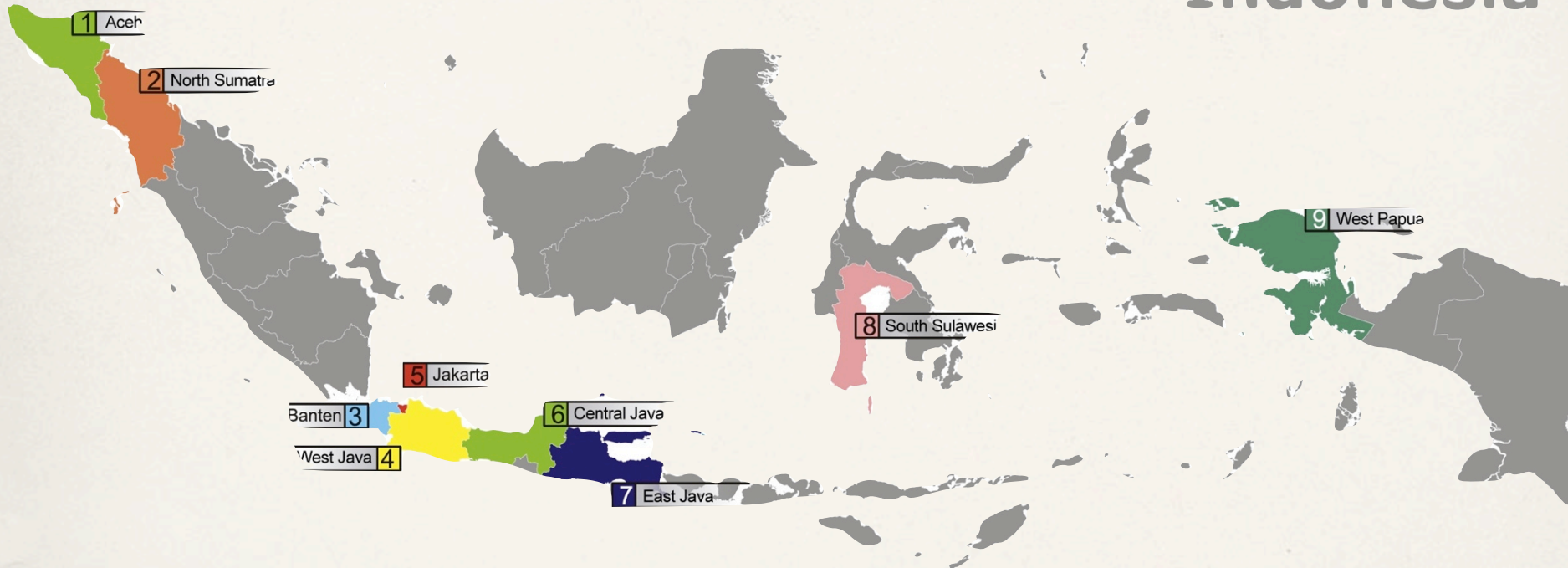


Over 14,000 teachers

Over 1,100 schools and principals

Approximately 250,000 students

Indonesia



# Decentralized Basic Education

A USAID-Funded Initiative in Indonesia

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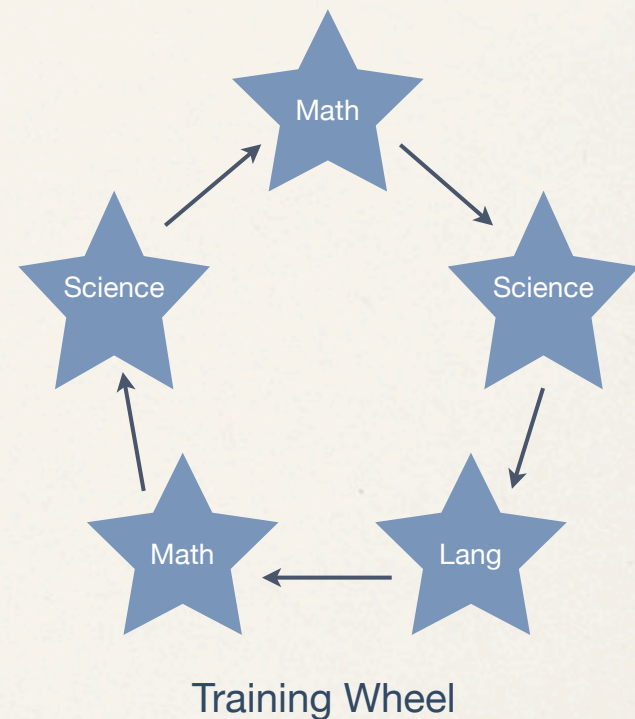
AEA - October 17, 2013

Jennifer Ho, University Of California, Los Angeles

# Research Questions

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- ❖ How might DBE 2 teacher performance differ from the kind of teaching observed in average, non-project classrooms?
- ❖ Are there variations in DBE 2 teacher performance (as compared with non-project classrooms) across districts and provinces?



# Measuring Active Learning

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## Classroom Observation Example Active Learning Items

1. The teacher uses the following teaching and learning methods over course of observation:

- A. Open-ended Question & Answer (non-recall questions)**
- B. Small group work**
- C. Pair share**
- D. Discussion**
- E. Role plays/skits**
- F. Games/physical activities**
- G. Written Instructions**
- H. Oral Instructions**



# Teacher Sample Description

	Cohort 1	Cohort 2	Grade 3	Grade 6	Male	Female	Urban	Rural
<b>Control</b>	127	124	126	125	60	191	152	99
<b>DBE 2</b>	403	360	404	359	195	568	437	326
<b>Subtotal</b>	530	484	530	484	255	759	589	425
<b>Total</b>	<b>1,014</b>		<b>1,014</b>		<b>1,014</b>		<b>1,014</b>	

# Differences in Teachers' Mean Active Learning Scores

Treatment	Province	Mean ALS	N	SD
Control	Aceh	13.45	38	5.66
	North Sumatra	10.54	43	3.65
	West Java	12.46	29	4.12
	Central Java	14.68	46	3.99
	East Java	11.95	43	4.25
	Banten	11.03	12	4.59
	South Sulawesi	11.40	40	4.57
	<b>Total</b>	<b>12.36</b>	<b>251</b>	<b>4.58</b>
DBE 2	Aceh	13.62	116	5.14
	North Sumatra	14.07	127	4.60
	West Java	17.01	109	5.54
	Central Java	21.90	144	4.05
	East Java	16.32	124	5.06
	Banten	16.49	36	3.87
	South Sulawesi	16.43	107	5.19
	<b>Total</b>	<b>16.71</b>	<b>763</b>	<b>5.59</b>
<b>Grand Total</b>		<b>15.63</b>	<b>1,014</b>	<b>5.67</b>



# Multi-Level Model: Three Level Nested Structure

Level 1 - Teachers Within Districts:

$$ALS_{ijk} = \pi_{0jk} + e_{ijk}$$

Level 2 - Districts Within Provinces:

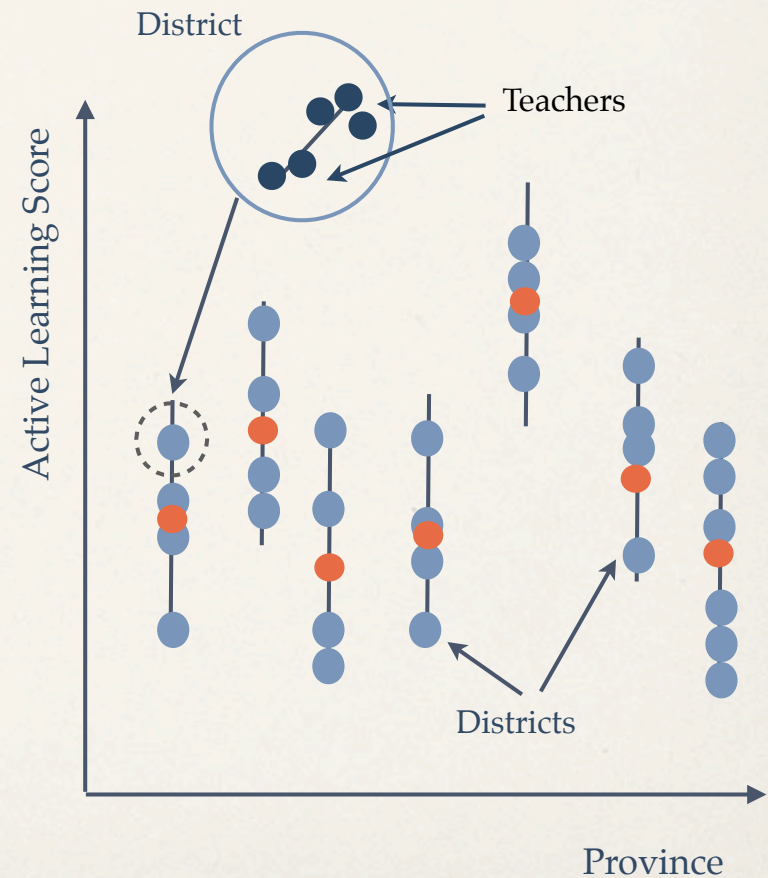
$$\pi_{0jk} = \beta_{00k} + r_{0jk}$$

Level 3 - Across Provinces:

$$\beta_{00k} = \gamma_{000} + u_{00k}$$

Single Equation Model:

$$ALS_{ijk} = \gamma_{000} + r_{0jk} + u_{00k} + e_{ijk}$$

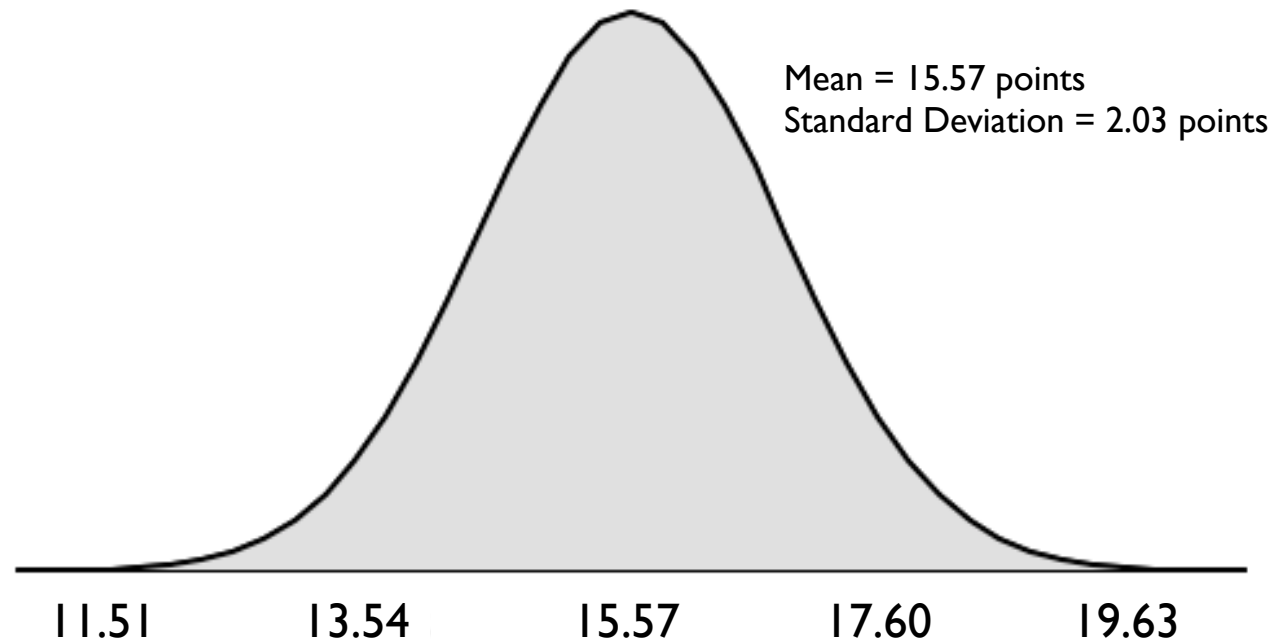


# Initial Results - No Predictors

**Distribution of Teachers' Active Learning Score around Mean**

**Distribution of Districts' Active Learning Score around Mean**

**Distribution of Provincial Active Learning Score around Mean**



# Variance Decomposition

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	Variance
Level 1 - Teachers Within Districts	81.4%
Level 2 - Districts within Provinces	5.3%
Level 3 - Between Provinces	13.3%



# Controlling for Treatment Group

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Level 1 - Teachers Within Districts:

$$ALS_{ijk} = \pi_{0jk} + \pi_{1jk} * TREATMENT_{ijk} + e_{ijk}$$

Level 2 - Districts Within Provinces:

$$\pi_{0jk} = \beta_{00k} + r_{0jk}$$

$$\pi_{1jk} = \beta_{10k}$$

Level 3 - Across Provinces:

$$\beta_{00k} = \gamma_{000} + u_{00k}$$

$$\beta_{10k} = \gamma_{100} + u_{10k}$$

Single Equation Model:

$$ALS_{ijk} = \gamma_{000} + \gamma_{100} * TREATMENT_{ijk} + r_{0jk} + u_{00k} + u_{10k} * TREATMENT_{ijk} + e_{ijk}$$

# Controlling for Treatment Group

Fixed Effects	Coefficient	SE	p-value	
MEAN ALS, $\gamma_{000}$	12.34	0.53	<0.001	
TREATMENT, $\gamma_{100}$	4.28	0.75	0.001	
Random Effects	Variance	df	$\chi^2$	p-value
Level 1 - Teachers in Districts				
Mean ALS	21.08			
Level 2 - Between Districts				
Mean ALS	1.81	40	115.74	<0.001
Level 3 - Between Provinces				
Mean ALS	1.05	6	16.11	0.013
Treatment Group Effect	3.09	6	37.89	<0.001



# Interpreting the Results

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Province	Est. Intercept (MEAN ALS)	Est. Slope (TREATMENT)
<b>Aceh</b>	<b>13.45</b>	<b>0.17</b>
North Sumatra	10.54	3.53
West Java	12.46	4.55
<b>Central Java</b>	<b>14.68</b>	<b>7.22</b>
East Java	11.95	4.37
Banten	11.03	5.46
South Sulawesi	11.40	5.03

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# Explaining Variance

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	Unconditional Model Variance	Variance Controlling for Treatment	R-Squared
Level 1 - Teachers Within Districts	81.4%	78.0%	0.17
Level 2 - Between Districts	5.3%	6.7%	
Level 3 - Between Provinces	13.3%	15.3%	

# Controlling for Pre-Test Scores

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- ❖ Teachers may teach classes with differing levels of ability
- ❖ It may be more difficult for a teacher to implement new Active Learning techniques if their classes already struggle to achieve academically
- ❖ **If we control for students' prior ability (i.e., pre-test scores), would we still see the same effect of DBE 2 participation on teachers' use of Active Learning techniques?**

# Student Sample Description

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	Male	Female	Grade 3	Grade 6	Cohort 1	Cohort 2
Control	1,951	2,016	1,944	2,023	1,824	2,143
DBE 2	5,761	5,862	5,599	6,024	5,559	6,064
Subtotal	7,712	7,878	7,543	8,047	7,383	8,207
Total	15,590		15,590		15,590	



# Average Pre-Test Scores by Teacher

Treatment	Subject	Mean % Correct	N	SD
Control	Grade 3 - Language	53.93	71	14.10
	Grade 3 - Math	23.08	71	8.08
	Grade 6 - Language	39.57	70	9.59
	Grade 6 - Math	24.31	70	5.19
	Grade 6 - Science	42.30	70	8.91
DBE 2	Grade 3 - Language	55.42	208	16.42
	Grade 3 - Math	23.12	208	8.65
	Grade 6 - Language	40.58	208	12.17
	Grade 6 - Math	24.55	208	5.32
	Grade 6 - Science	42.35	208	10.21

# Grade 3 - Controlling for Treatment and Language PreTest

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Level 1 - Teachers Within Districts:

$$ALS_{ijk} = \pi_{0jk} + \pi_{1jk} * (LANG - \overline{LANG})_{ijk} + \pi_{2jk} * TREATMENT_{ijk} + e_{ijk}$$

Level 2 - Districts Within Provinces:

$$\pi_{0jk} = \beta_{00k} + r_{0jk}$$

$$\pi_{1jk} = \beta_{10k}$$

$$\pi_{2jk} = \beta_{20k}$$

Level 3 - Across Provinces:

$$\beta_{00k} = \gamma_{000} + u_{00k}$$

$$\beta_{10k} = \gamma_{100}$$

$$\beta_{20k} = \gamma_{200} + u_{20k}$$

Single Equation Model:

$$ALS_{ijk} = \gamma_{000} + \gamma_{100} * (LANG - \overline{LANG})_{ijk} + \gamma_{200} * TREATMENT_{ijk} + r_{0jk} + u_{00k} + u_{20k} * TREATMENT_{ijk} + e_{ijk}$$



# Grade 3

## Controlling for PreTest Scores

Fixed Effects	Coefficient	SE	p-value
MEAN ALS, $\gamma_{000}$	12.01	0.53	<0.001
LANG PRETEST, $\gamma_{100}$	0.07	0.02	0.003
TREATMENT, $\gamma_{200}$	3.93	0.75	0.001

Random Effects	Variance	df	$\chi^2$	p-value
Level 1 - Teachers in Districts				
Mean ALS	17.55			
Level 2 - Between Districts				
Mean ALS	3.31	40	85.85	<0.001
Level 3 - Between Provinces				
Mean ALS	1.60	6	11.83	0.065
Treatment Group Effect	2.40	6	13.72	0.033



# Grade 6

## Controlling for PreTest Scores

Fixed Effects	Coefficient	SE	p-value
MEAN ALS, $\gamma_{000}$	12.49	1.10	<0.001
SCIENCE PRETEST, $\gamma_{100}$	0.10	0.04	0.024
TREATMENT, $\gamma_{200}$	3.71	0.62	<0.001

Random Effects	Variance	df	$\chi^2$	p-value
Level 1 - Teachers in Districts				
Mean ALS	19.84			
Level 2 - Between Districts				
Mean ALS	4.05	40	90.79	<0.001
Level 3 - Between Provinces				
Mean ALS	5.66	6	46.05	<0.001

# Variation by Province

Province	Grade 3		Grade 6
	Est. Intercept (MEAN ALS)	Est. Slope (TREATMENT)	Est. Intercept (MEAN ALS)
Aceh	12.10	-0.85	9.80
North Sumatra	10.48	3.62	10.71
West Java	10.60	5.37	13.48
Central Java	15.93	5.91	17.86
East Java	11.76	5.00	10.99
Banten	11.74	3.90	12.76
South Sulawesi	10.30	5.32	12.14



# Summary of Findings

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- ❖ DBE 2 teachers more likely than Control teachers to use Active Learning practices at the time of initial observation (one year following program implementation)
  - ❖ True after taking into consideration student performance in Grade 3 Language and Grade 6 Science pre-test scores
- ❖ Active Learning Scores varied most amongst teachers within districts, but were also seen to vary between districts and between provinces
  - ❖ DBE 2 participation was seen to have an even greater effect on some provinces over others - can look to Central Java as model
- ❖ No effect of cohort, teacher sex, school location, or class size - advantages of program consistent across these variables





# OLS Comparison



## All Grades

	Coefficient	SE	p-value
Average ALS	12.36	0.34	<0.001
Treatment	4.37	0.39	<0.001
R-Squared	0.109		

## Grade 3

	Coefficient	SE	p-value
Average ALS	7.82	1.25	<0.001
Treatment	4.12	0.73	<0.001
Language Pre-Test	0.08	0.02	<0.001
R-Squared	0.151		

## Grade 6

	Coefficient	SE	p-value
Average ALS	8.65	1.57	<0.001
Treatment	3.63	0.76	<0.001
Science Pre-Test	0.10	0.03	0.005
R-Squared	0.101		

# Comparing Variance Explained

	Grade 3 - Controlling for Language PreTest and Treatment		Grade 6 - Controlling for Science PreTest and Treatment	
	Variance Decomposition	R-Squared	Variance Decomposition	R-Squared
<b>Level 1</b> Teachers Within Districts	81.4%	0.23	78.0%	0.15
<b>Level 2</b> Between Districts	5.3%		6.7%	
<b>Level 3</b> Between Provinces	13.3%		15.3%	
<b>OLS Model</b> Teachers as Independent Individuals		0.15		0.10



# MLM Advantages Over OLS

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- ❖ With clustered data, OLS forces us to choose whether we are going to analyze the data at the individual level OR the group level
  - ❖ But, there are complications in making this EITHER/OR choice
- ❖ MLM preserves clustered data structure and allows for estimation of error terms for BOTH the individual and the group
- ❖ MLM uses more accurate estimations of standard errors (Empirical Bayes/Maximum Likelihood)
- ❖ MLM can examine the effects of variables at both individual and group levels, as well as possible cross-level interactions



# What Does Your Data Need to Look Like to Conduct MLM?

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- ❖ Take care to collect information on teacher characteristics
- ❖ If you know in advance that you would like to be able to examine certain groups or regions, think about collecting data to inform group-level variables
- ❖ If you can afford it, collect pre-test data and baseline data regularly
- ❖ Design a numeric identification system early on that is easy to distinguish regions, groups, and individuals
- ❖ If you're interested in longitudinal analyses - track carefully! You'll want at least 3 observations per individual

# The End

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