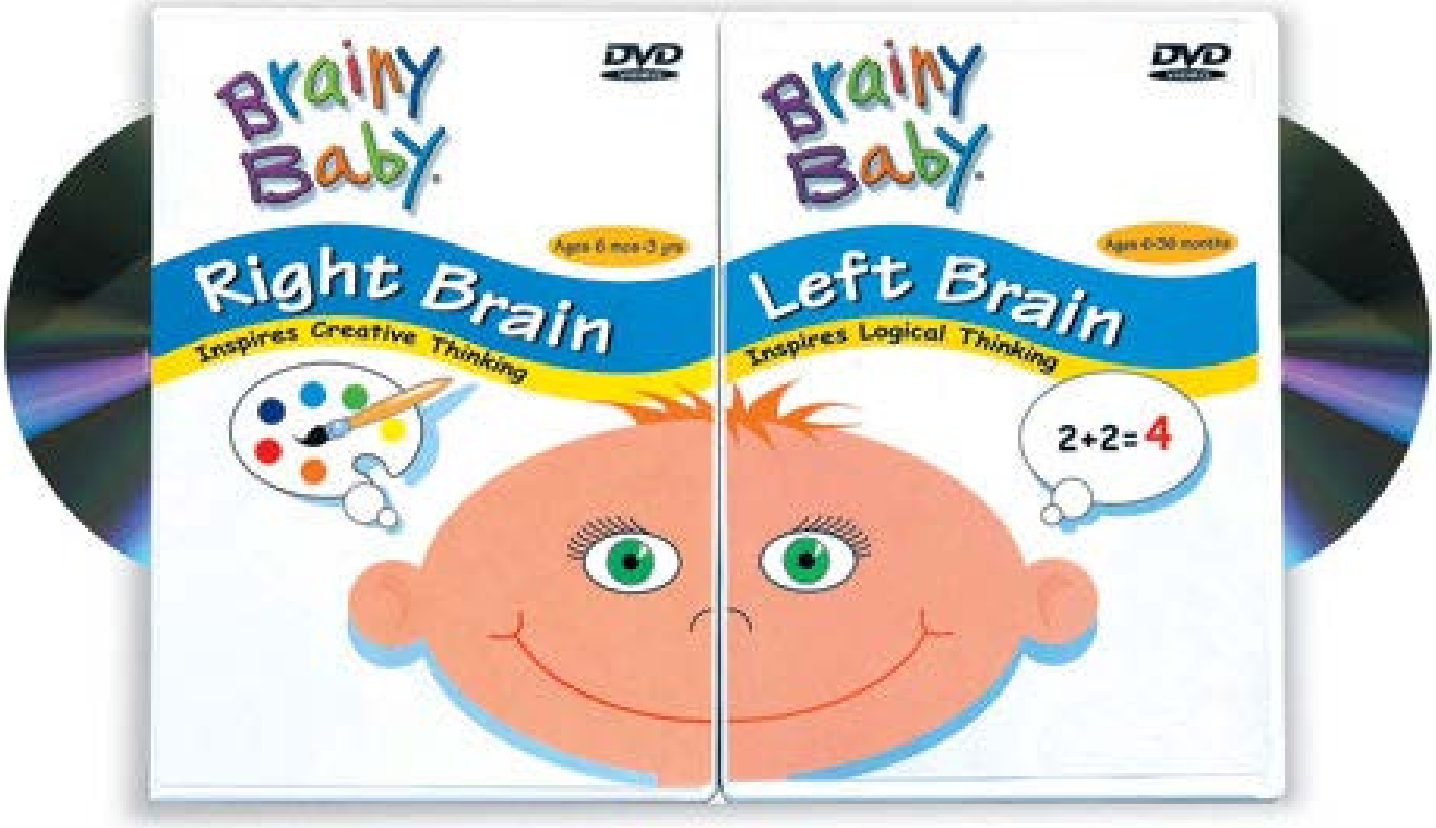


Which offer two separate CDs depending on which hemisphere you want to activate

A recent White House Conference bridging neuroscience and learning found that there was not a single study that could conclusively support product generation or a curriculum based on educational neuroscience.

Then there are the one-million so called, “educational apps” that will help you learn everything from math, to a second language, to logic

And our piece for *Psychological Science in the Public Interest (2015)* suggests that many of these apps are likely to have little

Finally, our personal favorite

Susan Neuman

POPULAR SCIENCE

June 6, 2014

Neuman and her colleagues took 117 babies aged 10 to 18 months. Half the group used flashcards, DVDs and books from the Your Baby Can Read System, while half did not. In 13 of 14 assessments, which included the ability to recognize letter names, letter sounds and vocabulary, the researchers found no difference between the groups. The lack of difference between the groups surprised even Neuman. “We did not think that their claim that babies can read was going to be justified – but we did expect some precursors to literacy (like phoneme awareness)z to be affected,” she says.

Bottom line….No, your baby can’t read!

At the July 2000 International Conference on Infant Studies Andy Meltzoff asked…

(and we paraphrase)

Why is our infancy research so misinterpreted by the public? Why do they translate our findings on number to mean babies can do math? Our findings on language to mean babies can read?

Perhaps because “educational” apps and “your baby can read” are the public faces of our field…

The ways in which many parents, policy makers and educators access the “latest” on child development.

Our careers have focused on…

- Conducting “use-inspired” basic research in the science of learning
- Developing platforms for scientific outreach within the science of learning

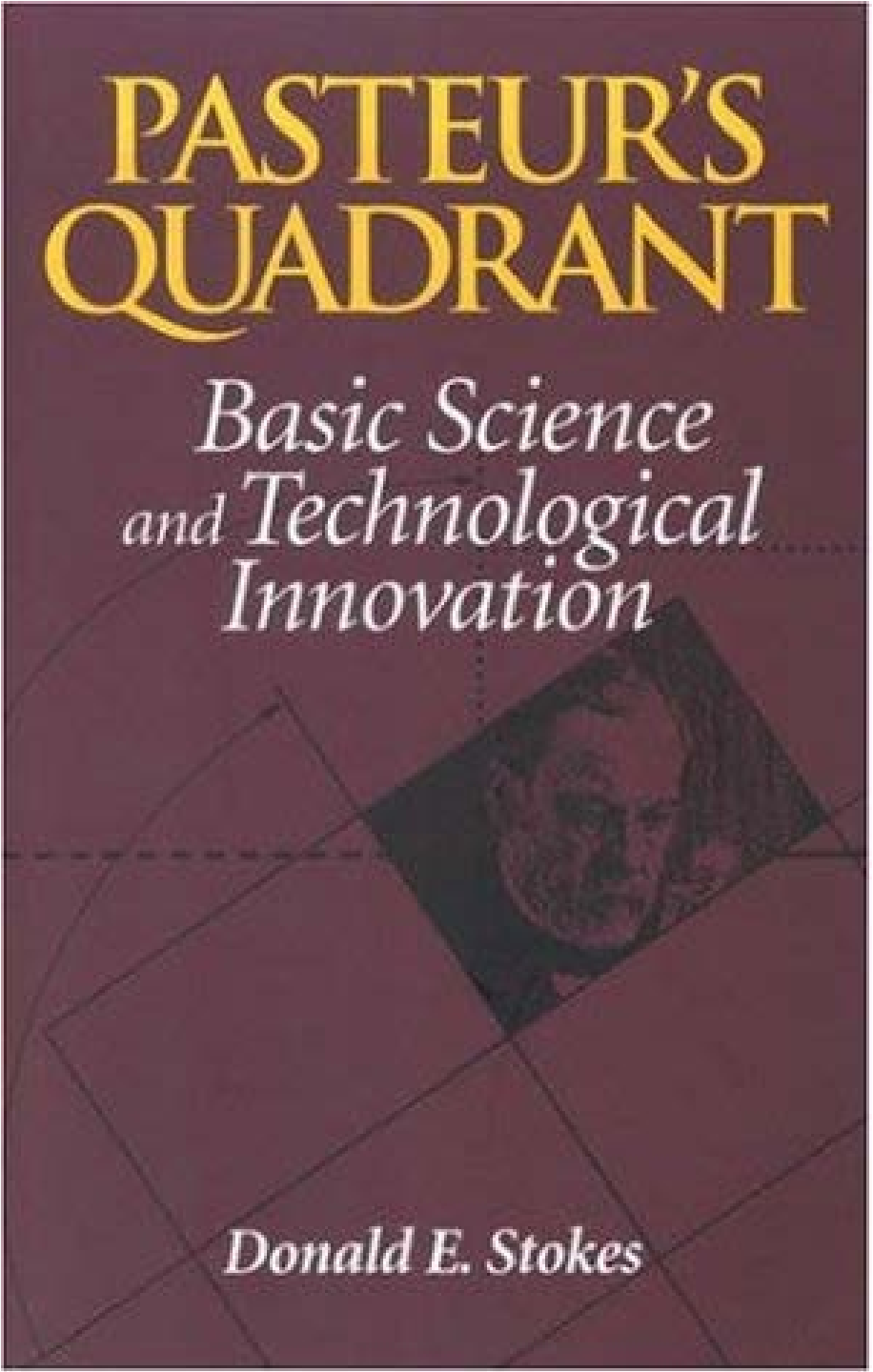
A talk in two parts

- Exploring life in Pasteur's quadrant
  - Three examples in language and literacy
- Leaping beyond the quadrant into the world at large

A talk in two parts

- Exploring life in Pasteur's quadrant
  - Language and literacy

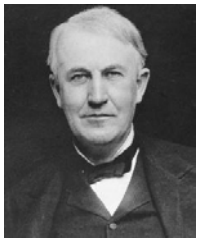
- Leaping beyond the quadrant into the world at large



In 1997, political scientist Donald Stokes wrote a very influential book.

Offering a new solution to the tension that arises between basic science and more applied research.

Stokes' Vision

Quest for fundamental understanding? High	BOHR QUADRANT Pure basic research	PASTEUR QUADRANT Use inspired basic research
Low		EDISON QUADRANT  Applied research
	Low	High

Consideration of use?

A PSYCHOLOGY VERSION MIGHT LOOK LIKE THIS!

the diversion into practical channels of energy which would otherwise have been expended in the service of the laboratory must be regarded as a definite loss to pure science

Quest for fundamental understanding? High	TITCHENER QUADRANT Pure basic research	BRONFENBRENNER QUADRANT Use inspired basic research
Low		ANASTASI QUADRANT Applied research

Low — High

Consideration of use?

A PSYCHOLOGY VERSION MIGHT LOOK LIKE THIS!

Quest for fundamental understanding?

High

Low

TITCHENER QUADRANT

Pure basic research

BRONFENBRENNER QUADRANT

Use inspired basic research

ANASTASI QUADRANT

Applied research

Low

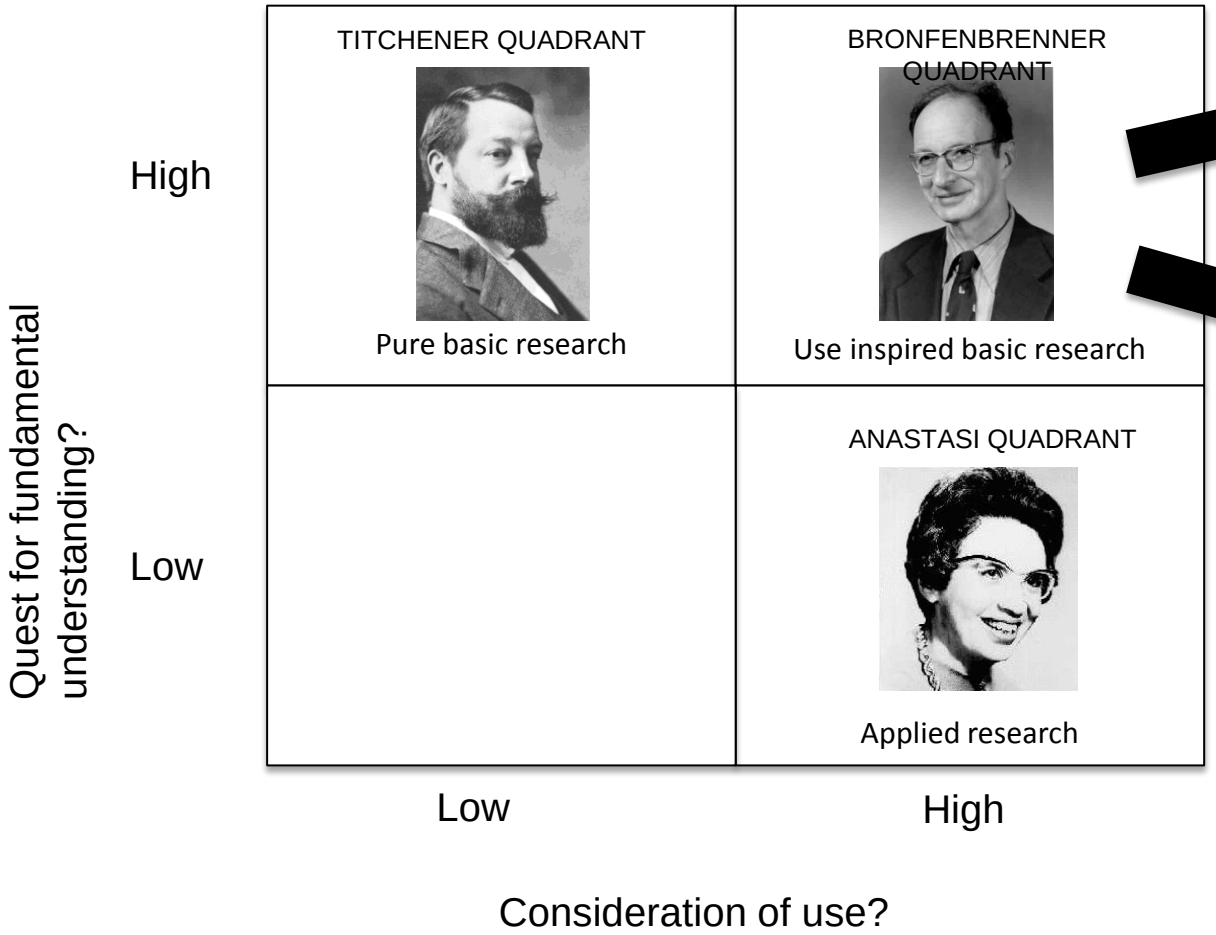
High

Consideration of use?

Language and Literacy

Early spatial development
Importance of spatial experience for math learning

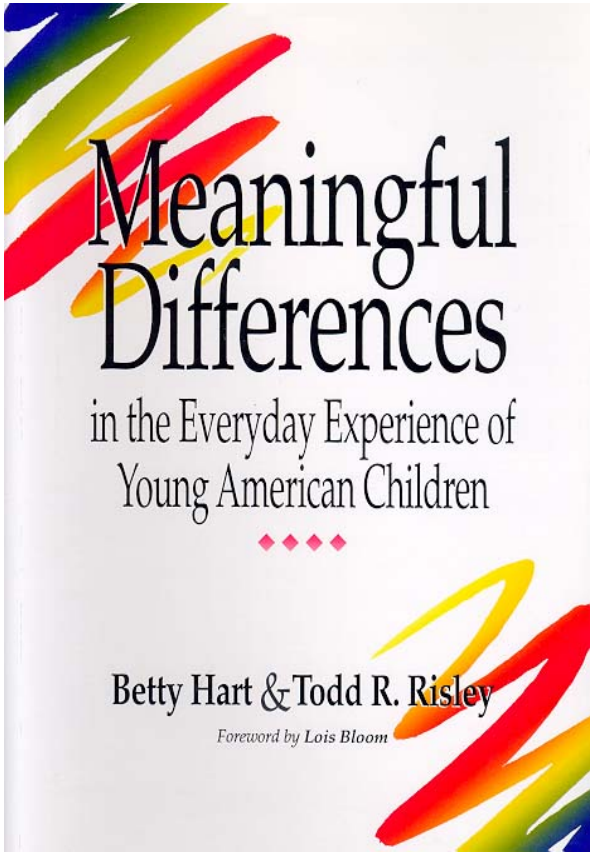
A PSYCHOLOGY VERSION MIGHT LOOK LIKE THIS!



Language and Literacy

Early spatial development
Importance of spatial experience for math learning

Our recent work on early language started with Hart and Risley (1995)

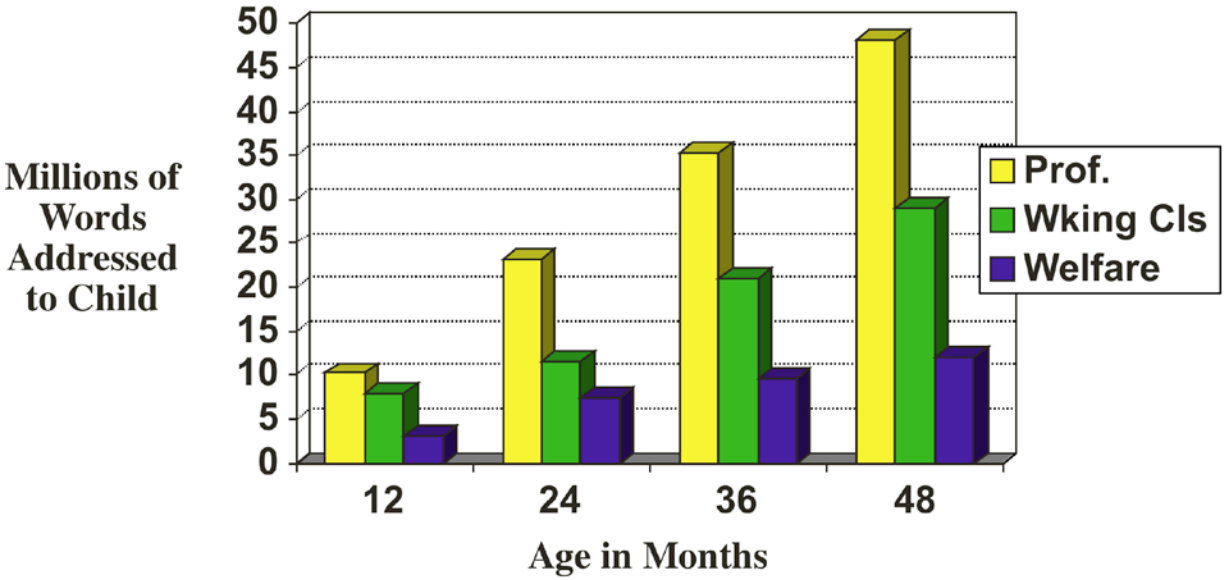


Examined language input to children from…

- Welfare
- Working class
- Professional families

(see also Hoff, 2002, 2003; Pancsofar & Vernon-Feagans, 2010)

Results?



Number of words heard per hour by children in each group:

Welfare - 616

Working Class - 1,251

Professional - 2,153

This finding is widely known as the **30 million word gap**
and it has a number of far reaching consequences

Children's recorded vocabulary size?

Professional - 1,116

Working Class - 749

Welfare - 525

And…

- Verbal IQ correlates with school achievement
- Reading is parasitic on language
- Language encodes concepts!
- Language skill predicts health care outcomes

But is it all about *number of words* that pass children's ears?

Given the latest interventions, you might think so

But Hart and Risley (1995) also said that is it not just quantity! Parent talk that is *contingent and responsive* to child talk is more important than just number of words – quality counts too! (Tamis LeMonda et al., 2014; Dunham & Dunham, 1996; Hart & Risley; Mol & Newuman, 2014).

Sometimes that message gets lost in popular translation

So –

On the heels of a number of our colleagues…

Goldin Meadow et al. (2014); Rowe (2012); Cartmill et al. (2013); Tamis-LeMonda et al. (2014)

And building from Adamson and Bakeman's prior work on joint engagement…

We decided to revisit the questions about both the quality AND quantity of early communication and its impact on later language learning.

We asked two questions:

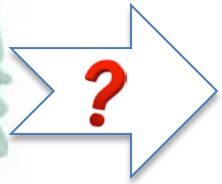
1. Do low-income children who are successful language learners experience a higher quality of communication than their less able peers?
2. How important is the *quantity* of language children hear relative to the *quality* of the communication foundation?

(Adamson, Bakeman, Deckner, & Nelson, 2012; Aksan, Kochanska, & Ortmann, 2006; Hirsh-Pasek, Adamson, Bakeman, Owen, Golinkoff, Pace, Yust, & Summa, (2015). Psychological Science.

Secondary data analysis from the NICHD Study of Early Child Care and Youth Development…

A longitudinal study of children from 0-16 years, from varied ethnicities and income groups… we designed a study to evaluate quantity v

Examining the Quality and Quantity of Communication during parent-child interaction



High language scores

Mid language scores

Struggling language scores

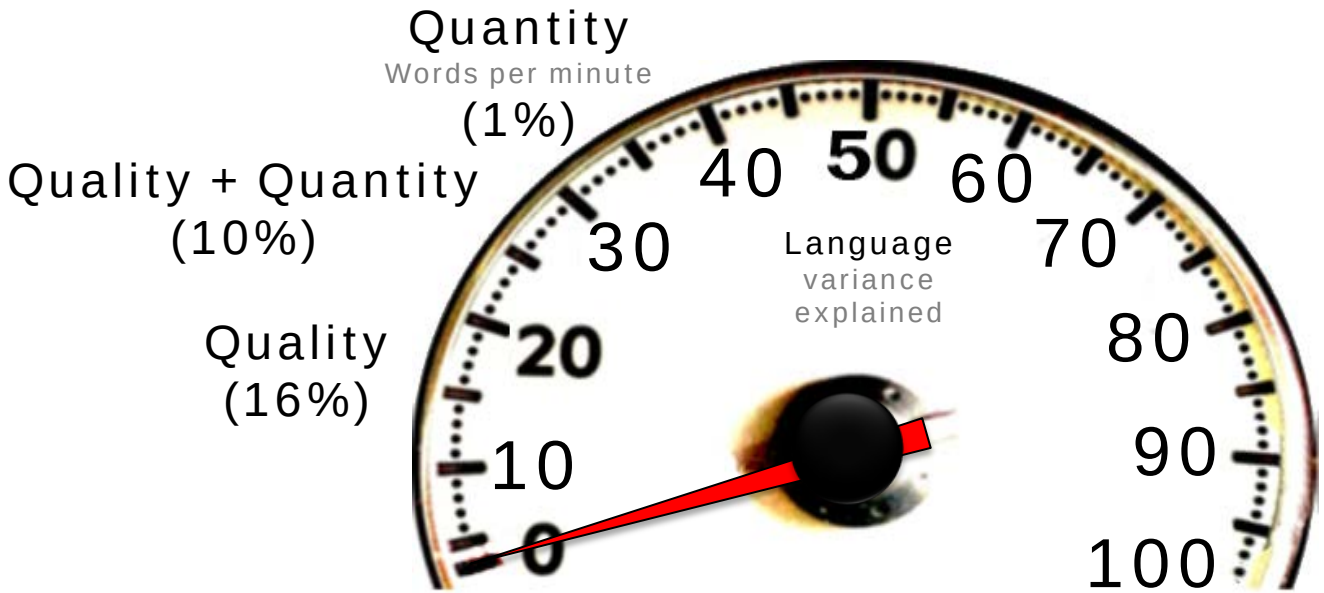
N = 60 low-income children

Quality =

1) **Symbol infused joint engagement (gesture and words)**
2) **Fluid and connected exchanges (verbal and non-verbal)**
3) **Playful routines and rituals**

Quantity = number of mother's words per minute

Findings and Implications



1. Quantity of input (amount) and Quality of Foundation for Communication are both important for language growth but "communication foundation" matters more.

2. In our study, it's not about poverty.

3. Fluid and connected conversations – "Conversational duets" require serve and return, and return and return and return. …it can't be a solo performance.

4. It's "filling the gap" + "building the foundation" – a new metaphor for intervention

See Cartmill et al. (2013) for related findings

Conversational duets – whether during play or reading storybooks -

-in which what the adult says and does is ***CONTINGENT on the child's focus***

Are the interactions that fuel language growth

And likely fuel attention and the ability to engage at sc

We did a second study that more closely examined Quality as contingent interaction by looking at language learning in video chats

Roseberry, S., Hirsh-Pasek, K., & Golinkoff, R.M. (2013) Skype me! Socially contingent interactions help toddlers learn language. *Child Development*

You have heard this before…

- Little people learn best from live interaction and less from TV – “video deficit”
    - Anderson & Hanson (2013), for a review
    - Troseth and colleagues

BUT if contingent responding *really* matters, might children learn new words from Skype conversations?

We looked at the learning of action words -- verbs

Here is the training:

"Wow! I'm ***blicking*** him! I'm ***blicking*** the baby doll.

Will you watch while I'm ***blicking*** the baby doll?

I'm ***blicking*** him, I'm ***blicking*** the baby doll.

I am ***blicking*** the baby doll."

And trained the words in either live presentations, video chats (as on Skype) or TV

Tested word learning in 24- to 30-month-olds in one of three ways:

- Video Chat Training (responsive and contingent but 2D)
- Live Interaction Training (responsive and contingent 3D)
- Yoked Video Training (a pre-recorded video not responsive or contingent)

Test Phase

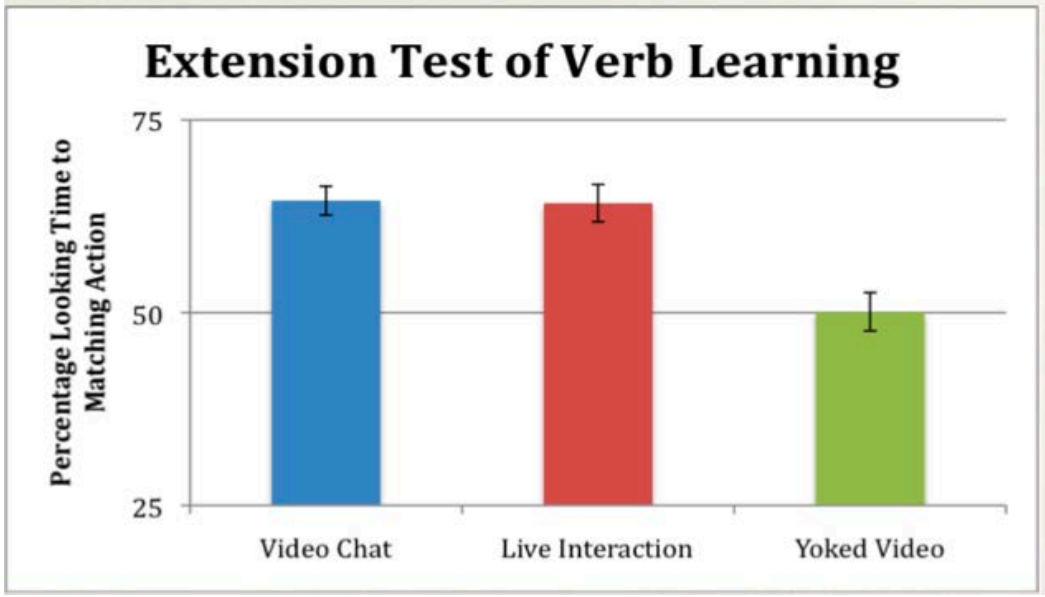
- Split-screen design
  - One matching action
  - One non-matching action

Could the children learn the verb? And was the video chat more like live? Or more like television?

Results – How did children respond to video chats compared to live interactions?

Sarah Roseberry

Learning from video chats was more like LIVE



Roseberry, S., Hirsh-Pasek, K., & Golinkoff, R.M. (2014) Skype me! Socially contingent interactions help toddlers learn language. *Child Development*

Contingent responses enable word learning – even over Skype!

- But what happens if we disrupt the contingency?
- Random cell phone calls and text messages disrupt contingent conversation!

Do these interruptions derail children's word learning?

To test this question, we

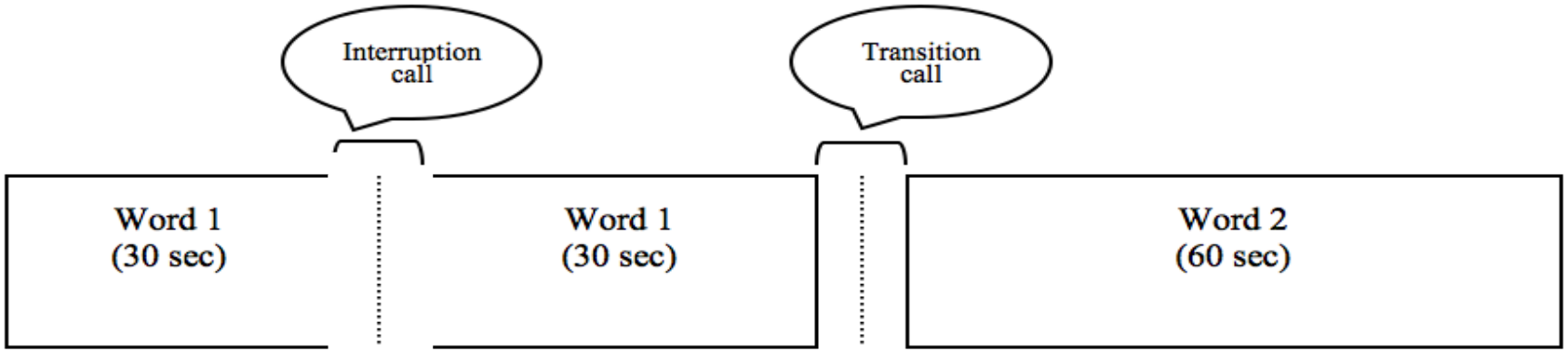
-Asked Moms to teach two novel verbs

- the same words as in Roseberry Skype study

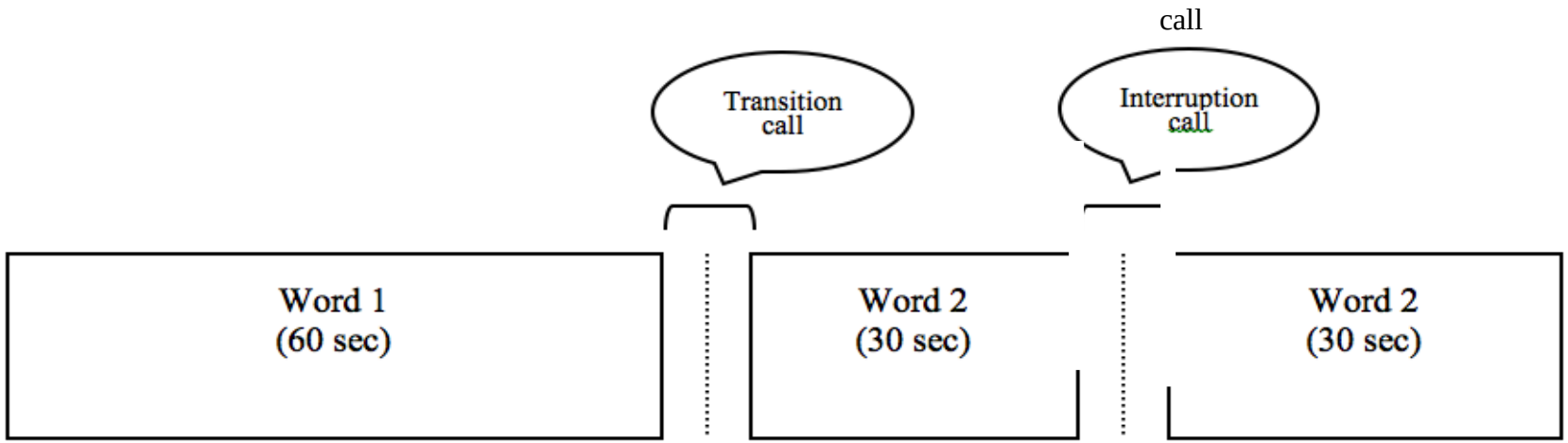
-And in a within subject design, they taught the two words to their children

Method: Design Overview

In one condition mom received a phone call in the middle of the 1st word



In the other condition, mom received a phone call during the second 2nd word



The interruption

N = 38 dyads (M_{child} = 27.2 months)

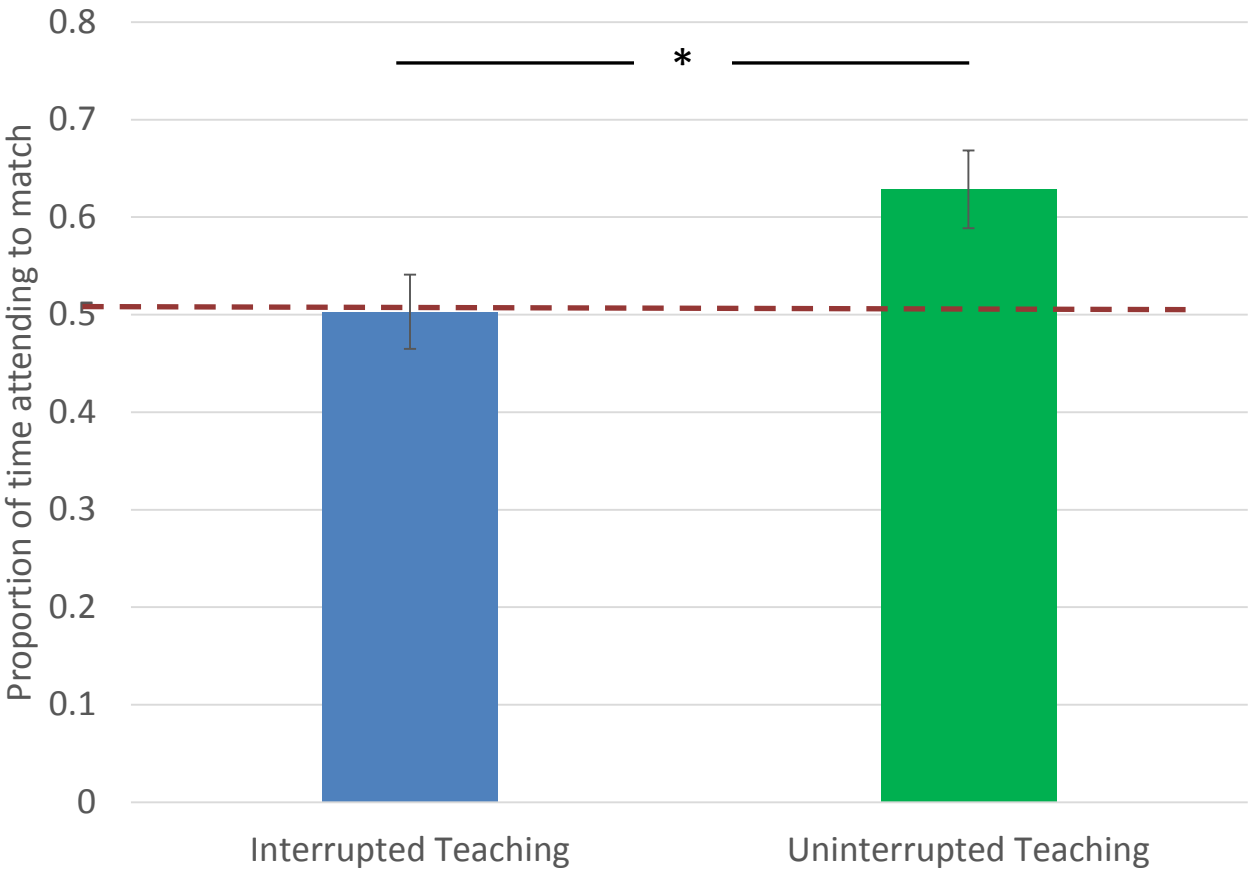
Word learning assessed via Intermodal Preferential Looking Paradigm

(GOLINKOFF, MA, SONG, & HIRSH-PASEK (2013)

Find blicking!

Do interruptions affect word learning?

Jessa Reed



Significantly longer looking target *only* when the teaching was **not interrupted**, $F(1, 34) = 5.96$, $p = 0.02$.

Part I: Summary

Contingency matters!

- Two studies show contingency matters in:
  - Conversational duets in vivo
  - Over Skype
- A third study turned this on its head:
  - Violate that contingency → disrup language learning

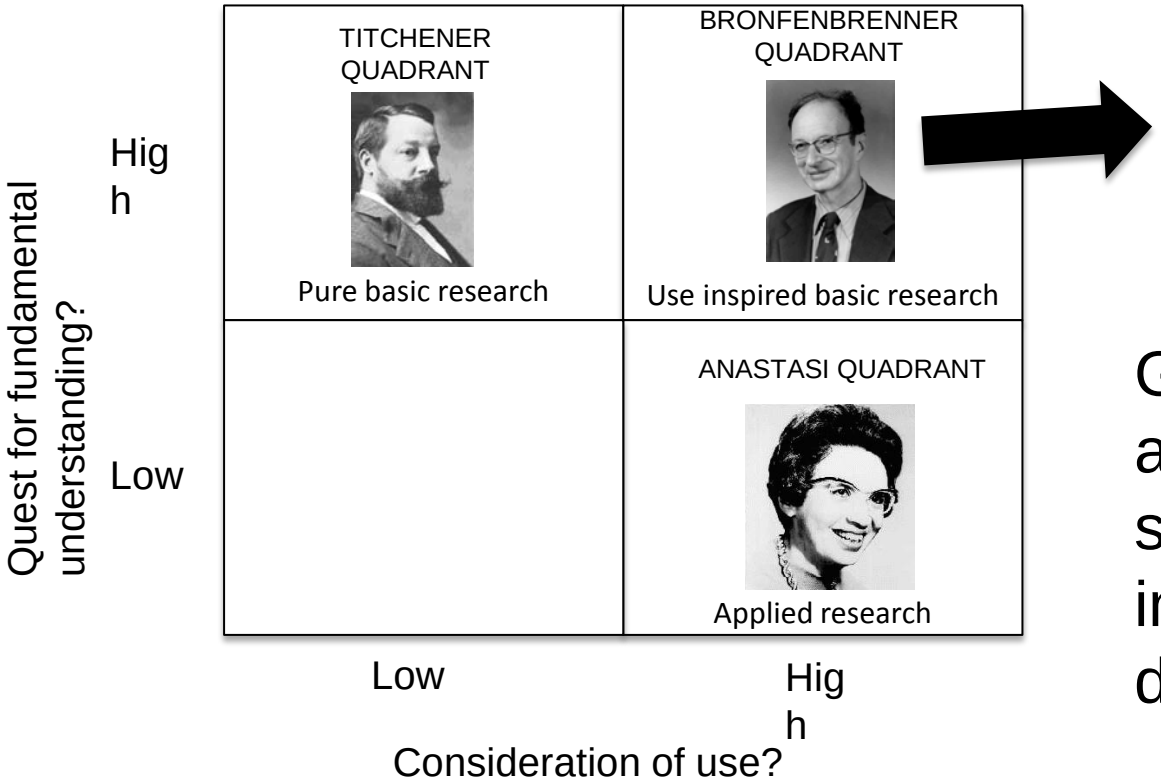
The message from Pasteur’s quadrant:

- If you want to increase children’s language, reduce the 30 million word gap, focusing on quantity alone is not enough!

The QUALITY of adult-child conversation matters.

Part I of today's talk

We explored life in Pasteur's and Bronfenbrenner's quadrant

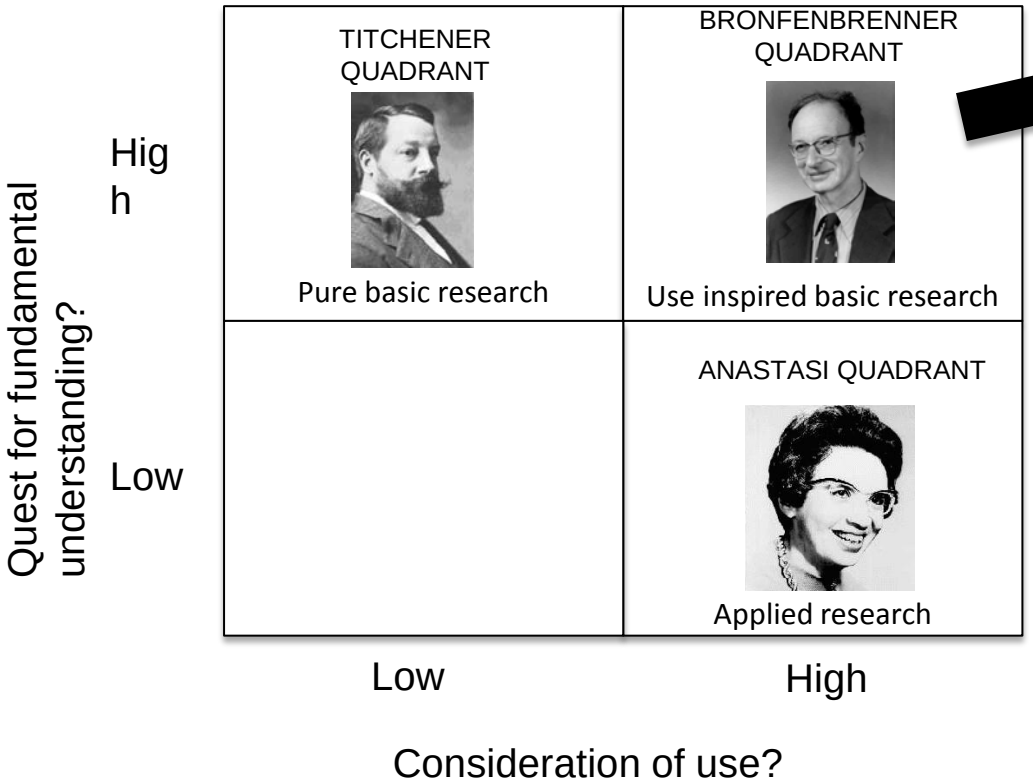


Language and Literacy: 3 examples

Getting these answers and publishing in scientific journals is important for developmental science!

But it's not enough to **live inside the quadrants**

Part II of today's talk



Language and Literacy:
3 examples

Leaping beyond the quadrants into the world at large: Sharing the science!

Leaping from Pasteur's (and Bronfenbrenner's) quadrant raises additional challenges….

- **WHEN** has the field amassed enough "gold standard" data to share it with the public?

- **HOW** can we best share the body of evidence in ways that protect the integrity of the science while informing practice?

On WHEN to share gold standard findings….

We are often reticent to put our findings into the marketplace of ideas. But we actually know a lot based on strong bodies of data that **can** inform the public.

For example, we suggested principles that can be derived across a number of areas that enjoy general consensus.

Perhaps it is time to derive working principles in a number of

On HOW to share our wares:

Creating "edible science" that is accessible, digestible and usable

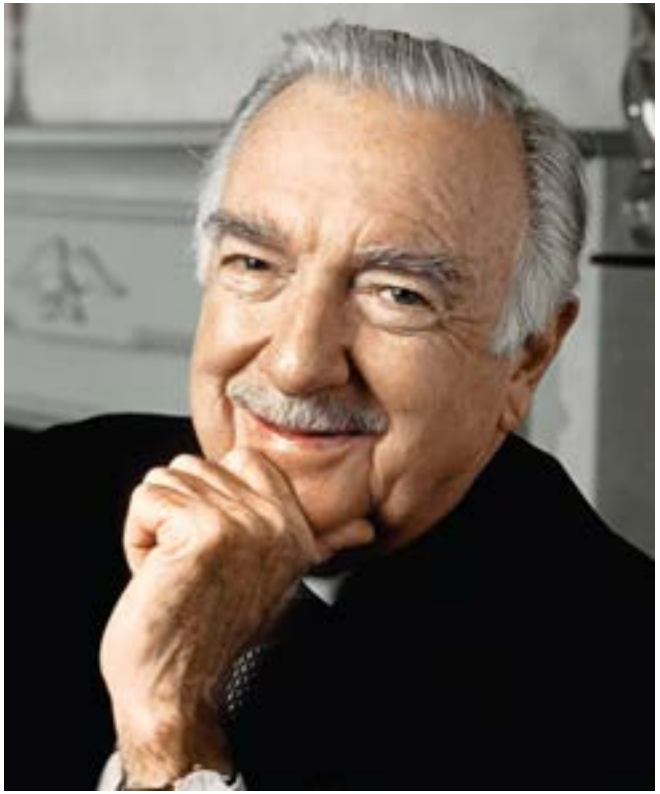
- Through dissemination of **information**

- Through dissemination of **experiences**
  - A new way to share the science of learning

On disseminating information

The Bad News: Dissemination $\neq$ publishing a journal article! Estimated: article read by 17 people (King et al. (2006) suggests the more optimistic numbers for the journal *Pediatrics*)

The Other Bad News: Gatekeepers are gone. In the olden days, if you had a new finding, the news would cover the story.



Does anyone remember this trusted gatekeeper??

On disseminating information

- Today: blogs, TED talks, tweets, books and a host of other outlets that portray our psychological findings.

- How do we ensure that properly nuanced findings reach this audience and move above the “noise?”

- And what is our responsibility to work with journalists to get the information to the public?

On disseminating experiences

- Don’t just tell ‘em; show ‘em and involve ‘em!

- Using findings from psychological science, we have experimented with creating experiences to foster learning for families and kids.

- Three examples tell our story.

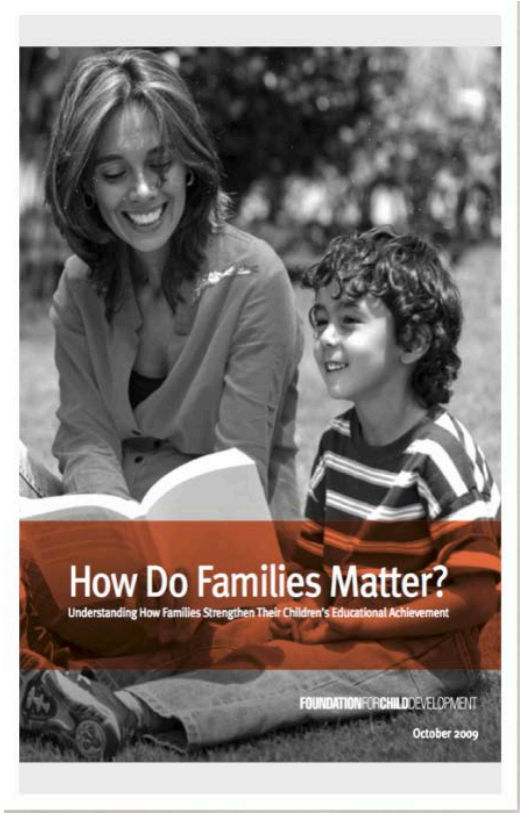
Example 1: The Supermarket Study

Ridge, Ilgaz, Weisberg, Hirsh-Pasek & Golinkoff (in press)

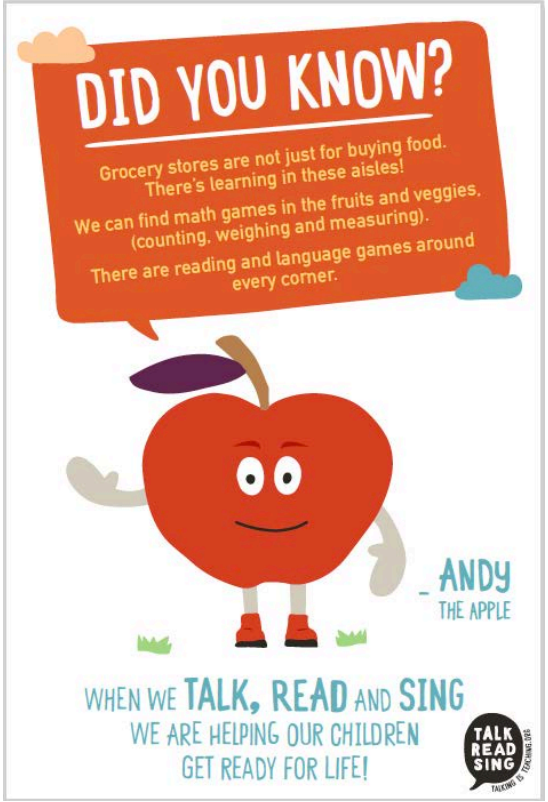
- Amount and quality of parental input is important for language learning.

- Inspired by “Three moms and an eggplant”
  - Mom 1, 2, and 3
  - (Foundation for Child Development (2009)

- Would putting signs in the supermarket prompt parents to talk more to children in everyday places?



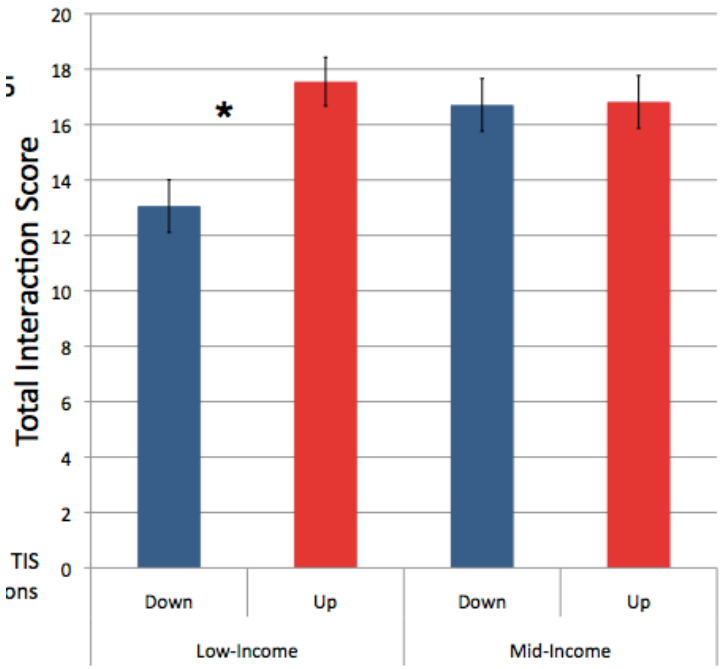
Turning supermarkets into children's museums



In collaboration with Fresh Grocer

thefreshgrocer

RESULTS?



In low income neighborhoods, we got a 33% increase in parent/child language when the signs were up.

Example 2: The Ultimate Block Party

Bringing the science of learning to Central Park in 28 scientist- vetted activities each built from a research article on spatial learning, executive function, literacy, mathematics……

SILC

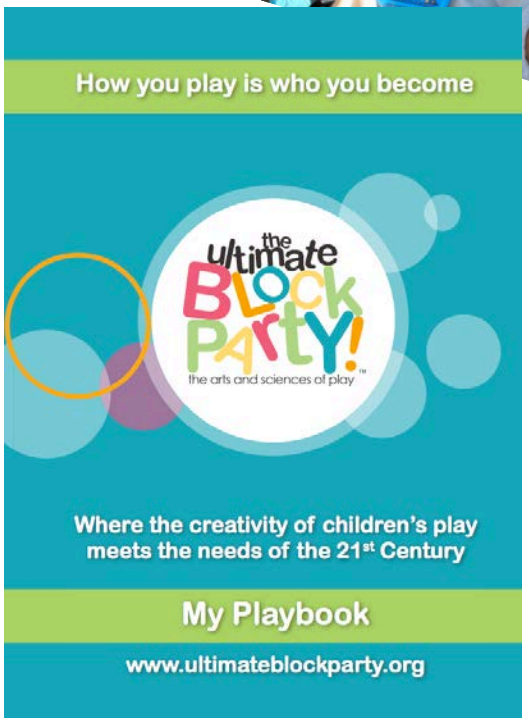
NSF National Science Foundation
WHERE DISCOVERIES BEGIN

LIFE

Impulse control at the World's Largest *Simon Says*

Spatial learning through LEGO

Scientists and educators like Ellen Frede & Elana Bodrova who helped parents link activities to the science



And 16,000 free books that linked the activities to the science of learning!

Results?

- Over 50,000 participants in NYC with strong showings in later Ultimate Block Parties in
  - Toronto and Baltimore
  - More planned in Bath, England and Washington DC

- Reach in NY – 10.2 million before *NY Times* article

- Evaluation survey by Grob, Schlesinger et al.,
  - Compared 258 adult attendees at the NY event vs. small control group who played at Central Park on another day (n=34).

- Results suggest that:
  - The attendees were highly racially and economically diverse
  - Those who attended more activities →, were more likely to understand the link between science and playful learning

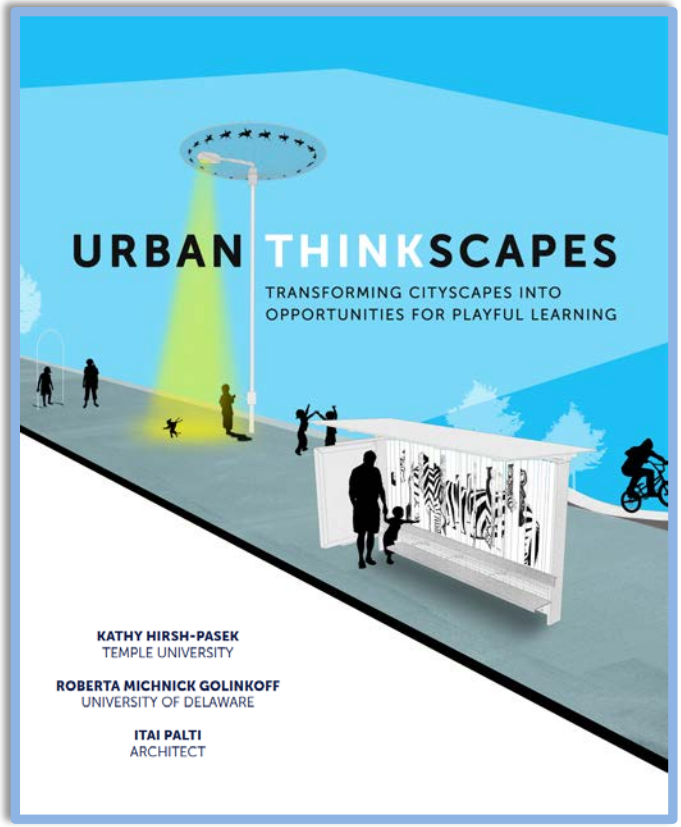
Much more to be learned from experiential outreach….

- Does the learning stick?
- Are the positive results coming only from parents who were biased towards seeing the connection?
- Did the learning continue at home when the event was over?
  - We distributed handbooks and had a website and blog

Example 3: Our newest initiative in disseminating experiences

URBAN THINKSCAPES

TRANSFORMING CITYSCAPES INTO OPPORTUNITIES FOR PLAYFUL LEARNING



Here we transform everyday street lights and park benches in ways that can create “smart” cities

Imagine transformed street lights...

ITAI PALTI
ARCHITECT

STREET LIGHT PROJECTION

Installation on existing street light.
turning the wheel changes colour of projected light.

STREET LIGHT ANIMATION

Installation on existing street light.
turning the wheel creates a moving projection.

Or what about new designs that alter ordinary objects like benches?

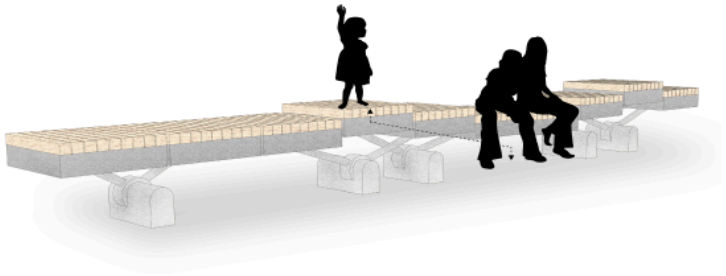
ITAI PALTI
ARCHITECT

THE TURNING PUZZLE BENCH

The wall of the bus stop challenges passengers to complete the puzzle.

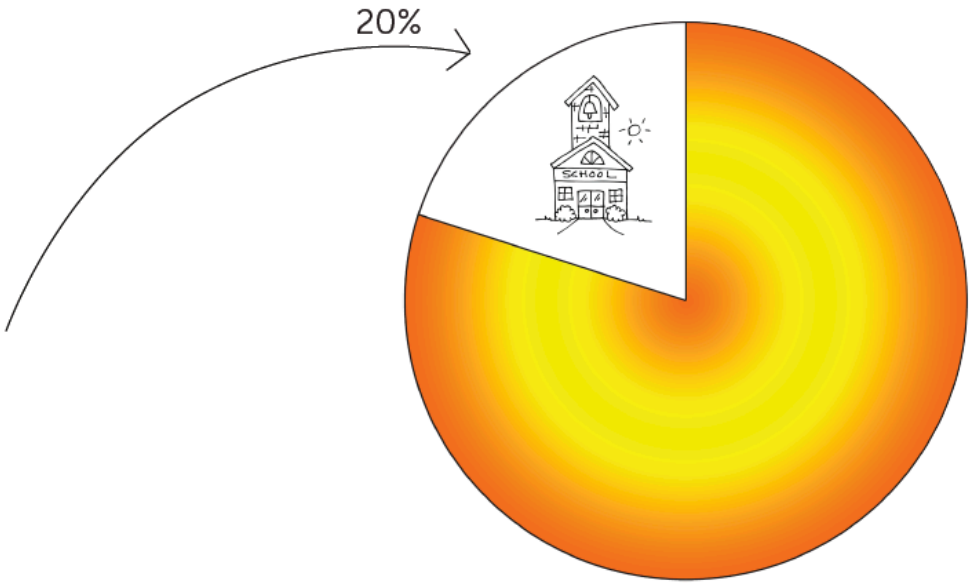
THE SCALE BENCH

Has connected scales allowing people to play with the weight of a person (or people) and the height of the bench.



Though most of our science of learning efforts are focused on school reform…Notice that each of our dissemination experiences engage children and families in the non-school time.

SCHOOL REFORM



Children spend only 20% of their waking time in school.

And each affords researchers the opportunity to do use-inspired basic research!

In sum,

- The field of psychology is often divided by those who do basic versus applied science

- Use-inspired science – as in the science of learning -- helps us navigate a new road in which our work is relevant to both theory and practice.

BUT….

- Doing the science is not enough!
  - Our work is often misunderstood
  - Or never read beyond our narrow discipline.

- So our challenge to all of you – is to ask how you can go beyond Pasteur’s quadrant to help families, policy makers and educators really understand the body of research that we produce.

In fact..

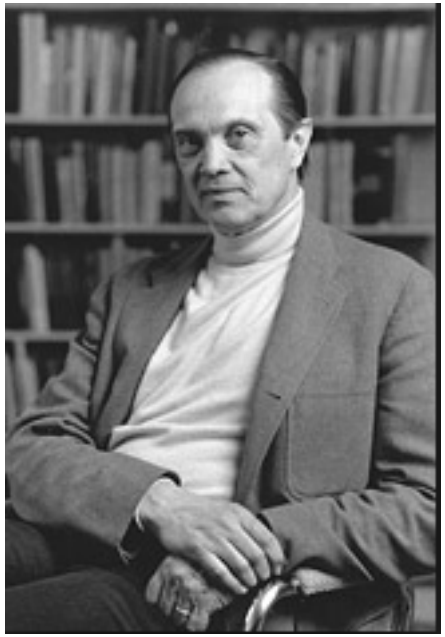
ICIS

INTERNATIONAL CONGRESS
FOR INFANT STUDIES

We are working on a model where our organizations might offer fellowships that twin researchers with journalists to train the next generation of disseminators

We hope that you will join us in thinking about new models for our field so that scientists can put the data in the hands of parents, educators and policy-makers.
APA President, George Miller, 1969 presidential address:

As a science concerned directly with behavioral and social processes, psychology might be expected to provide intellectual leadership in the search for new and better personal and social arrangements…I can imagine nothing we could do that would be more relevant to human welfare, and nothing that could pose a greater challenge to the next generation of psychologists than to discover how to best give psychology



To take the challenge…

We invited articles to a Special Issue…

Bringing Developmental Science into the World

Guest Editors:
Roberta Michnick Golinkoff (University of Delaware), Kathy Hirsh-Pasek (Temple University), Rachel Grob (University of Wisconsin) and Mark Schlesinger (Yale University)

We hope you will take the challenge with

Follow us on twitter @KathyandRo1

Thanks to….

- *The Temple Infant and Child Lab*

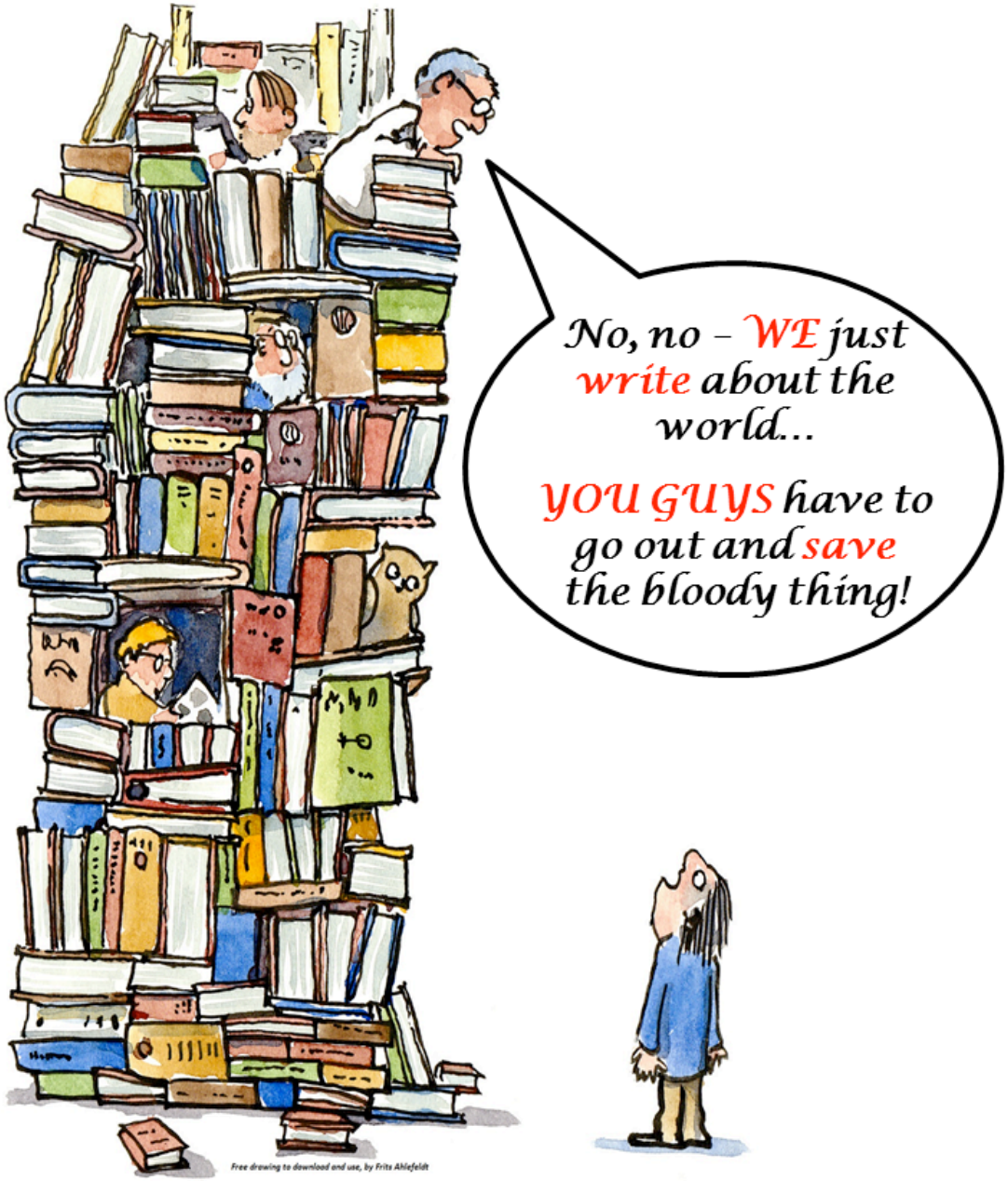
- *The Child's Play, Learning, and Development Lab at the University of Delaware*

Thanks to….

- The families and children who participated in our research

- And the many organizations that have supported our research over the years

- And Debra and Stan Lefkowitz for supporting our work for the last 10 years; and the Unidel Foundation


No, no – WE just write about the world...
YOU GUYS have to go out and save the bloody thing!
Free drawing to download and use, by Frits Ahlefeldt