



# The development and validation of contextually relevant scales to assess and monitor child development and learning in the East Asia Pacific Region

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**Maternal and Child Health: The Foundation of Population Health**

**Pre-Conference Seminar on Early Child Development: Recent research on brain development and assessment tools**

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# Overview

1. Introduction
2. The Hong Kong Early Child Development Scale (HK-ECDS)
3. The East Asia Pacific – Early Child Development Scales (EAP-ECDS)
4. Conclusions

# Introduction

Why is the assessment of early development and learning important?

- To monitor child development in the context of poor school readiness and learning outcomes
- To track the development of vulnerable and at-risk children in different parts of the East Asia and Pacific Region

# Sub-regions and Countries

Sub-regions	Countries
<b>Mekong Sub-Region</b>	Cambodia; Lao PDR; Myanmar; Thailand; Viet Nam
<b>Insular South-East Asia Sub-Region</b>	Brunei Darussalam; Indonesia; Malaysia; Philippines; Timor-Leste
<b>East Asia Sub-Region</b>	China; Democratic People's Republic of Korea; Mongolia
<b>Pacific Sub-Region</b>	Cook Islands; Fiji; Kiribati; Marshall Islands; Micronesia; Nauru; Niue; Palau Papua New Guinea; Samoa; Solomon Islands; Tonga; Tuvalu; Vanuatu
<b>Developed Countries</b>	Australia; Japan; New Zealand Republic of Korea; Singapore
<b>South Asia Sub-Region</b>	Bangladesh; Bhutan; India; Maldives Nepal; Sri Lanka; Pakistan
<b>West Asia Sub-Region</b>	Afghanistan; Iran
<b>Central Asia Sub-Region</b>	Kazakhstan; Kyrgyzstan; Tajikistan; Turkmenistan*; Uzbekistan*

# Hong Kong Early Child Development Scale

- Project Team: Nirmala Rao, Sun Jin, Sharon Ng, Kitty Ma, Yvonne Becher, Diana Lee, Carrie Lau, Dr. CB Chow, & Patrick Ip
- To develop a psychometrically robust, culturally and developmentally appropriate measure of holistic child development for children aged three to six.
- Dearth of research on Early Childhood Development – only one large-scale study of early childhood development in Hong Kong (Oppen, 1996).

# Process of development

- Includes some items used by Oppen (1992, 1996) ( $n = 55$ ) and 40 new items added to reflect curriculum guidelines and new competencies expected of children today.
- Eight domains

# Hong Kong Early Child Development Scale

Domains	# of Items	$\alpha$
Personal, Social and Self-Care Environment	7	.63
Language Development	13	.80
Pre-academic Learning	27	.95
Cognitive Development	10	.70
Gross Motor	12	.78
Fine Motor	9	.75
Physical Fitness and Health	7	.61
Self and Society	10	.64
<b>Total</b>	<b>95</b>	<b>.97</b>

# Sample Items

**Self-care item:** Fasten and unfasten buttons

**Language item:** Name common actions



**Pre-academic item:** Point to the middle object



**Cognitive item:** Match two functionally related items





# Sample Items

**Gross motor item:** Walk forward heel-to-toe along straight line on floor

**Physical fitness and health item:** Identify activity that should be performed more often



**Fine motor item:**  
Make a bowl out of playdoh

**Self and society item:** Sort recyclable and non-recyclable materials



# Scoring Criteria

Self and society item: Sort recyclable and non-recyclable materials

<b>Materials</b>	Pictures of: (1) Plastic bottle; (2) Newspaper; (3) Cans; (4) Tissue paper; (5) Banana skin
Procedure	<p>Show child pictures of :</p> <p>(1) Plastic bottle; (2) Newspaper; (3) Cans; (4) Tissue paper; (5) Banana skin</p> <p>Ask the child to sort the materials into two piles according to whether they are recyclable.</p>
Scoring criteria & Comments	<p>0: No or incorrect response</p> <p>1: 1-2 correct responses</p> <p>2: 3-4 correct responses</p> <p>3: 5 correct responses</p>



# Validation Studies

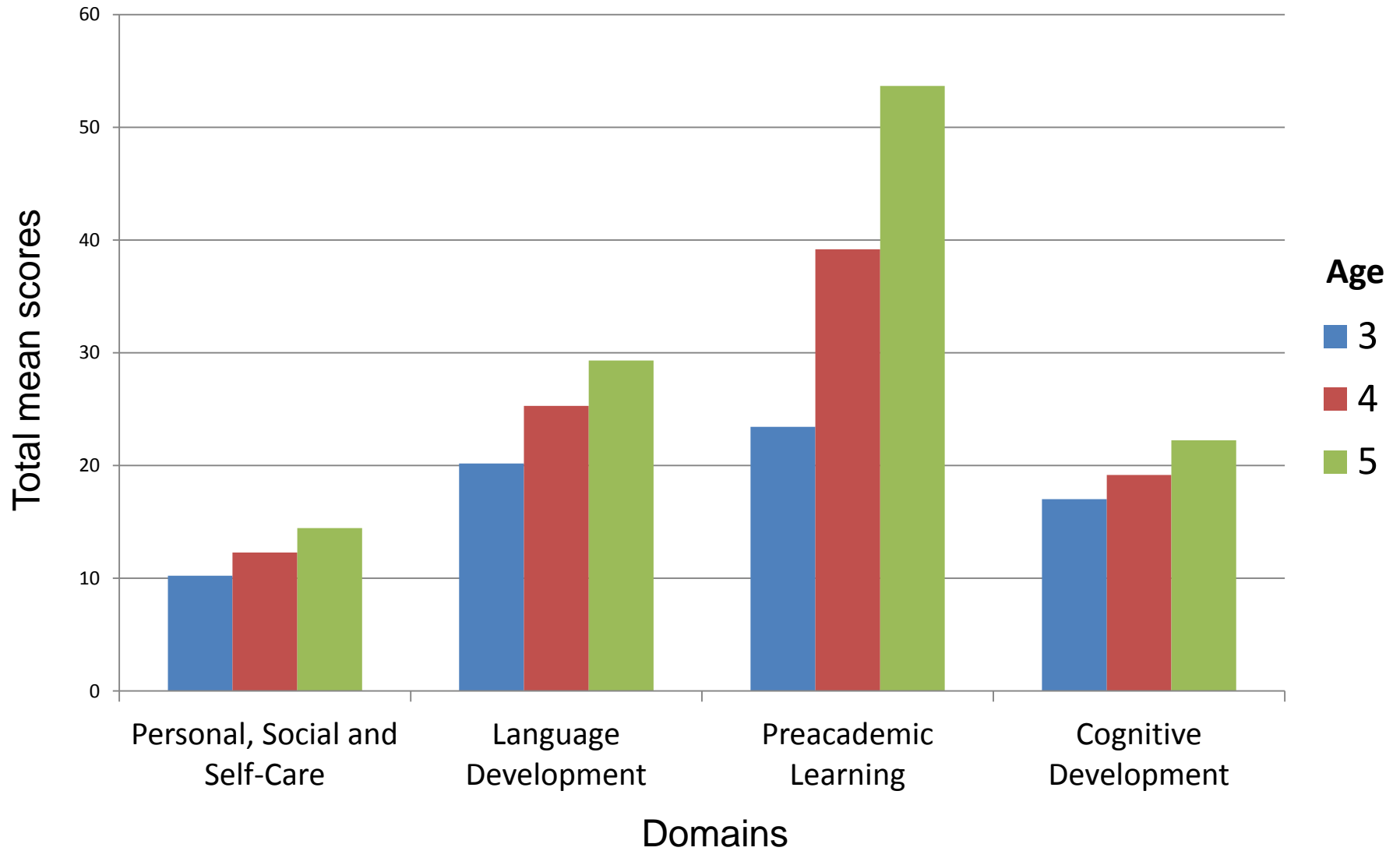
## **Pilot Study**

- 20 3-, 20 4- , and 20 5- year olds from two randomly selected preschools in Hong Kong.
- 29 girls, 31 boys

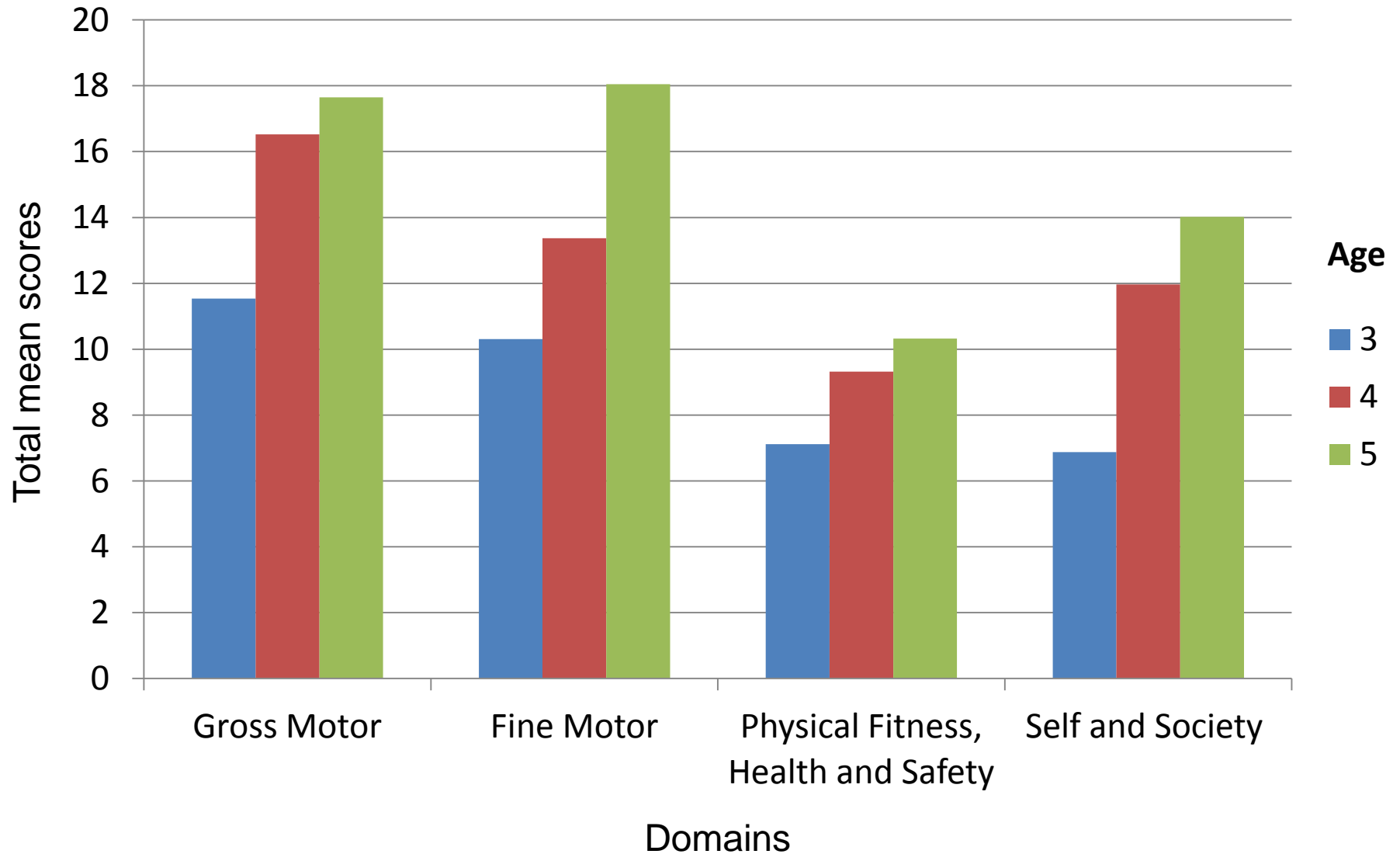
## **Main Study**

- 49 3-, 49 4- and 142 5-year-olds from four preschools in two districts of Hong Kong.
- 156 girls, 84 boys

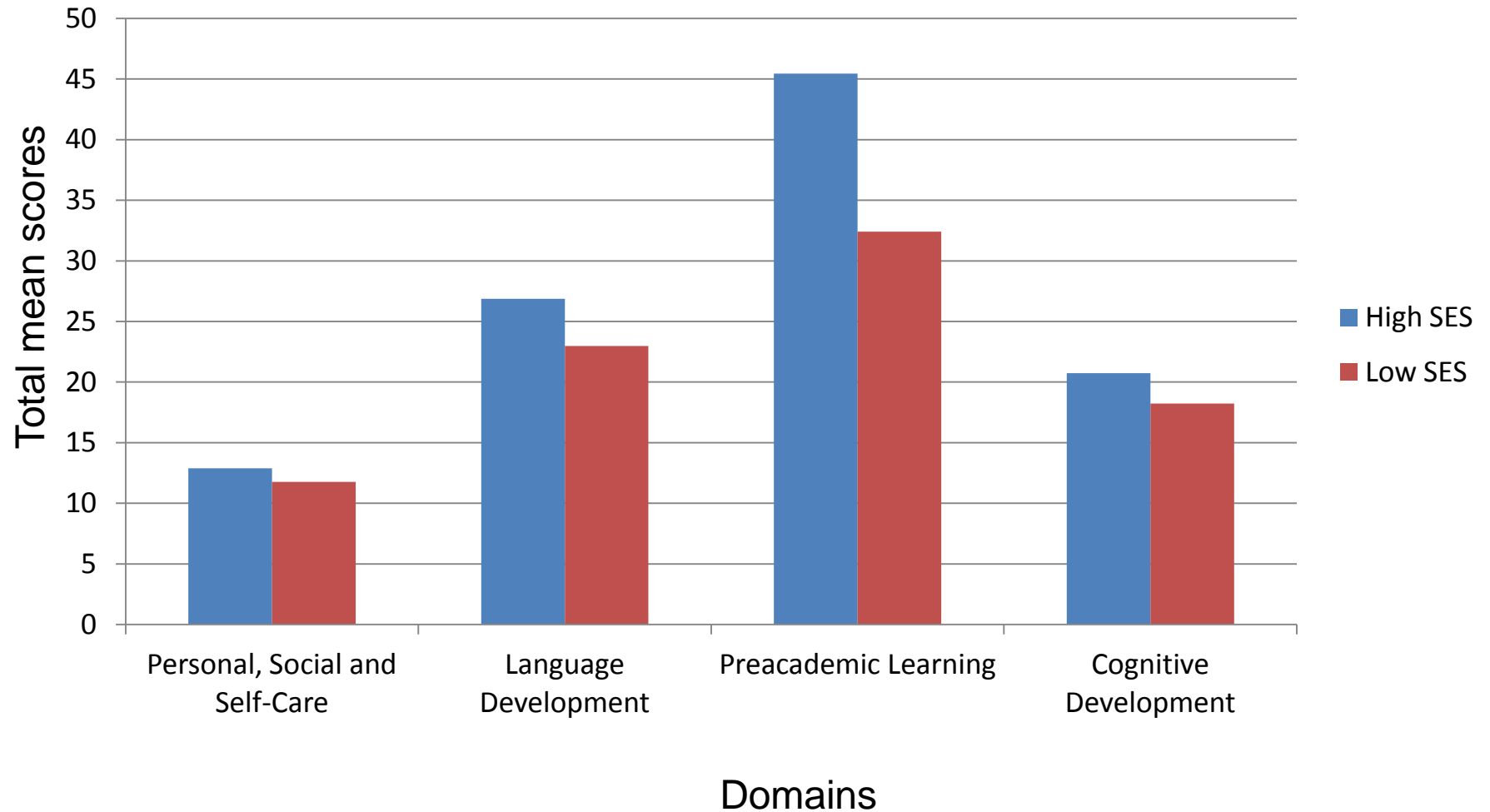
# Domains by Age



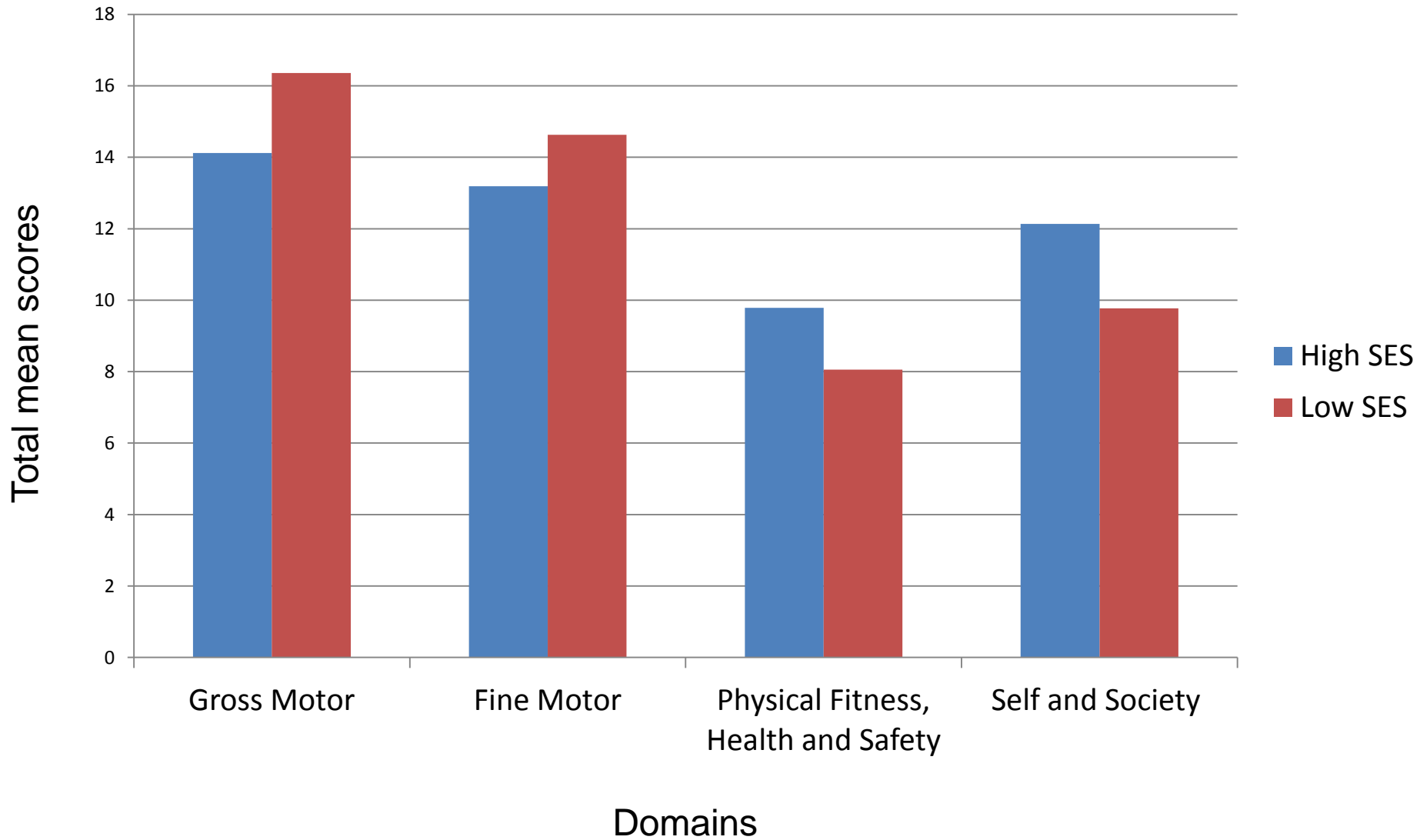
# Domains by Age



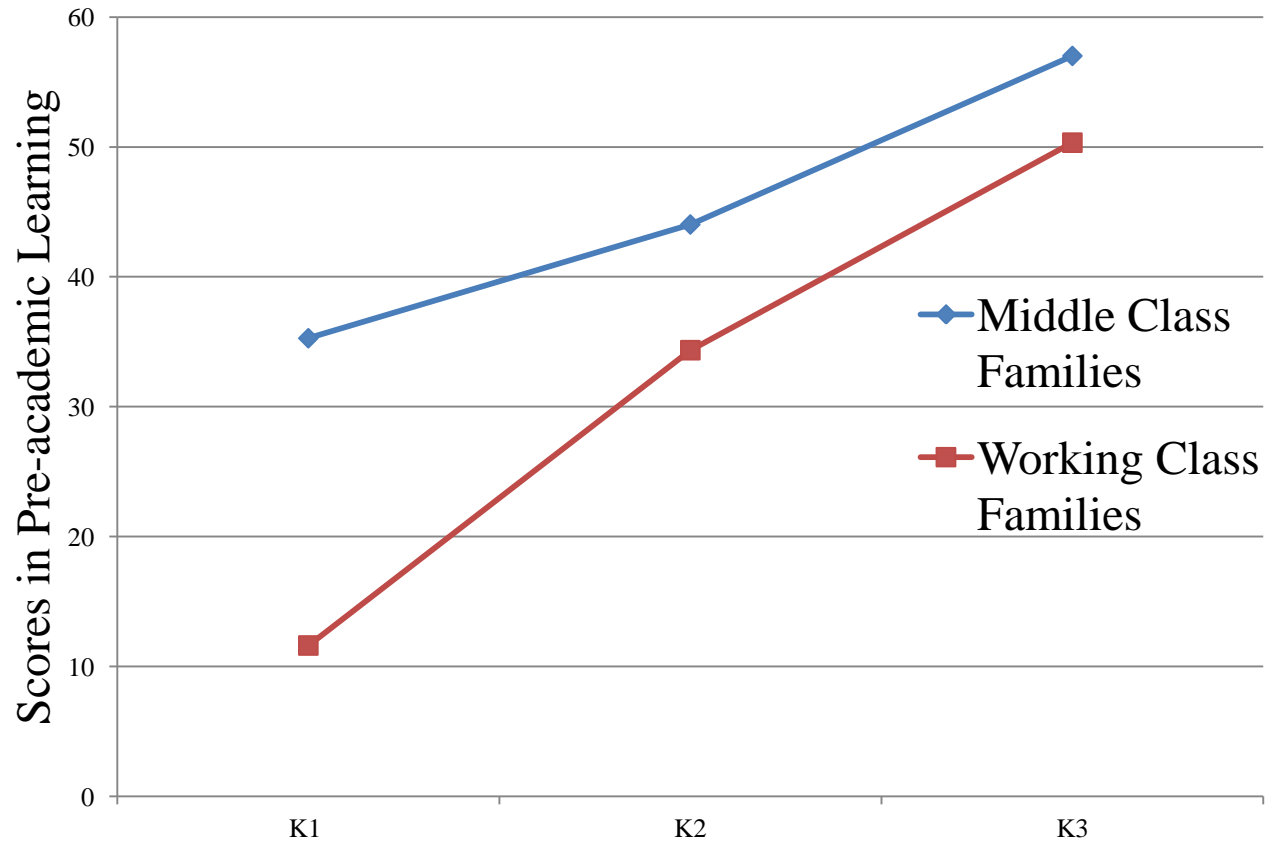
# Domains by SES



# Domains by SES

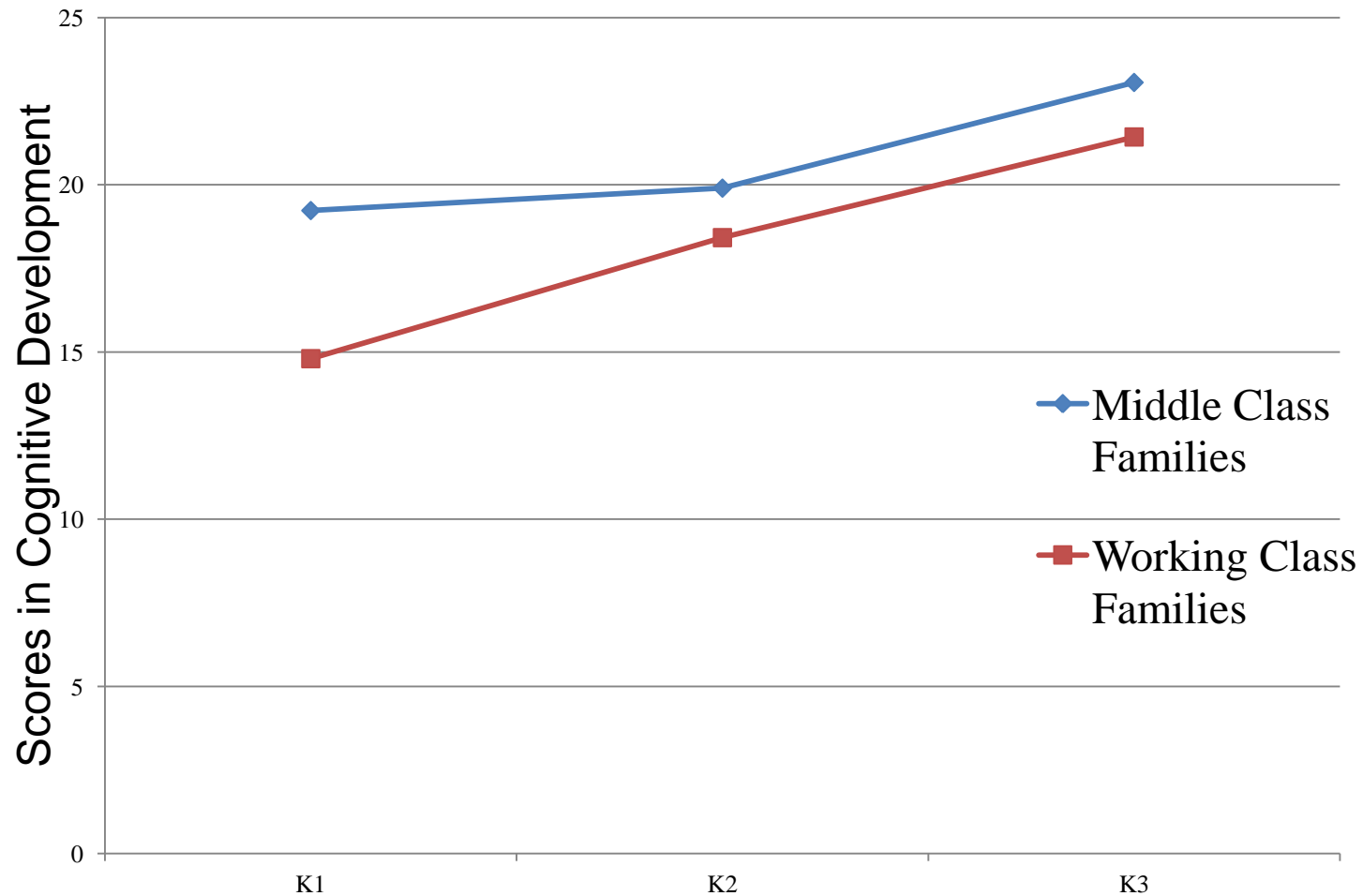


# Family background and Pre-academic Learning





# Family Background and Cognitive Development



# Summary

- Development of the scale
- Instrument structure similar to western countries but taps culturally sensitive expectations in each domain (chopsticks; Octopus cards; matching food and festival; local landmarks)
- SES effects but preschool is closing the achievement gap
- Lack of gender differences
- Implications of findings

# What are Early Learning and Development Standards?

- Statements of expectation for “what children should know and be able to do”
- Five Broad Domains of School Readiness have been widely accepted:
  - Physical Health, Well-Being, and Motor Development
  - Social & Emotional Development
  - Approaches Toward Learning
  - Language, Literacy & Communication
  - Cognition and General Knowledge

# Standards Language: Terms & Definitions

- There are four levels:
  - Level 1: Domain
    - Level 1.A. Sub-Domain
  - Level 2: Standard
  - Level 3: Indicator
  - Level 4: Preparatory Learning Activities

# Example of an Early Learning Standard for a 4-year-old

***Domain:*** Language, Literacy & Communication  
***Sub-domain:*** Communication

***Standard:*** Children should be able to listen to and understand language

***Indicator:*** Child is able to follow directions that involve a two or three step sequence of actions

***Preparatory Learning Activity:*** Give oral directions and play a game like “caregiver says”  
Make the children give simple directions to each other

# Example of an Early Learning Standard for a 4-year-old

***Domain:*** Physical Health & Well-being & Motor Development  
***Sub-Domain:*** Health & Personal Care

***Standard:*** Children should be able to practice basic care routine

***Indicator:*** Child gets drink of water without assistance

***Preparatory Learning Activity:*** Offer plenty of opportunities to the child to take care of self

# Early Learning and Development Standards (ELDS) in the East Asia-Pacific Region

- 7 countries in the East Asia-Pacific Region had developed and/or validated ELDS for their countries with the support of UNICEF
- The East Asia Pacific – Early Child Development Scales (EAP-ECDS) was developed based on their ELDS

# ARNEC Project

- ARNEC commissioned HKU team to do project on ELDS: Nirmala Rao, Pat Engle, Sun Jin, Marie Ng, Yvonne Becher, Diana Lee, Carrie Lau and Zhang Li
- Develop draft Early Child Development Scales based on the Early Learning Development Standards (ELDS) of countries of the East Asia and Pacific Region
- The Scales should have dimensions of child development which all countries consider valuable



# Early Learning and Development Standards (ELDS)

- Physical, Hygiene & Safety
- Language
- Cognitive & Basic Concept
- Emotional
- Social

- Physical Health, Well-Being & Motor
- Language, Pre-Reading and Pre-Math
- Cognitive
- Social and Emotional
- Character and Values

- Physical, Motor, Health and Well-Being
- Living and Learning Together
- Spiritual and Character
- Language
- Cognitive

Cambodia

Laos

Mongolia

Philippines

Thailand

Vanuatu

Vietnam

- Physical and Health
- Moral and Cultural
- Social and Emotional
- Awareness and Thinking
- Language and Cognitive

- Creative
- Math
- Mental
- Physical
- Socio-Emotional

- Motor and Physical Well-Being
- Social
- Emotional
- Cognitive
- Language
- Moral
- Creative

- Physical
- Emotional & Social
- Language & Communication
- Cognitive

# ARNEC Project

## Phase I

Select items to be used in the scale (desk review).

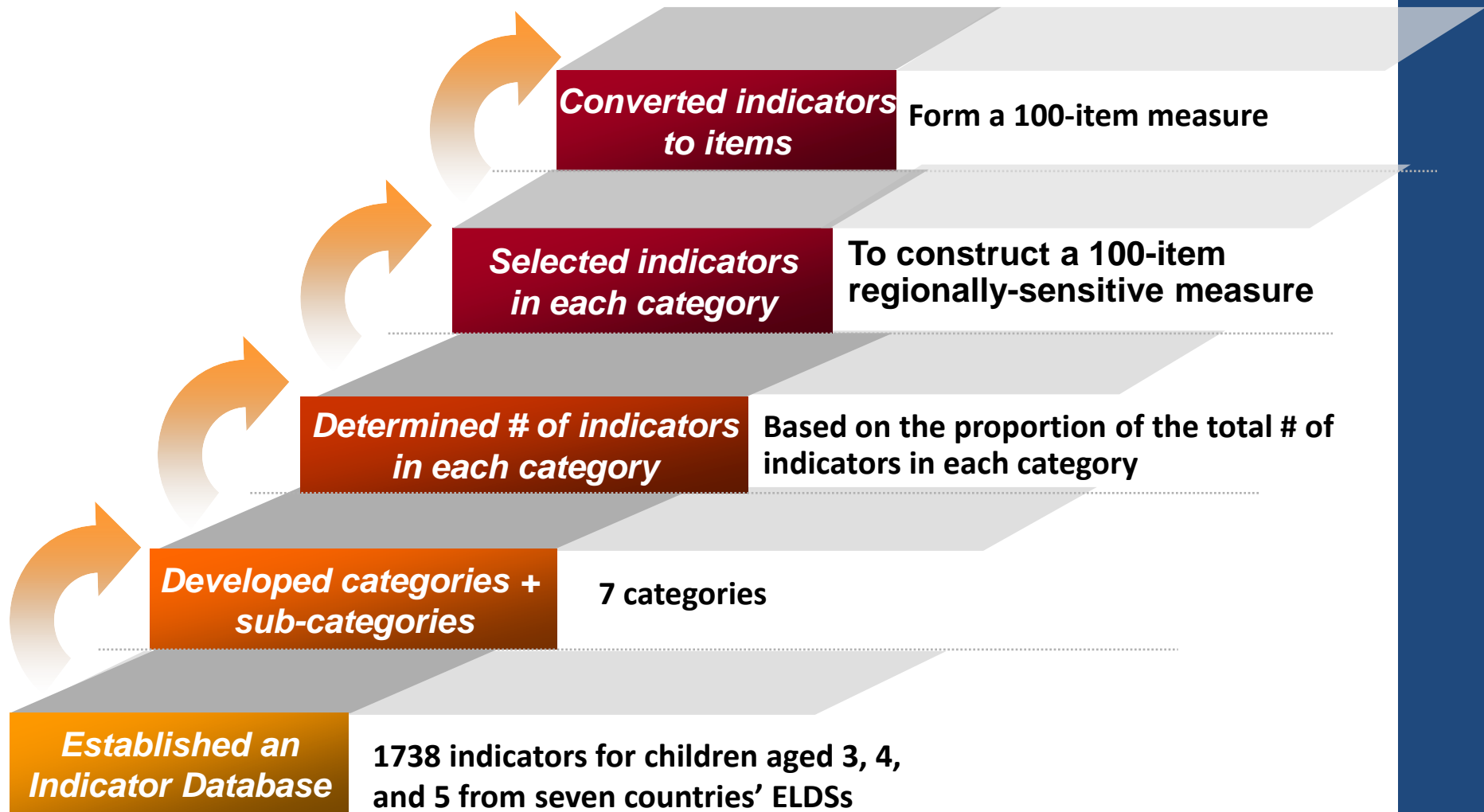
## Phase II

Pilot test in small samples in as many countries as possible. Revise and re-do test based on results.

## Phase III

Representative sample in as many countries as possible. Final revision and creation of age-based norms.

# Preparation of the database

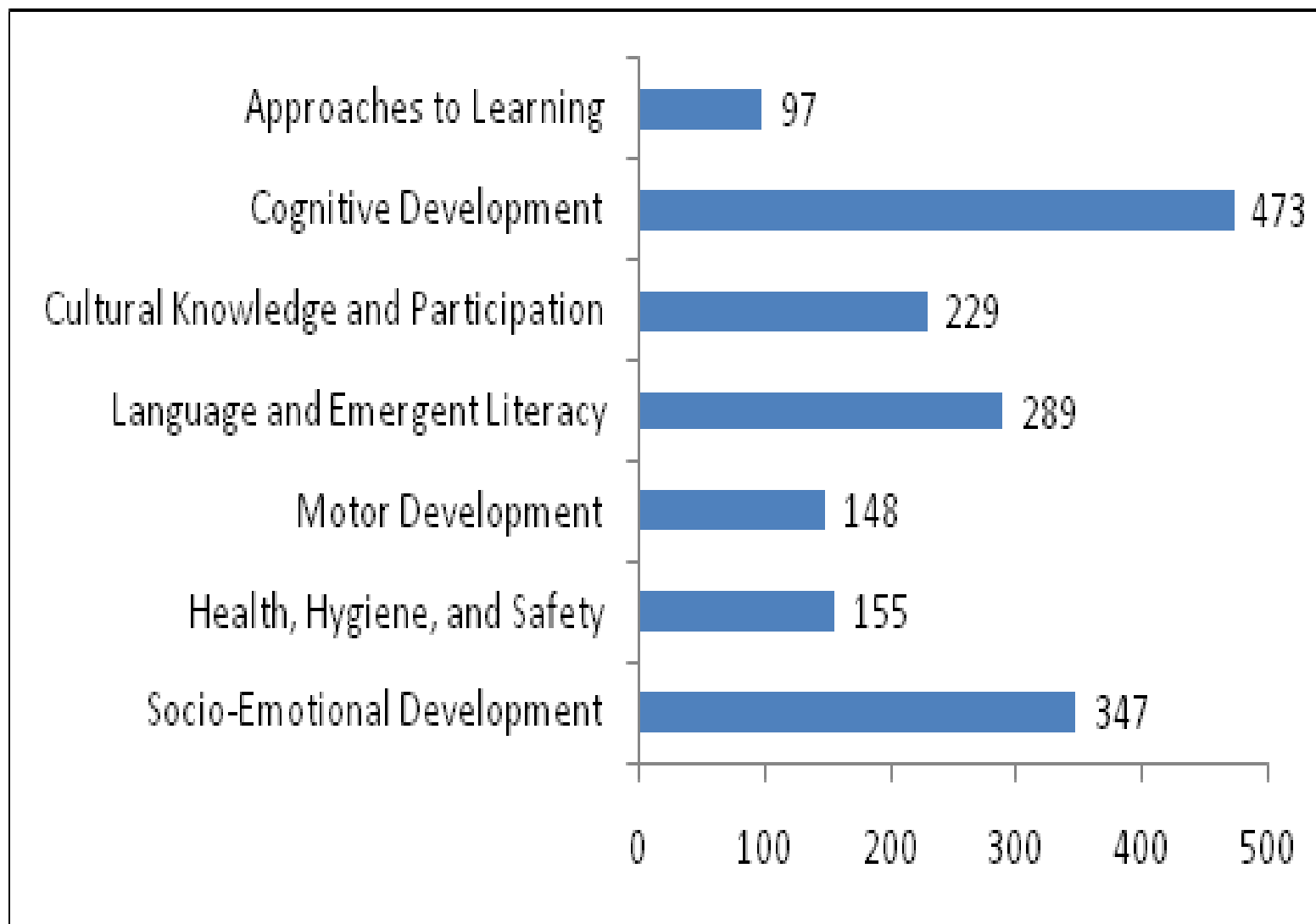


➤ **Focus on rationale and process**





# Categories and indicators







# Example of an item

Materials	1. A piece of paper; A pencil	
Procedure	Assessor asks child to draw a complete picture of him / herself.	
Instruction	Here is a pencil and paper. I would like you to draw a complete picture of yourself standing.	
Scoring Criteria and Comments	Head and/or trunk plus one other feature.	<input type="checkbox"/> 0 <input type="checkbox"/> 1
	Recognizable arms and/or legs.	
	Recognizable hands and/or feet.	<input type="checkbox"/> 0 <input type="checkbox"/> 1
	One recognizable facial feature (eyes, mouth, nose, or ears).	
	At least one additional recognizable facial feature (eyes, mouth, nose, or ears)	<input type="checkbox"/> 0 <input type="checkbox"/> 1
		<input type="checkbox"/> 0 <input type="checkbox"/> 1







# Process

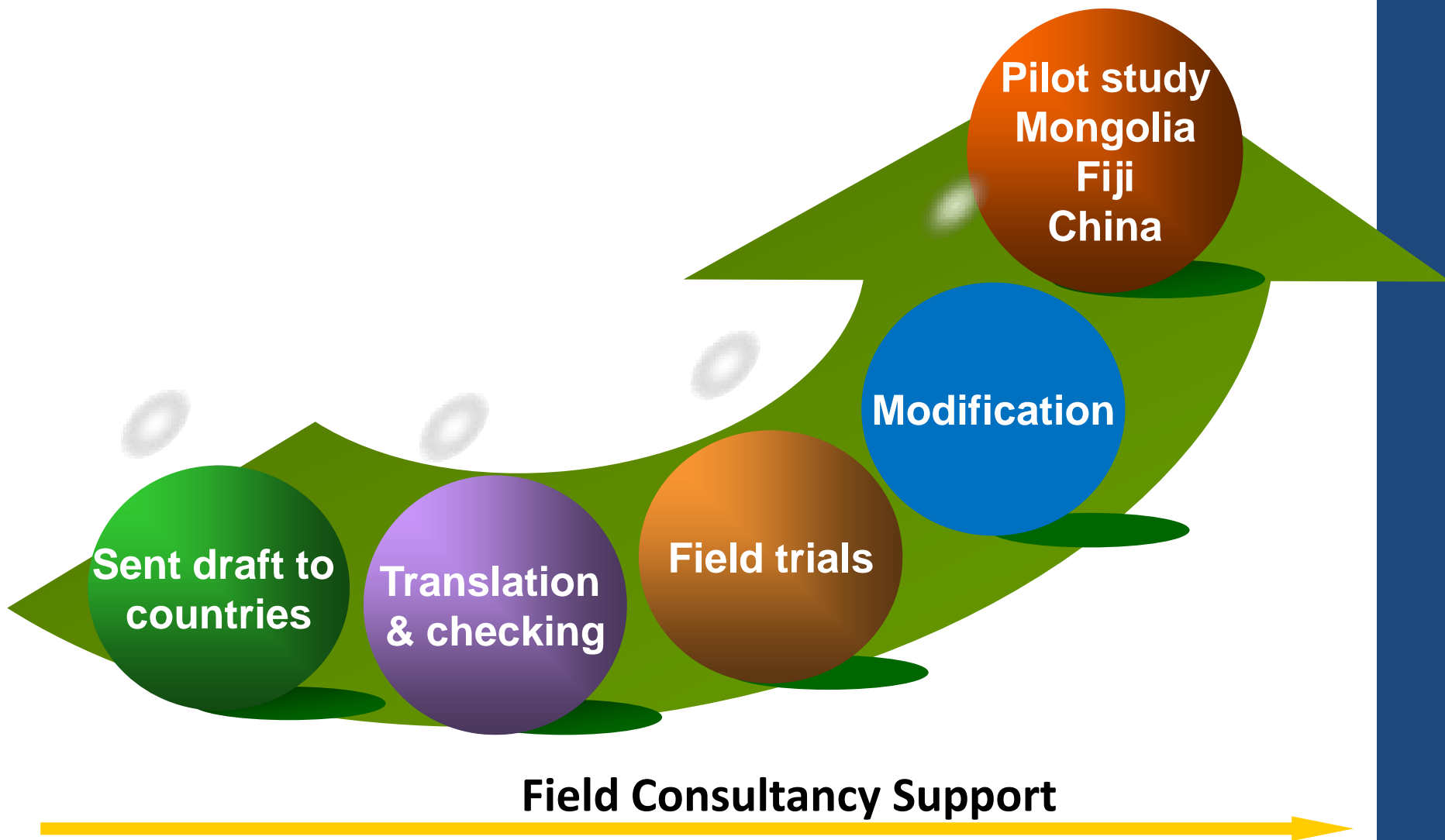
- Revised feedback on draft categories, subcategories, indicators and items at January workshop
- HKU team developed items, scoring criteria and instructional manual. How we did this? Iterative process
- Panel of experts reviewed drafts materials and appropriateness of methods and suggested changes



## Phase II: Pilot studies

1. To field test items in three diverse countries.
2. To modify the Scales based on the results and feedback.
3. To develop a final version of the Scales which can be used in many countries in Phase 3.

# Phase II: Adapted EAP-ECDS for each country



# Specific Suggestions

- Use testing materials which are familiar to the child
- Use language which child can understand
- Follow the standard instructions and procedures
- Give children different ways to respond : actions not always words
- Establishing and maintaining rapport



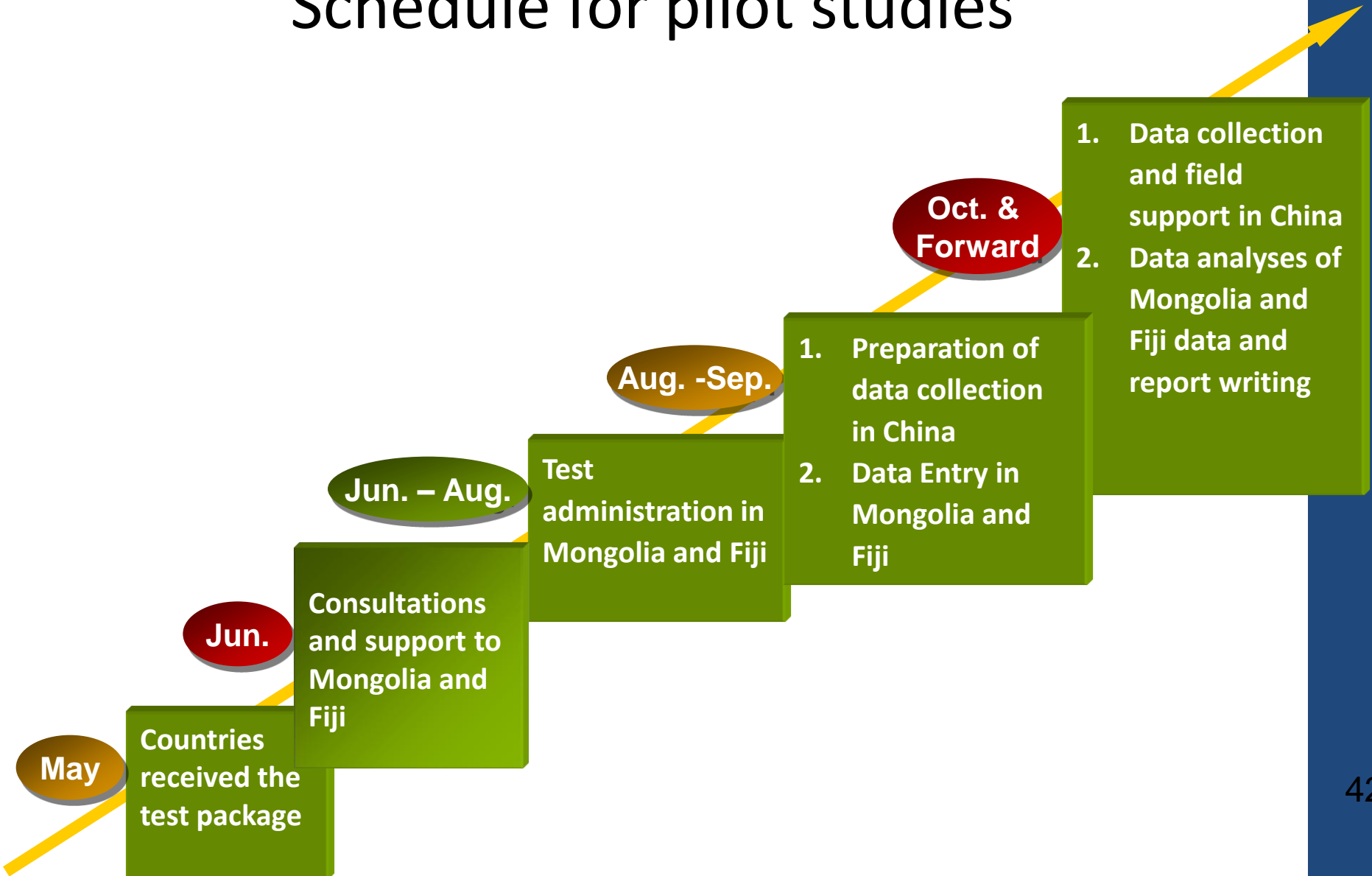
# Field training workshops










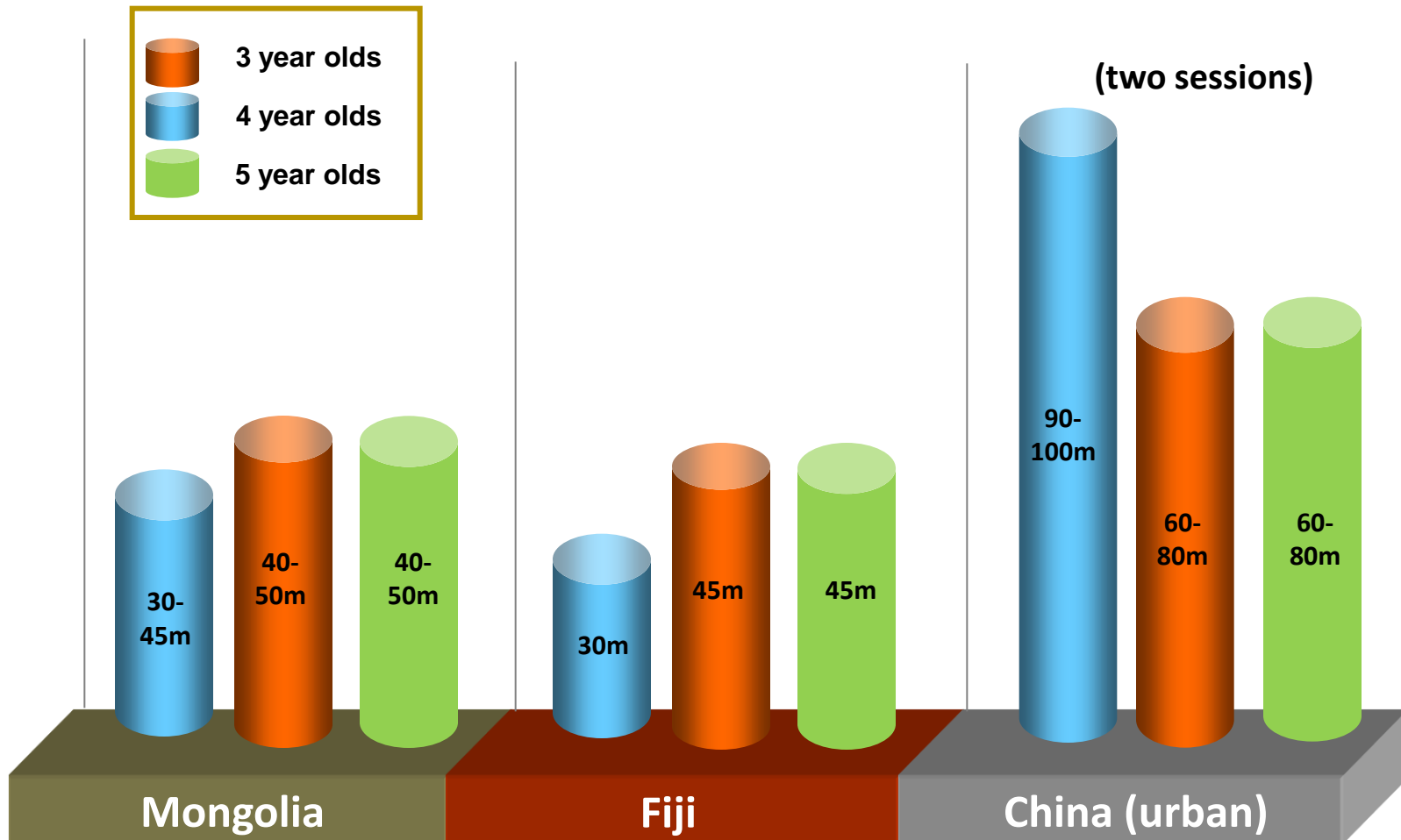
# Schedule for pilot studies



# Samples in three sites

		Urban		Rural		Total (in school)	
		Boys	Girls	Boys	Girls	Boys	Girls
 <b>Mongolia</b> (Total: 120)	3 years	11	10	10	9	21(13)	19(16)
	4 years	10	10	13	9	20 (20)	22(17)
	5 years	9	11	9	9	20(15)	18(17)
 <b>Fiji</b> (Total: 120)	3 years	6	7	12	8	13(7)	20(9)
	4 years	7	12	4	10	19(5)	14(9)
	5 years	11	10	20	13	21(20)	33(15)
 (Total: 120)	3 years	10	10	10	10	20(20)	20(20)
	4 years	10	10	10	10	20(20)	20(20)
	5 years	10	10	10	10	20(20)	20(20)

# Duration of assessment (in minutes)



# Questions for Phase II validation

- Can this scale measure achievement of standards/competence/ability?
  - Are the items appropriate?
    - Discriminative
    - Difficulty level
- How do the countries differ?
  - Scoring on the scales
  - Difference across age groups

# Strategy

## Step 1

- Model Selection
  - Compare the fit by different models

## Step 2

- Item Analysis
  - Item discrimination
  - Item variance (difficulty)

## Step 3

- Country comparisons
  - Responses pattern
  - Scores

# Model Selection

- Can this scale measure ability/attainment of ELDS?
- Item Response Theory (IRT)
  - Assume a latent ability variable
  - Latent variable measured by observed variables
  - Observed variables are dichotomous or polytomous

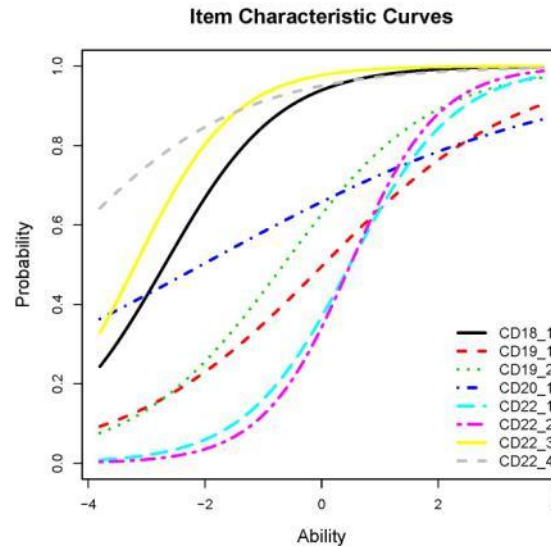
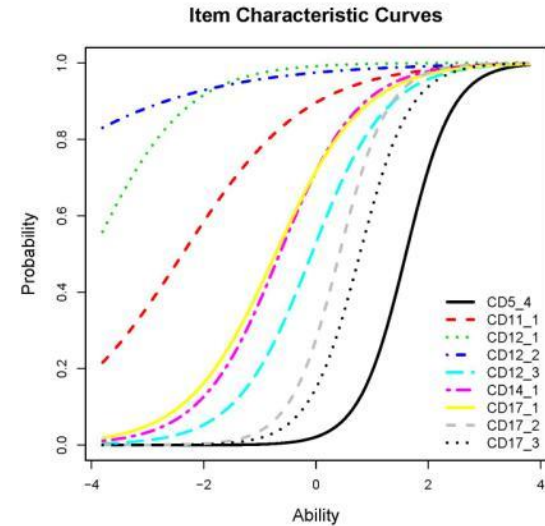
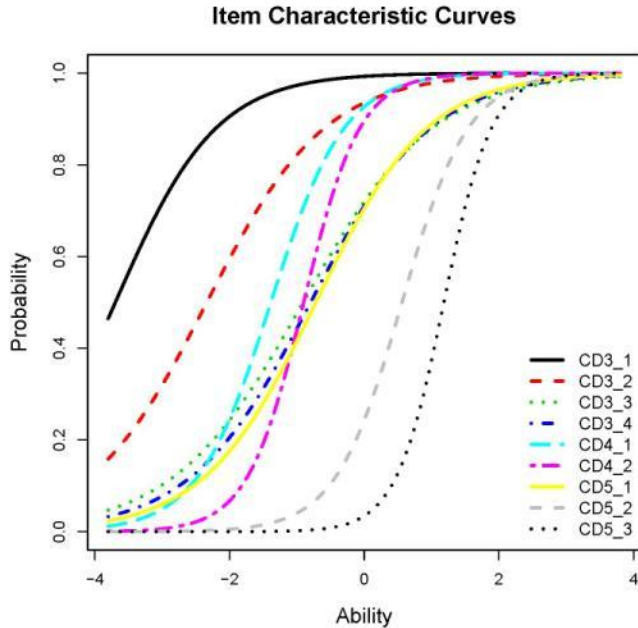
# Models considered

- Rasch Model
- Two-parameter logistic latent trait model
- Birnbaum's three-parameter model

	AIC	LRT	P-Value
Rasch	2756.64	-	-
Logistic (2 parameter)	2689.19	119.45	<0.001
Birnbaum's	2727.36	15.88	0.955



# Item Difficulty & Discrimination: Cognitive Development



# Item Difficulty & Discrimination: Cognitive Development

## Top 5 Easiest Items

<b>CD12_2</b>	Sat on the chair
<b>CD22_4</b>	Correctly put the toy under the chair
<b>CD12_1</b>	Brought the block (or other small item) to assessor
<b>CD3_1</b>	Correctly put one block inside the box
<b>CD22_3</b>	Correctly put the toy on the chair

## Top 5 Hardest Items

<b>CD22_2</b>	Correctly put the toy on the left side of the chair
<b>CD5_2</b>	Correctly picks 7 blocks on the paper
<b>CD17_3</b>	Correctly arranged all the pictures in right order
<b>CD5_3</b>	Correctly picks 15 blocks on the paper
<b>CD5_4</b>	Correctly picks 29 blocks on the paper

# Item Difficulty & Discrimination: Socio-Emotional Development

## Top 3 Easiest Items

SED1_1	Knows full formal name
SED80_1	Consistently followed the rules during assessment
SED25_2	Correctly point to the HAPPY face

## Top 3 Hardest Items

SED24_4	Correctly answered “what help” in the losing mummy situation
SED26_2	Correctly gave an answer to help stop crying
SED24_5	Correctly gave a second answer for “what help” in the losing mummy situation

# Item Difficulty & Discrimination: Motor Development

## Top 3 Easiest Items

MD36_1	Poured water and sipped from an open cup independently
MD35_1	Walk forward: fell off or side-stepped three times or less
MD41_1	Successfully strung large beads

## Top 3 Hardest Items

MD38_4	Hit the target on third attempt
MD38_2	Hit the target on first attempt
MD38_3	Hit the target on second attempt

# Item Difficulty & Discrimination: Language and Emergent Literacy

## Top 5 Easiest Items

LEL45_4	Correctly identified playing (with ball)
LEL43_5	Correctly identified cleaning teeth
LEL45_2	Correctly identified reading
LEL43_1	Correctly identified combing hair
LEL45_1	Correctly identified running

## Top 5 Hardest Items

LEL56_2	Copied triangle
LEL56_3	Copied rectangle
LEL48_3	Mentioned another one or more events or happening of one event in logical order
LEL46_3	Linked all four pictures with some cohesive evidence
LEL54_3	Drew recognizable hands and/or feet

# Item Difficulty & Discrimination: Health, Hygiene and Safety

## Top 3 Easiest Items

HHS58_1	Could pretend to clean his/her face and hand
HHS58_2	Could pretend to brush his/her teeth
HHS60_2	Could take the smock off

## Top 3 Hardest Items

HHS59_1	Mentioned washing hands after using the toilet
HHS66_2	Correctly identified confectionary as unhealthy food
HHS66_1	Correctly identified chips as the unhealthy food

# Item Difficulty & Discrimination: Cultural Knowledge and Participation

## Top 3 Easiest Items

CKP74_1	Correctly clapped one line according to the rhythm of the song
CKP74_2	Correctly clapped one more line
CKP74_3	Correctly clapped another one ore more lines and refrain

## Top 3 Hardest Items

CKP70_1	Mentioned informing an adult
CKP70_2	Mentioned returning the toy to the owner
CKP71_3	Correctly named another festival

# Item Difficulty & Discrimination: Approaches to Learning

## Top 3 Easiest Items

ATL84_1	Showed positive emotion
ATL83_1	Beginning: stays on task
ATL84_4	Spontaneous positive interaction with assessor

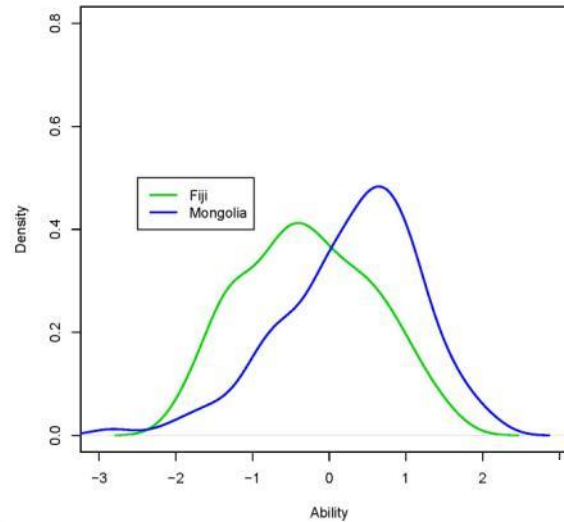
## Top 3 Hardest Items

ATL83_6	End: not want to stop tasks
ATL83_5	End: not easily distracted
ATL83_3	Beginning: not want to stop tasks

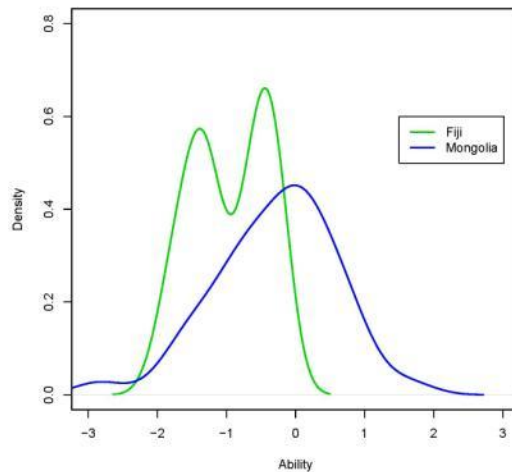


# Country Comparisons: Cognitive Development

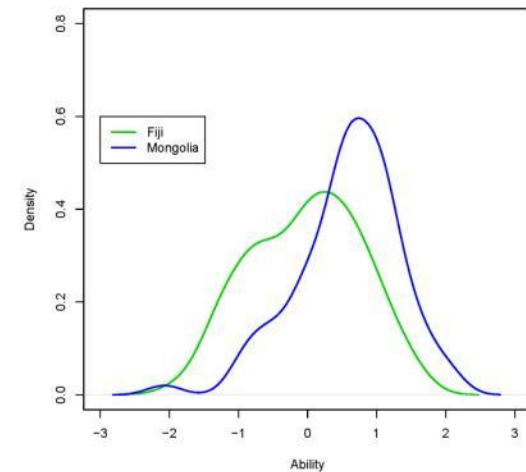
Distribution of Latent CD Ability Scores



Distribution of Latent CD Ability Scores (3 years)



Distribution of Latent CD Ability Scores (4/5 years)



# Discussion

- Psychometric issues
  - Limited data
  - Factor analysis difficult and unreliable
  - Time consuming and challenging to develop culturally appropriate items







# Difficulties in Assessment

- Children felt tired during the process of the assessment.  
→ *Let children go out of the test room if they feel tired.*
- The assessors' conversations with the children beyond the instructions prolonged the whole testing.  
→ *Avoid too many conversations and always keep children focused on the test.*
- The assessors unintentionally revealed the recording sheet to children which made children nervous.
- How to motivate children during assessment?  
→ *Give children enough oral encouragement, but not small gifts*

# Summary

- Test based on culturally sensitive ELDS; first effort in the region
- Test is reasonably valid and reliable and can meet need for a tool to monitor child development at the population level
- Valuable effort to achieve both cultural appropriateness and item equivalence in cross-cultural measurement

# Conclusions

- Diversity in the region – but there are socially disadvantaged children everywhere
- School readiness is important and decreasing the achievement gap is necessary to promote equity
- Importance of culturally-sensitive indicators of child development for monitoring child development and interventions



**THANK YOU!**