

The Making of 'Masters of Math', Interactive Story Series in Multiple Languages



CHICAGO, 2023





MÜNIRE (MOONY-
RAY) BOZDEMIR,
MFA
Juniata College &
MyMoon Storytelling



DANIEL XIAO, PhD
Dalian Medical University
& DNA Learning



ANGELA SONG, MA
DNA Learning

CHICAGO, 2023

MASTERS

of MATH

Episode 1: One For Each



MEET
RAY RAY
AND
MR. ODD
NUMBERS!

CHICAGO, 2023



Illustration by
Munire Bozdemir,

Graphic and Page
Design by Onursal Engel

CHICAGO, 2023



Illustration by
Munire Bozdemir,

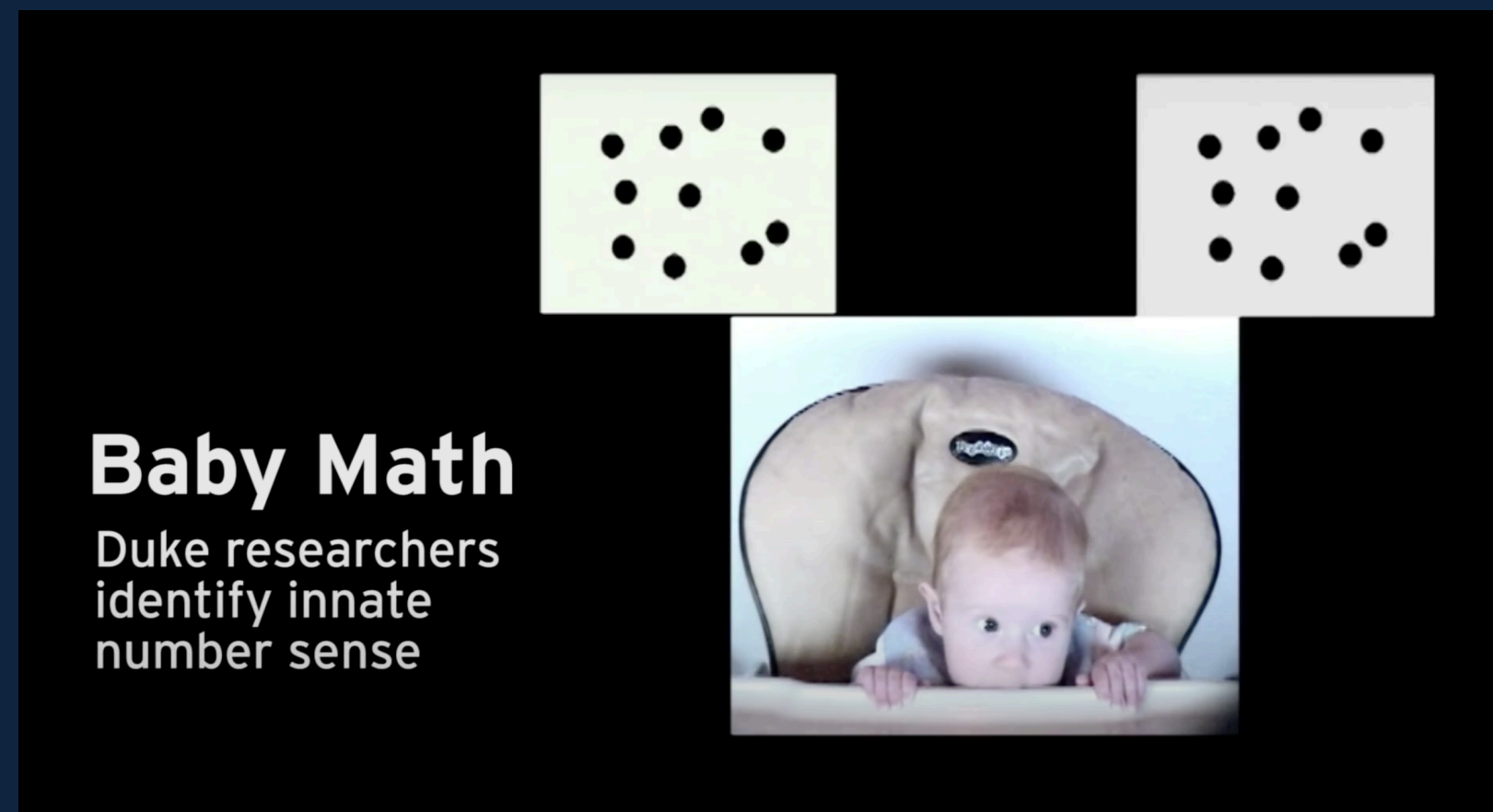
Graphic and Page
Design by Onursal Engel



Angela's discoveries:

CHICAGO, 2023

Why can math be introduced at an early age?



CHICAGO, 2023

How is good storytelling
related to math education?

CHICAGO, 2023

What kind of math stories are available in the market? How is what we are doing different?

CHICAGO, 2023



[1] Whitin, Phyllis, and David J. Whitin. *Math Is Language Too: Talking and Writing in the Mathematics Classroom*. National Council of Teachers of English, 1111 W. Kenyon Road, Urbana, IL 61801-1096 (Stock No. 21349: \$14.95 members, \$19.95 nonmembers), 2000.

[2] Hoover, Stephanie. "Developing real-world math through literacy." (2012).

[3] Suskind, Dana, Beth Suskind, and Leslie Lewinter-Suskind. *Thirty million words: Building a child's brain*. Dutton, 2015.

[4] Trafton, Anne. "Back-and-forth exchanges boost children's brain response to language." (2018).

CHICAGO, 2023

Daniel- Curriculum Design & Math Education in the American and Chinese Educational Systems

CHICAGO, 2023





Math education in China as defined by the national curriculum and based on personal teaching experiences.

CHICAGO, 2023



THE LEADING POSITION OF ASIA IN MATH COMPETITION

PISA is the OECD's program for International Student Assessment. PISA Measures 15-year-olds' ability to use their reading, Mathematics and Science knowledge and skills to meet real life challenges.

PISA 2012 Insights and Interpretations

	Mathematics				Reading		Science	
	Mean score in PISA 2012	Share of low achievers in mathematics (Below Level 2)	Share of top performers in mathematics (Level 5 or 6)	Annualised change in score points	Mean score in PISA 2012	Annualised change in score points	Mean score in PISA 2012	Annualised change in score points
OECD average	494	23.0	12.6	-0.3	496	0.3	501	0.5
Shanghai-China	613	3.8	55.4	4.2	570	4.6	580	1.8
Singapore	573	8.3	40.0	3.8	542	5.4	551	3.3
Hong Kong-China	561	8.5	33.7	1.3	545	2.3	555	2.1
Chinese Taipei	560	12.8	37.2	1.7	523	4.5	523	-1.5
Korea	554	9.1	30.9	1.1	536	0.9	538	2.6
Macao-China	538	10.8	24.3	1.0	509	0.8	521	1.6
Japan	536	11.1	23.7	0.4	538	1.5	547	2.6
Liechtenstein	535	14.1	24.8	0.3	516	1.3	525	0.4
Switzerland	531	12.4	21.4	0.6	509	1.0	515	0.6
Netherlands	523	14.8	19.3	-1.6	511	-0.1	522	-0.5
Estonia	521	10.5	14.6	0.9	516	2.4	541	1.5
Finland	519	12.3	15.3	-2.8	524	-1.7	545	-3.0
Canada	518	13.8	16.4	-1.4	523	-0.9	525	-1.5
Poland	518	14.4	16.7	2.6	518	2.8	526	4.6
Belgium	515	19.0	19.5	-1.6	509	0.1	505	-0.9
Germany	514	17.7	17.5	1.4	508	1.8	524	1.4
Viet Nam	511	14.2	13.3	m	508	m	528	m
Austria	506	18.7	14.3	0.0	490	-0.2	506	-0.8
Australia	504	19.7	14.8	-2.2	512	-1.4	521	-0.9
Ireland	501	16.9	10.7	-0.6	523	-0.9	522	2.3
Slovenia	501	20.1	13.7	-0.6	481	-2.2	514	-0.8
Denmark	500	16.8	10.0	-1.8	496	0.1	498	0.4
New Zealand	500	22.6	15.0	-2.5	512	-1.1	516	-2.5
Czech Republic	499	21.0	12.9	-2.5	493	-0.5	508	-1.0
United States	481	25.8	8.8	0.3	498	-0.3	497	1.4

PISA 2015 Insights and Interpretations

	Science		Reading		Mathematics		Science, reading and mathematics	
	Mean score in PISA 2015	Average three-year trend	Mean score in PISA 2015	Average three-year trend	Mean score in PISA 2015	Average three-year trend	Share of top performers in at least one subject (Level 5 or 6)	Share of low achievers in all three subjects (below Level 2)
	Mean	Score dif.	Mean	Score dif.	Mean	Score dif.	%	%
OECD average	493	-1	493	-1	490	-1	15.3	13.0
Singapore	556	7	535	5	564	1	39.1	4.8
Japan	538	3	516	-2	532	1	25.8	5.6
Estonia	534	2	519	9	520	2	20.4	4.7
Chinese Taipei	532	0	497	1	542	0	29.9	8.3
Finland	531	-11	526	-5	511	-10	21.4	6.3
Macao (China)	529	6	509	11	544	5	23.9	3.5
Canada	528	-2	527	1	516	-4	22.7	5.9
Viet Nam	525	-4	487	-21	495	-17	12.0	4.5
Hong Kong (China)	523	-5	527	-3	548	1	29.3	4.5
B-S-J-G (China)	518	m	494	m	531	m	27.7	10.9
Korea	516	-2	517	-11	524	-3	25.6	7.7
New Zealand	513	-7	509	-6	495	-8	20.5	10.6
Slovenia	513	-2	505	11	510	2	18.1	8.2
Australia	510	-6	503	-6	494	-8	18.4	11.1
United Kingdom	509	-1	498	2	492	-1	16.9	10.1
Germany	509	-2	509	6	506	2	19.2	9.8
Netherlands	509	-5	503	-3	512	-6	20.0	10.9
Switzerland	506	-2	492	-4	521	-1	22.2	10.1
Ireland	503	0	521	13	504	0	15.5	6.8
Belgium	502	-3	499	-4	507	-5	19.7	12.7
Denmark	502	2	500	3	511	-2	14.9	7.5
Poland	501	3	506	3	504	5	15.8	8.3
Portugal	501	8	498	4	492	7	15.6	10.7
Norway	498	3	513	5	502	1	17.6	8.9
United States	496	2	497	-1	470	-2	13.3	13.6

CHICAGO, 2023

PISA 2018 Insights and Interpretations (math)

	S.D.*	Mean score	
B-S-J-Z (China)	80	591	Level 4
Singapore	94	569	
Macao (China)	81	558	
Hong Kong (China) ¹	94	551	
Chinese Taipei	100	531	Level 3
Japan	86	527	
Korea	100	526	
Estonia	82	523	
Netherlands ¹	93	519	
Poland	90	516	
Switzerland	94	515	
Canada	92	512	
Denmark	82	509	
Slovenia	89	509	
Belgium	95	508	
Finland	82	507	
Sweden	91	502	
United Kingdom	93	502	
Norway	90	501	
Germany	95	500	
Ireland	78	500	
Czech Republic	93	499	
Austria	93	499	
Latvia	80	496	
France	93	495	



2. Combining the Forces: Eastern and Western Ways of Math Education

Advantages

- Inquiry- based learning – more student centered.
- Less academic pressure in terms of grades based on exams.
- Focuses on exploration.
- Able to motivate creative minds.

American

Disadvantages

- Depends more on students' self-motivation and less on explicit instruction.
- Not enough practice (to remember information or strengthen math muscles.)
- Some students may slowly fall behind in time and define themselves as people without mathematical talent.

Eastern

“engineer education”

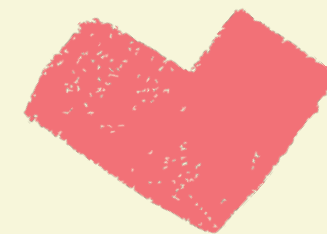
Advantages

- System- based learning (same all over the country)
- Efficient and sufficient practice
- Focus on application
- Able to train skillful engineers.

Disadvantages

- High academic pressure and competition (national exam)
- Teacher Centered.
- Inadequate creativity
- Many students may easily lose interest in learning and math becomes a boring chore.

CHICAGO, 2023



Secret of Success in Mathematics Education in Asia

Ability to solve advanced problems thanks to efficient input and instructions from the teacher, a lot of practice with discipline and resilience in the face of boredom and at times high stress.

CHICAGO, 2023



Why stories? Why intercultural math education?

- As cross-language and cultural mathematics teachers, we can combine the forces of different educational systems while bridging the gap between privileged and underprivileged kids.
- In children's early math learning, no matter what cultural system we are in, the input of mathematical language may be insufficient depending on their social and economical circumstances. And research proves that language development (as well as ability to speak more than one language) plays a significant role in math.
- We should let mathematics enter children's brains earlier and more through picture books and stories so that these mathematical ganglia can be fully developed at a very young age.

CHICAGO, 2023





"Reading enjoyment is more important for children's educational success than their families socio-economic status."

(RESEARCH EVIDENCE ON READING FOR PLEASURE,
DEPARTMENT OF EDUCATION, UK, 2012)

CHICAGO, 2023





QUESTION 1: HOW CAN WE
PROVIDE ACCESS TO
BOOKS?



QUESTION 2: HOW CAN WE
CREATE READING
ENJOYMENT?

CHICAGO, 2023



FACTS:



2.5 MILLION CHILDREN ACROSS THE COUNTRY
ARE ENROLLED IN DISTRICTS WHERE THERE
ARE NO LIBRARIES

USA DEPARTMENT OF EDUCATION



61% OF LOW INCOME FAMILIES HAVE NO BOOKS
AT ALL IN THEIR HOMES FOR KIDS.

LITERACY PROJECT- literacyproj.org , 2019



IN SOME COUNTRIES, MORE THAN 4 PUPILS SHARE 1
MATHEMATICS OR READING BOOK.

A GLOBAL BOOK FUND FEASIBILITY STUDY, 2016, AVAILABLE AT <https://r4d.org/news/new-study-looks-at-why-more-children-lack-access-to-books-and-how-we-can-change-that/#2>

CHICAGO, 2023



INTERNET ACCESS:

USA: 91.8% Turkey: 83.4% China: 73.7%

<https://www.statista.com/statistics/227082/countries-with-the-highest-internet-penetration-rate/>

FACTS:



36% OF AMERICANS HAVE ALL THREE: PHONE, TABLET & COMPUTER

<https://www.pewresearch.org/fact-tank/2015/11/25/device-ownership/>



AMONG ALL HOUSEHOLDS IN 2018, 92% HAD AT LEAST ONE TYPE OF COMPUTER / USA

USA Census Bureau, 2018

CHICAGO, 2023

FACTS:



64.4 PERCENT OF THE GLOBAL POPULATION
ARE INTERNET USERS

[statista.com](https://www.statista.com), 2023

CHICAGO, 2023

For children from disadvantaged backgrounds :

PRINT BOOK
OWNERSHIP



TECHNOLOGY
OWNERSHIP



CHICAGO, 2023





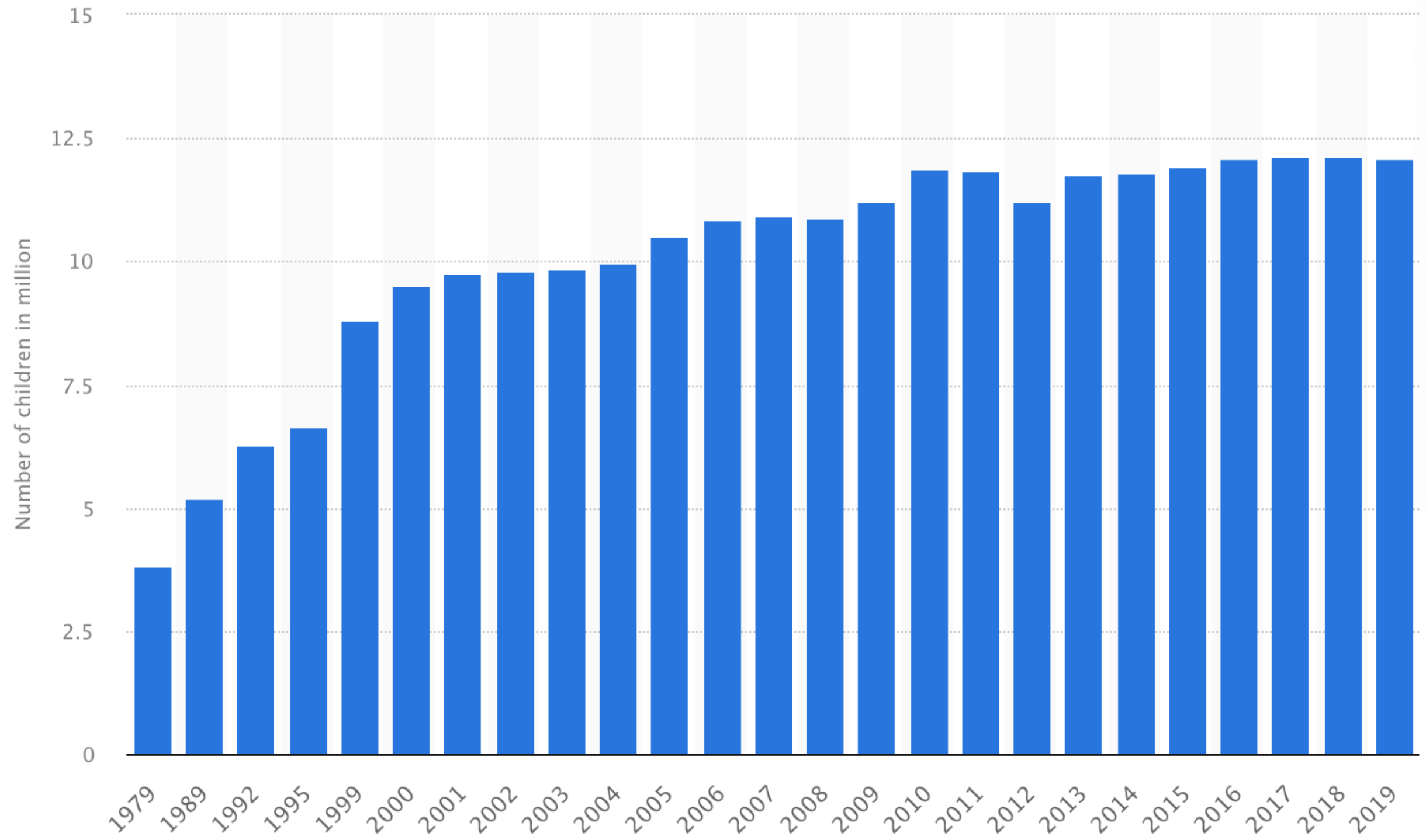
FIRST APP GAP: AVAILABILITY OF TECH
SECOND APP GAP: THE WAY TECH IS USED IN POOR AND
RICH HOUSEHOLDS.

[Kucirkova, N. \(2018\). How and Why to Read and Create Children's Digital Books: A Guide for Primary Practitioners. UCL Press. http://www.jstor.org/stable/j.ctv5j01w1](http://www.jstor.org/stable/j.ctv5j01w1)

CHICAGO, 2023



NUMBER OF CHILDREN WHO SPEAK ANOTHER LANGUAGE THAN ENGLISH AT HOME IN THE UNITED STATES FROM 1979 TO 2019



CHICAGO, 2023



THERE IS AN INADEQUATE SUPPLY OF APPROPRIATE MOTHER TONGUE READING BOOK TITLES DUE TO LOW AWARENESS OF THE VALUE OF READING BOOKS, LIMITED AUTHORSHIP CAPACITY, AND LACK OF **CONTENT SHARING ARRANGEMENTS.**

[A GLOBAL BOOK FUND FEASIBILITY STUDY, 2016. AVAILXBLE EXT <https://r4d.org/news/new-study-looks-at-why-more-children-lack-access-to-books-and-how-we-can-change-that/#2>](https://r4d.org/news/new-study-looks-at-a-global-book-fund-feasibility-study-2016-availxble-ext)

CHICAGO, 2023





QUESTION 2: HOW CAN WE CREATE READING ENJOYMENT?

CHICAGO, 2023





Challenges and Potential Solutions

* DEVICE OWNERSHIP & INTERNET ACCESS ARE TWO DIFFERENT MATTERS

CHICAGO, 2023



Challenges and Potential Solutions

- ✿ LOCAL, CULTURAL VALUES AND ATTITUDES ABOUT BOOK READING, READING FROM PRINT BOOKS and READING FROM SCREEN
- ✿ CREATING CHARACTERS AND STORIES THAT SPEAK TO DIVERSE AUDIENCES

CHICAGO, 2023

GILBERT DELAHAYE - MARCEL MARLIER

Ayşegül

Alışveriş Yapıyor



CHICAGO, 2023



Challenges and Potential Solutions

- ✿ CREATING PERSISTENCE AT A TASK
+ CURIOSITY + FUN
- ✿ SCARCITY OF STORIES WRITTEN
ESPECIALLY FOR MATH TEACHING
PURPOSES.

CHICAGO, 2023



RESOURCES:

CHEHAK ARNEJA, DR. SNEHA TYAGI. THE IMPORTANCE OF USING STORIES FOR TEACHING-LEARNING OF MATHEMATICAL CONCEPTS. INT J ADV ACAD STUD 2020;2(4):499-503. DOI: [10.33545/27068919.2020.V2.I4H.445](https://doi.org/10.33545/27068919.2020.V2.I4H.445)

HONG, H. (1996). EFFECTS OF MATHEMATICS LEARNING THROUGH CHILDREN'S LITERATURE ON MATH ACHIEVEMENT AND DISPOSITIONAL OUTCOMES. EARLY CHILDHOOD RESEARCH QUARTERLY, 11, 477-494.

KUCIRKOVA, N. (2019). HOW COULD CHILDREN'S STORYBOOKS PROMOTE EMPATHY? A CONCEPTUAL FRAMEWORK BASED ON DEVELOPMENTAL PSYCHOLOGY AND LITERARY THEORY. FRONTIERS IN PSYCHOLOGY, 10, ARTICLE 121.

KUCIRKOVA, N. (2018). HOW AND WHY TO READ AND CREATE CHILDREN'S DIGITAL BOOKS: A GUIDE FOR PRIMARY PRACTITIONERS. UCL PRESS. [HTTP://WWW.JSTOR.ORG/STABLE/J.CTV5J01W1](http://www.jstor.org/stable/j.ctv5j01w1)

KUCIRKOVA, N.; LITTLETON K. & CREMIN T. (2017) YOUNG CHILDREN'S READING FOR PLEASURE WITH DIGITAL BOOKS: SIX KEY FACETS OF ENGAGEMENT, CAMBRIDGE JOURNAL OF EDUCATION, 47:1, 67-84, DOI: 10.1080/0305764X.2015.1118441

LEMONIDIS, C., & KAIIFA, I. (2019). THE EFFECT OF USING STORYTELLING STRATEGY ON STUDENTS' PERFORMANCE IN FRACTIONS. JOURNAL OF EDUCATION AND LEARNING.

SCHIRO, M. S. (2004). ORAL STORYTELLING & TEACHING MATHEMATICS: PEDAGOGICAL AND MULTICULTURAL PERSPECTIVES. SAGE PUBLICATIONS, INC., [HTTPS://DX.DOI.ORG/10.4135/9781452229751](https://dx.doi.org/10.4135/9781452229751)

TOOR, A., MGOMBELO J. (2015) TEACHING MATHEMATICS THROUGH STORYTELLING: ENGAGING THE 'BEING' OF A STUDENT IN MATHEMATICS. CERME 9 - NINTH CONGRESS OF THE EUROPEAN SOCIETY FOR RESEARCH IN MATHEMATICS EDUCATION, CHARLES UNIVERSITY IN PRAGUE, FACULTY OF EDUCATION; ERME, PRAGUE, CZECH REPUBLIC. PP.3276-3282. HAL-01289881

VAAHTORANTA, E., LENHART, J., SUGGATE, S., & LENHARD, W. (2019). INTERACTIVE ELABORATIVE STORYTELLING: ENGAGING CHILDREN AS STORYTELLERS TO FOSTER VOCABULARY. FRONTIERS IN PSYCHOLOGY, 10, 1534. [HTTPS://DOI.ORG/10.3389/FPSYG.2019.01534](https://doi.org/10.3389/fpsyg.2019.01534)



* Subscribe to <https://mymoonstories.com/test/Register.php> to follow updates.
Email: munirebozdemir@gmail.com

* Munire Bozdemir on LinkedIn: www.linkedin.com/in/munire-bozdemir-mfa-8a99a252



* DNA Learning, Dalian, China
Email: angelasong12@foxmail.com

CHICAGO, 2023

