









Multilingual Education in India: Effects of Language of Instruction on the development of **Literacy and Mathematical Skills**

Theo Marinis



Conference on Multilingualism, 3rd September 2019



Research jointly supported by the ESRC and DFID

Multilingualism and Multiliteracy: Raising Learning Outcomes in challenging contexts in primary schools across India (May 2016 – April 2020)



Ianthi Tsimpli, PI University of Cambridge



Theo Marinis, Co-I University of Konstanz University of Reading



Jeanine Treffers-Daller, Co-I

University of Reading



Research jointly supported by the ESRC and DFID



Suvarna Alladi, Co-I NIMHANS





Lina Mukhopadhyay, Co-I EFL-U

Partners and Consultants



Partners:

British Council India The Language and Learning Foundation

Consultants (Advisory Board):

Debanjan Chakrabarti Rama Mathew Ganesh Devy Dhir Jhingran

Ajit Mohanty Vasanta Duggirala Bapi Raju British Council India Delhi University Dhirubhai Ambani Institute of ICT The Language and Learning Foundation Jawaharlal Nehru University Osmania University International Institute of Information Technology



- Multilingualism is a natural phenomenon and has always existed, it's not something new, e.g.
 - 3rd millenium BC Mesopotamia;
 - Roman empire;
 - England: English: common people, French: ruling class, Latin: church;
 - Ottoman empire;
 - ...



- Multilingualism is possible with or without Multiliteracy;
 - A soldier in the Roman army didn't have to be literate in multiple languages;
 - An administrator did;
- (Multi)literacy depends on education;
 - Does the education system offer opportunities for people to become multiliterate?
 - Do all children go to school?



Mesopotamia (Sumerian-Akkadian -> Babylonian glossary, Louvre)



- In the past literacy was for the elite, not anymore;
- Literacy skills is a necessity to function in the 21st century:
 - navigating through a city;
 - rent contract,
 - employment contract,
 - instructions for gadgets;
 - terms and conditions ... for Apps on mobile phones,
 - passing a test to get the citizenship of a host country,

•



 Literacy skills is a necessity to function in the 21st century:







- And yet, some people in our societies lack basic literacy skills or have low literacy skills:
 - people who didn't attend school for various reasons;
 - people who dropped out of school;
 - people who had low educational achievement in school.
- These are usually people from the most disadvantaged backgrounds.
- We wanted to investigate children from disadvantaged backgrounds in India → what factors lead to high/low learning outcomes at school.

Learning outcomes in schools in India



ASER (Annual Status of Education Report) studies with 600,000 children across India:

- more than half of all children in Standard 5 (grade 5) could not read a Standard 2 (grade 2) level text fluently, and nearly half of them could not solve Standard 2 level subtraction task;
- Low literacy and numeracy can limit other important capabilities, e.g., critical thinking and problem solving;

Learning outcomes in schools in India



- Low educational achievement may lead to school drop out;
- High dropout rate in schools affects girls more than boys (UNESCO's Education Report, 2015; Annual Status of Education Report Pratham, 2014);
- The gap between state and private schools increases every year.

Multilingualism in India





Although multilingualism is the norm in India, level of proficiency in the home language varies primarily as a function of **whether or not education includes the home language**. (Panda & Mohanty 2013; ASER 2014)

Education and the language of instruction



- Reports from developing countries suggest that 221 million children are educated in a language they do not speak at home;
- Poor education quality, drop-out rates, low literacy outcomes (Cummins 2009).

The role of Mothertongue literacy/education



In children attending schooling in the L2, there are **benefits of Mother-tongue literacy** in:

- The <u>strength</u> of the minority language in its mental (conceptual and processing) competition with the majority language;
- Working memory;
- Efficient transfer of basic and higher level literacy skills.

Baker (2000), Cummins (2000), Skutnabb-Kangas (2000), Tsimpli (2017)

Mothertongue literacy & cognition



Biliteracy effects on cognitive and language abilities in different groups of bilingual children with varied socio-economic status: the *strongest cognitive advantage* was found in the group with *literacy skills in both the Mothertongue and the L2.*

(Dosi, Papadopoulou & Tsimpli, 2016)

Bilingualism: some advantages



Bilingualism has been shown to have beneficial effects on:

- Cognitive control (e.g. Bialystok et al 2008; 2011):
 - a. working memory;
 - b. cognitive flexibility, allocation of attention resources and inhibition of inappropriate/incorrect response biases.
- Delay of dementia and cognitive decline in the elderly (Alladi et al 2013; 2014)
- Creativity (Kharkhurin 2012, for adults; Leikin 2012, for children)

The trigger







Languages in India



- Apart from the state languages, there are more than 1,000 indigenous languages belonging to four major language families (Indo-Aryan and Dravidian being spoken by the majority of the population followed by Austroasiatic and Sino-Tibetan languages).
- In our project, the languages used in the assessment tools are: Hindi, Telugu and English, although other home languages are included in the assessment of one task.

Languages in India and medium of instruction



- Education in India: three-language formula (from 1957): all children should be taught through the medium of a regional language or mother tongue, to which an additional modern Indian language (e.g. Hindi) and English can be added as curricular subjects
- Hindi and English function as link languages: the central government recognises Hindi as the official language and English as the provisional sub-language (Devy, 2018)

Languages in India and medium of instruction



- **English**: the language of power and a gateway to improving one's socio-economic position.
- Parental pressure to introduce English as early as Grade 3 (or even at Grade 1), and to use English as the medium of instruction (EMI), particularly in private schools (Annamalai, 2013).
- Problems: in many cases levels of English remain low because the teachers' own levels of English are limited and appropriate resources are not available (Dearden, 2014; Erling, Adinolfi and Hultgren, 2017).
 - → English medium *in name* only, and actual teaching takes place in the regional or local languages (Annamalai, 2004; Mohanty et al. 2010)

Other 'realities' of education in India



- Large class sizes, poor resources and teacher-centered pedagogies (Brinkmann, 2015)
- Critical thinking not prioritised (Dyer and Choksi, 2002), little room for creativity or expression of independent thought (Jambunathan, 2005).
- **Overage children**: negative or positive factor (Alcott & Rose, 2017)
- Impressive initiatives to improve basic literacy and arithmetic skills among primary school children in India are undertaken as part of Pratham's large-scale "Read India" initiative (Banerji & Chavan, 2016).

Urban slums



- Overall school attendance rates in Delhi schools in 2004: 90%;
- For children living in Delhi slums: around 54% (Tsujita, 2009);
- Around 73% of children in slums attending Standard I in Delhi schools are over-aged.



Geographical and social factors



- UN report 'The Challenge of Slums' (2003); "slums are a multidimensional concept involving aspects of poor housing, overcrowding, lack of services and insecure tenure."
- 17% of urban citizens in India live in slums. These include a large number of internal migrants who may speak other languages or varieties of the regional language.





The present study



- We developed a set of tools to examine directly or indirectly:
 - the children's school skills (literacy and numeracy),
 - their cognitive skills which support learning and development,
 - their school environment (teachers, methods, attitudes)
- We use the same set of tools in each of the sites: Delhi, Hyderabad, Bihar (Patna and non-remote rural areas)
- We visit schools where children from slum and non-slum areas go and we invite all children who are willing to participate.

Surveys and questionnaires



- Language questionnaire (child): Demographic info, Language use, socioeconomic variables;
- Headteacher questionnaire:
 language policy;
- Teacher questionnaire: teaching practice (language & maths);
- Classroom observation tool.



Direct measures



- 1. Cognition:
 - General Intelligence (Raven's Progressive matrices);
 - Inhibitory control (Flankers);
 - Working memory (2-back).
- 2. Language:
 - Narrative task (re-telling).
- 3. Literacy:
 - Letter naming, single word reading, reading of sentences, reading of passages and a couple of comprehension questions
- 4. Numeracy:
 - Subtraction & division;
 - Mathematical reasoning (word problems & meta-maths).

Talk today



Question 1:

Are there any effects of medium of instruction in tasks measuring the children's cognitive abilities, literacy, and numeracy?

Delhi cohort: 397 children (Age: 8-12, Mean: 8.77, SD: 0.63)

Site	n	Medium of Instruction	n	Gender	n
Slum	194	English	251	Girls	198
Non-slum	203	Hindi	146	Boys	199

29

MULTING TO A STATE OF THE STATE

Delhi team



Prof. Minati Panda



Nainy Rao



Shitika Chowdhary



Shalini Yadav



Yashika Chandna

1. Cognitive tasks



Flankers task: Executive function task measuring *inhibitory control*.

Reaction time and accuracy measured in conflict and non-conflict conditions.

Non-conflict condition



Conflict condition

Flankers Conflict effect (inhibition)





Hindi > English

t(395)= 2.15 (p =.03)*

1. Cognitive tasks



2-back task: examines working memory (attention, updating and inhibition)





2-back task (working memory)



Hindi > English

U=15695 (p =.017)*

2. Literacy



- ASER (Basic literacy <u>www.asercentre.org</u>):
- Letter naming, single word reading, reading of sentences, reading of passages and a couple of comprehension questions.
- Administered in the school language and English.

	Word	
ring	sun	
ball		
cold	king	
clap	foot	
fan		
girl	crow	



2. Literacy: Hindi, English





3. Basic Numeracy



• ASER (Basic numeracy task, subtraction and division):



- Subtraction and Division tasks have a better discriminant value compared to Addition and Multiplication
- Division is the hardest of all four.

3. Basic Numeracy





Subtraction:

Hindi > English

U=15558 (p =.008)**

Division:

Hindi > English

U= 14842 (p<0.001)**

3. Mathematical reasoning: word problems



- Word-problems require good reading comprehension levels (Bjork & Bowyer-Crane, 2012).
- Most children asked the experimenter to present the word problem orally in the regional language (Hindi or Telugu)

Question 1: Sita stacks the boxes (image 1) in the corner of the room. All boxes are the same size. How many boxes has she used, in total? [Please tick/circle]

3. Mathematical reasoning: meta-maths



QUESTION 1

Here is how Nita solves two addition problems.

19	17
+13	+9
212	116

Do you think that the problems are solved correctly? If not, why is Nita wrong in her responses?

Answer:

- 1 Nita doesn't know how to add numbers
- 2 Nita doesn't know place value and carry forward of values
- 3 Nita was not attentive
- 4 I don't know
- 5 Any other

Mathematical reasoning





Word problems:

Hindi > English

U=15803 (p=0.01)**

Meta-maths:

Hindi > English

U=15921 (p=0.02)*

Summary



1. Question:

Are there any effects of medium of instruction in tasks measuring the children's cognitive abilities, literacy, and numeracy?

Cognition:

- Working memory & updating: Hindi > English



Summary

Literacy:

- Hindi literacy: NO
- English literacy: English > Hindi

Numeracy:

- Subtraction & division: Hindi > English
- Word problems: Hindi > English
- Meta-maths: Hindi > English



What does that mean (medium of instruction)



- Literacy: English medium schools and schools that have some content learning in English boost English literacy skills;
- Maths: Better development of numeracy skills and mathematical reasoning when the medium of instruction in school is a language spoken in the home (in this case Hindi);

Implication \rightarrow English medium of instruction can lead to lower educational outcomes for children – it is not the ticket for success!

44



Question 2:

Are there any effects of socio-economic deprivation in tasks measuring the children's cognitive abilities, literacy, and numeracy?

Delhi cohort: 413 children

- 214 in non-slum areas,
- 199 in slum areas.

Cognitive tasks: Flanker (inhibition)



Conflict effect: Difference between incongruent and congruent trials

Task	Slum vs. Non-slum
Conflict effect	U=24217.5 (p<.001)**

Children in slum had a smaller conflict effect than non-slum.



N-back (2-back)



Slum vs. Non-slum

U= 17731.50 (p=.08)



Basic literacy – English & Hindi







Slum = Non-slum					
Slum vs. Non-slum					
U= 18147 (p= .17)					
U=18580.5 (p=.33)					

Subtraction and Division



21.98

Non-Slum





School type



Summary



2. Question:

Are there any effects of socio-economic deprivation in tasks measuring the children's cognitive abilities, literacy, and numeracy?

Cognition:

Inhibitory control: YES Non slum > slum



Working memory & updating: NO



Summary



- Hindi literacy: NO
- English literacy: NO

Numeracy:

- Subtraction: NO
- Division: Slum > Non-slum
- Word problems: Slum > Non-slum
- Meta-maths: NO



52

What does that mean (children living in slums)



- Cognition: working memory not affected by environmental factors, but children who don't live in slums have better attention/inhibitory control;
- Literacy: Literacy not affected by environmental factors;
- Maths: Children who live in slums have better mathematical abilities.

Children in living in a slum often help their parents in various activities that include counting and doing mental calculations \rightarrow advantage in mathematical skills.

Many open questions



- Which factors predict success in literacy & maths? Analyses ongoing
- Is there a difference between children living in rural vs. urban areas? Data inputting ongoing
- What is the role of teaching practice and teacher training? Teacher questionnaire & observations
- Are there differences in development? Longitudinal aspect

Many open questions



- Other factors (not considered yet):
 - Low school attendance rates (child and teacher);
 - Links between the school and the society? (in materials or method of teaching);
 - Distance between language of instruction and oral language (bookish Hindi and spoken Hindi);
 - Distance between language of instruction and home language (Hindi / Bhojpuri);
 - Noise in the classroom.

Acknowledgements

Children, families, teachers, head teachers, schools



ch jointly supported by the ESRC





Partners:

British Council India, The Language and Learning Foundation

Consultants:

Debanjan Chakrabarti Rama Mathew Ganesh Devy Dhir Jhingran Ajit Mohanty Vasanta Duggirala Bapi Raju British Council India Delhi University Dhirubhai Ambani Institute of ICT The Language and Learning Foundation Jawaharlal Nehru University Osmania University International Institute of Information Technology