

The Study of Beginning Reading at Scale: Context Matters

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Data Sources

- IERI study funded by IES/U.S. DoE, 2002-2007 (Foorman, PI)
- Bilingual/biliteracy program project funded by NICHD 2002-2006 (Francis, PI)

IERI Study: Conceptual Issue

- As schools use assessment to determine risk and guide instruction it's important to have effective models of risk/prevention.
 - What is the role of individual differences in student performance in kindergarten in determining grade 1 outcomes?
 - What is the role of the kindergarten classroom in determining grade 1 outcomes?

Research Question

Which predicts student yr 2 reading outcome better—student pretest in yr 1 or combination of student pretest and mean of pretest classroom?

Intervention

- Randomized study in 210 rural and urban schools
- Schools randomly assigned to conditions of teacher support and administration format.











Teacher Support

- No mentoring
- Website Mentor




































Administration Format

- Paper
- Paper + Desktop
- Handheld+Desktop

TPRI Screening Tasks

	Kindergarten		1st Grade		2nd Grade
	Middle of the Year	End of the Year	Beginning of the year	End of the Year	Beginning of the year
Graphophonemic Knowledge					
Word Reading					
Phonemic Awareness					

TPRI Inventory Tasks

	Kindergarten		1st Grade			2nd Grade		
	middle of the year	end of the year	beginning of the year	middle of the year (optional)	end of the year	beginning of the year	middle of the year (optional)	end of the Year (optional)
Book and Print Awareness								
Phonemic Awareness								
Graphophonemic Knowledge								
Reading Accuracy								
Fluency								
Reading/Listening Comprehension								

Book & Print Awareness is a warm-up activity

TPRI Data Collected on Handheld Device



Demographics of schools

	Rural	Urban
African American	9.16%	20.67%
Caucasian	43.98%	13.33%
Hispanic	35.86%	63.67%
Other	11%	2.33%

51.47% of students in rural schools & 73% of students in urban schools economically disadvantaged

TPRI Study

- 4,424 students
- 399 kindergarten teachers
- 413 Grade 1 teachers
- 1,336 K-1 teacher pairs

TPRI Kindergarten Composite

- Letter name and sound identification; rhyming; blending word parts & phonemes; detecting initial/final sounds
- Fall scores missing by design
 - multiple imputation
 - SAS Proc MI to impute the missing values
 - SAS Proc MIAnalyze to combine the imputed inferences

TPRI Grade 1 Reading outcomes

- Word reading: Composite of words read correctly out of 8 on screen and out of 15 on the word list task
- Oral reading fluency: words read correctly per minute in passage reading task

TPRI Kinder Composite Predicting Grade 1 Word Reading or Fluency

- Proc Mixed with three levels
- Random Effects
 - random intercepts at the school level, grouped by areatype (urban vs. rural)
 - random intercepts and slopes at kindergarten-grade 1 classroom pair within school level, grouped by areatype
- Fixed Effects
 - Kindergarten composite student score deviated from classroom mean
 - Kindergarten classroom mean
 - Interaction between student score and class mean

TPRI Kinder Composite Predicting Grade 1 Word Reading: Random Effects Results

Multiple Imputation Parameter Estimates Random Effects			
Parameter	Estimate	Std Error	Pr > |t|
Intercept School Level Rural	2.667642	0.761742	0.0005
Intercept School Level Urban	5.739346	1.262305	<.0001
Intercept Classroompair Level Rural	1.844492	0.551070	0.0008
Slope Classroompair Level Rural	0.019768	0.013486	0.1540
Intercept Classroompair Level Urban	5.197711	0.716914	<.0001
Slope Classroompair Level Urban	0.015324	0.006075	0.0121
Residual	21.094043	0.576580	<.0001

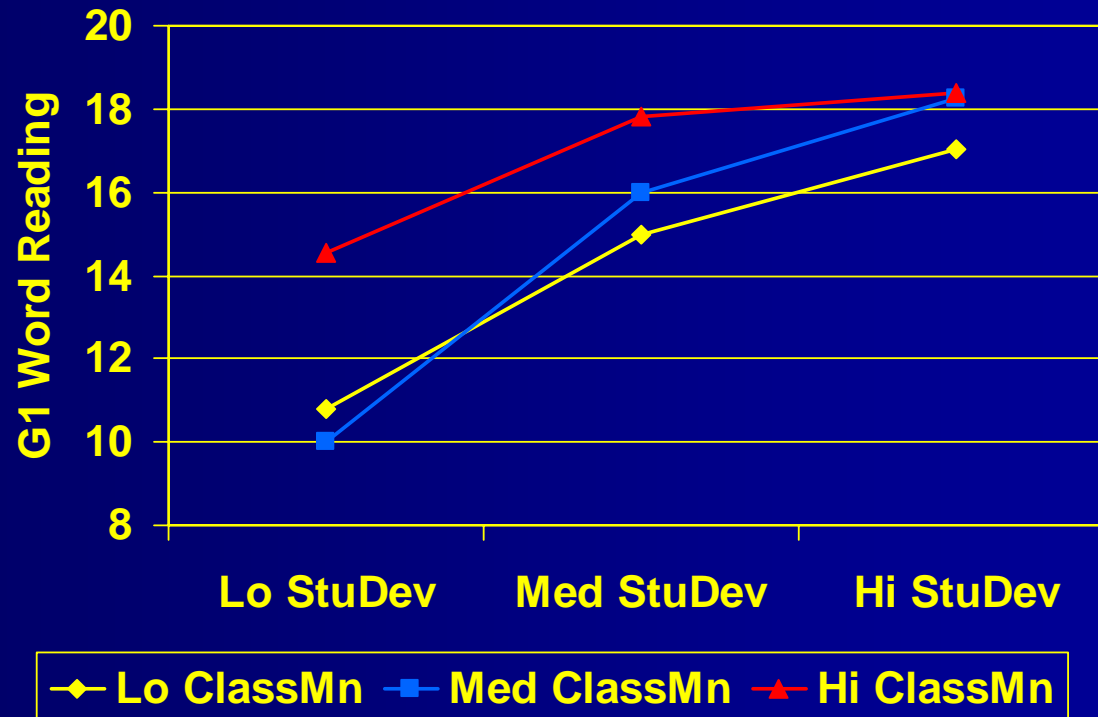
TPRI Kinder Composite Predicting Grade 1 Word Reading: ICCs

ICCs			
Parameter	Estimate	Std Error	ICC
Intercept School Level Rural	2.667642	0.761742	0.126
Intercept School Level Urban	5.739346	1.262305	0.218
Intercept Classroompair Level Rural	1.844492	0.551070	0.087
Slope Classroompair Level Rural	0.019768	0.013486	0.001
Intercept Classroompair Level Urban	5.197711	0.716914	0.198
Slope Classroompair Level Urban	0.015324	0.006075	0.001

TPRI Kindergarten Composite Predicting Grade 1 Word Reading: Fixed Effects Results

Multiple Imputation Parameter Estimates of Fixed Effects			
Parameter	Estimate	Std Error	Pr > |t|
intercept	0.943683	1.665028	0.5710
kinstudevclassmn	-0.568061	0.137094	<.0001
kinclassmn	0.267046	0.031340	<.0001
Kinstudevclassmn * kinclassmn	0.019801	0.002722	<.0001

TPRI Kindergarten Composite Predicting Grade 1 Word Reading: Student Score X Class Mean Interaction



TPRI Kindergarten Composite Predicting Grade 1 Fluency: Random Effects Results

Multiple Imputation Parameter Estimates Random Effects			
Parameter	Estimate	Std Error	Pr > |t|
Intercept School Level Rural	65.802	22.895	0.0041
Intercept School Level Urban	75.894	21.416	0.0004
Intercept Classroompair Level Rural	70.908	17.641	<.0001
Slope Classroompair Level Rural	0.003	0.183	0.9882
Intercept Classroompair Level Urban	72.516	19.514	0.0002
Slope Classroompair Level Urban	0.546	0.395	0.1689
Residual	609.501	18.051	<.0001

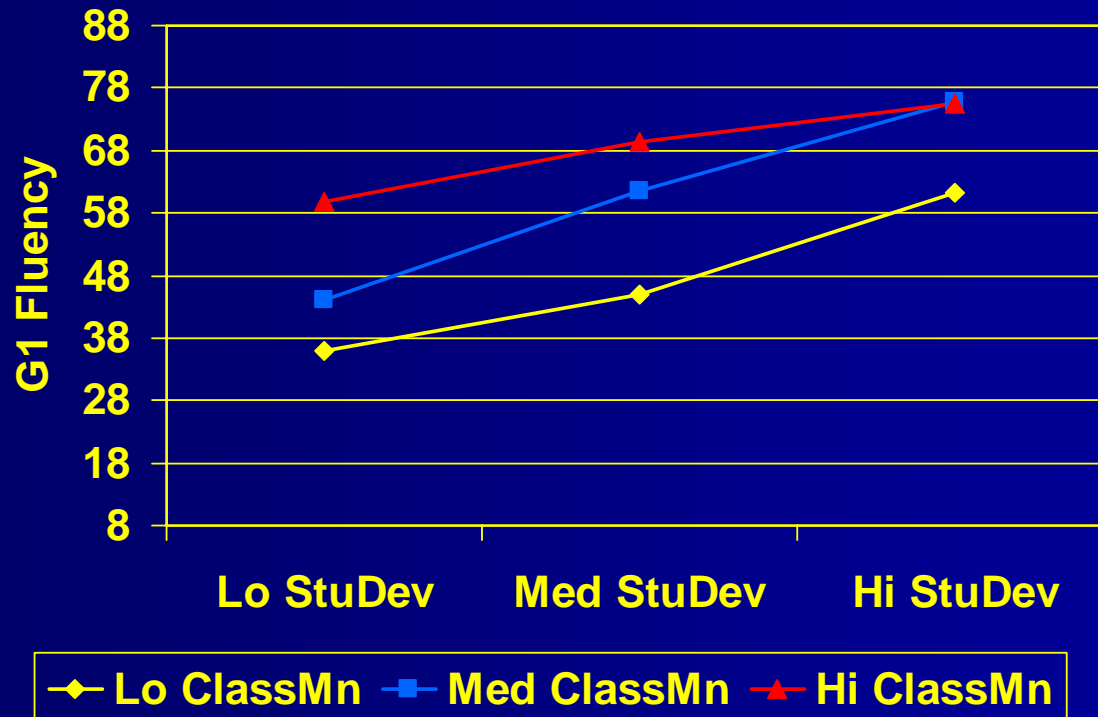
TPRI Kindergarten Composite Predicting Grade 1 Fluency: ICCs

ICCs			
Parameter	Estimate	Std Error	ICC
Intercept School Level Rural	65.802	22.895	0.088
Intercept School Level Urban	75.894	21.416	0.100
Intercept Classroompair Level Rural	70.908	17.641	0.095
Slope Classroompair Level Rural	0.003	0.183	0.000
Intercept Classroompair Level Urban	72.516	19.514	0.096
Slope Classroompair Level Urban	0.545	0.395	0.001

TPRI Kindergarten Composite Predicting Grade 1 Fluency: Fixed Effects Results

Multiple Imputation Parameter Estimates of Fixed Effects			
Parameter	Estimate	Std Error	Pr > |t|
intercept	17.127	5.778	0.0030
kinstudevclassmn	-1.148	0.825	0.1641
kinclassmn	1.500	0.196	<.0001
Kinstudevclassmn * kinclassmn	0.118	0.029	<.0001

TPRI Kindergarten Composite Predicting Grade 1 Fluency: Student Score X Class Mean Interaction



TPRI Results: Summary

- Urban ICCs almost twice that of rural ICCs at school and classroom levels for word reading
- Students low in word reading and fluency in K perform poorly in Grade 1 in low performing classrooms (& medium classrooms for word reading)
- High ability students in K score higher in Grade 1 word reading and fluency if they're in medium or high performing classrooms

Tejas Lee Kindergarten Composite Predicting Grade 1 Word Reading or Fluency

- Ran Proc Mixed with three levels
 - student nested within classroom pairs nested within schools
 - only urban schools
- Random Effects
 - random intercepts at the school level
 - random intercepts and slopes at kindergarten-grade 1 classroom pair within school level
- Fixed Effects
 - kindergarten composite student score deviated from classroom mean
 - kindergarten classroom mean
 - interaction between student score and class mean

K Composite for Tejas LEE

- Letter identification
- Letter-sound
- Blending syllables
- Segmenting syllables
- Initial sound identification
- Word reading

Tejas Lee Grade 1 Reading outcomes

- Word reading: Number correct out of 25 on word list
- Oral reading fluency: words read correctly per minute in passage reading task

Tejas Lee Kindergarten Composite Predicting Grade 1 Word Reading: Random Effects Results

Covariance Parameter Estimates

Cov Parm	Estimate	Standard Error	Pr Z
Intercept School Level	1.1316	0.3779	0.0014
Intercept Classroompair Level	1.2206	0.2783	<.0001
Covariance of Intercept and Slope Classroompair Level	-0.5823	0.0795	<.0001
Slope Classroompair Level	0.2888	0.0423	<.0001
Residual	11.0647	0.4089	<.0001

Tejas Lee Kinder Composite

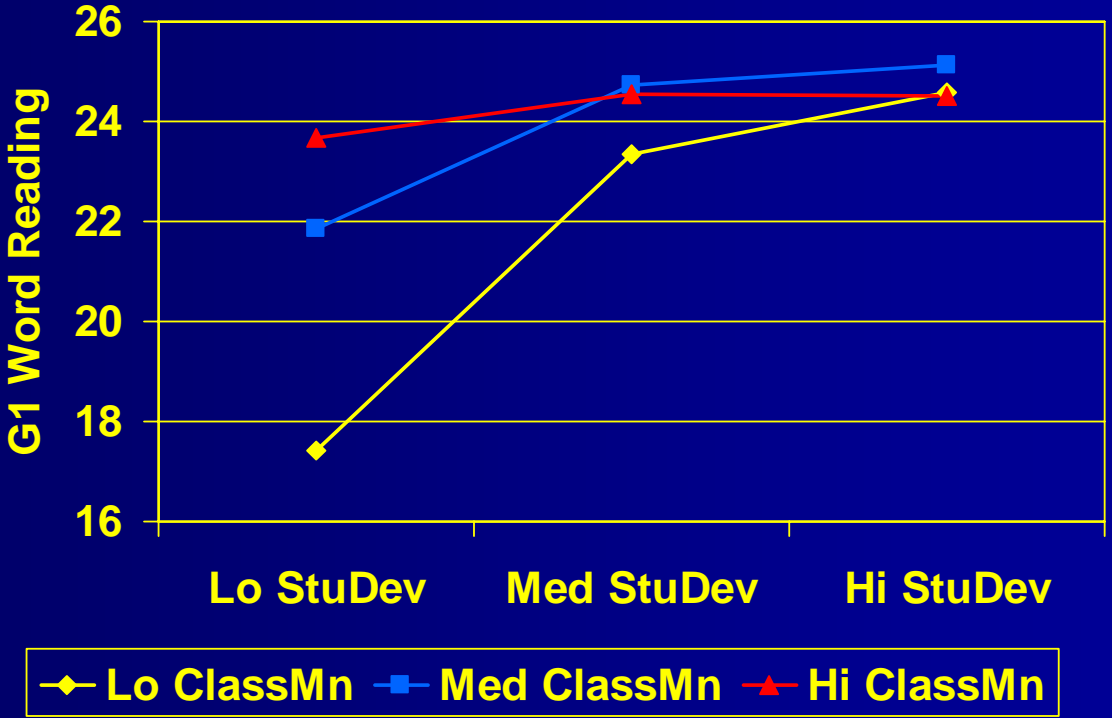
Predicting Grade 1 Word Reading: ICCs

ICCs			
Parameter	Estimate	Std Error	ICC
Intercept School Level	1.1316	0.3779	0.083
Intercept Classroompair Level	1.2206	0.2783	0.089
Slope Classroompair Level	0.2888	0.04236	0.021

Tejas Lee Kindergarten Composite Predicting Grade 1 Word Reading: Fixed Effects Results

Solution for Fixed Effects					
Effect	Estimate	Standard Error	DF	t Value	Pr > |t|
intercept	9.5112	1.6274	70	5.84	<.0001
kinstudevclassmn	-0.8118	0.4776	287	-1.70	0.0902
kinclassmn	0.4226	0.04995	1381	8.46	<.0001
Kinstudevclassmn * kinclassmn	0.04345	0.01528	1381	2.84	0.0045

Tejas Lee Kinder Composite Predicting Grade 1 Word Reading: Student Score X Class Mean Interaction



Tejas Lee Kinder Composite Predicting Grade 1 Fluency: Random Effects Results

Covariance Parameter Estimates			
Parameter	Estimate	Std Error	Pr > |t|
Intercept School Level	52.0784	14.7197	0.0002
Intercept Classroompair Level	50.0990	11.1395	<.0001
Covariance of Intercept and Slope Classroompair Level	4.0870	1.7150	0.0172
Slope Classroompair Level	0.6390	0.3671	0.0408
Residual	385.9000	14.0160	<.0001

Tejas Lee Kinder Composite

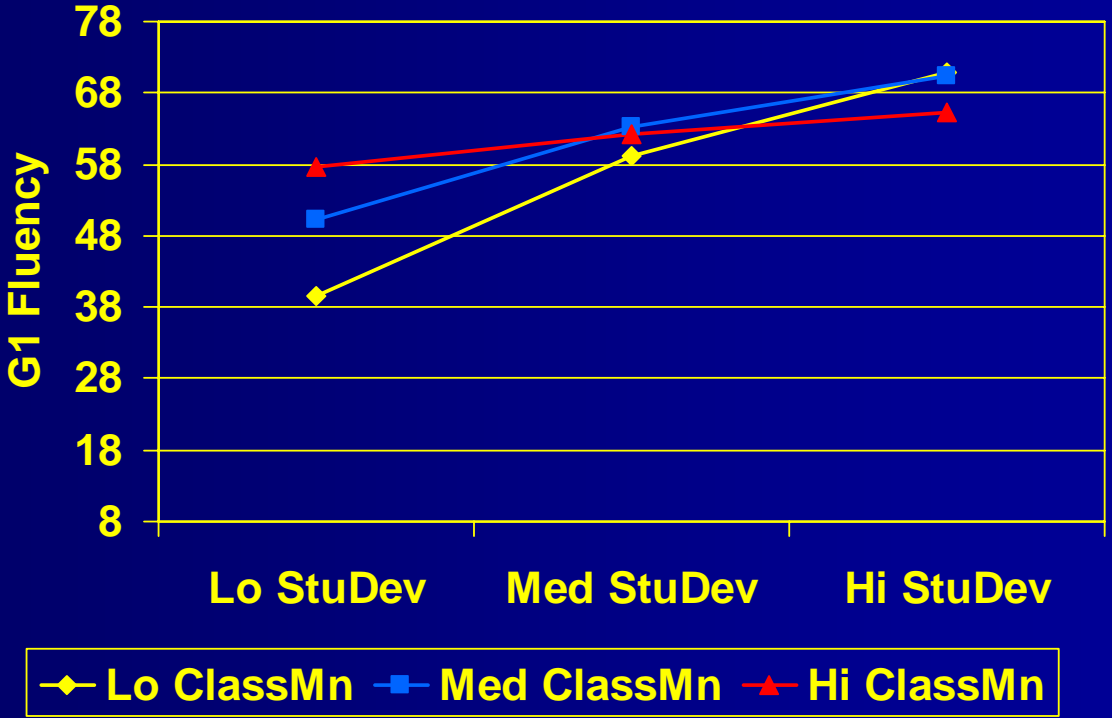
Predicting Grade 1 Fluency: ICCs

ICCs			
Parameter	Estimate	Std Error	ICC
Intercept School Level	52.0784	14.7197	0.107
Intercept Classroompair Level	50.0990	11.1395	0.103
Slope Classroompair Level	0.6390	0.3671	0.001

Tejas Lee Kinder Composite Predicting Grade 1 Fluency: Fixed Effects Results

Solution for Fixed Effects			
Parameter	Estimate	Std Error	Pr > |t|
intercept	36.3804	10.3020	0.0007
kinstudevclassmn	-5.7757	1.4257	<.0001
kinclassmn	0.7408	0.3166	0.0195
Kinstudevclassmn * kinclassmn	0.2588	0.0472	<.0001

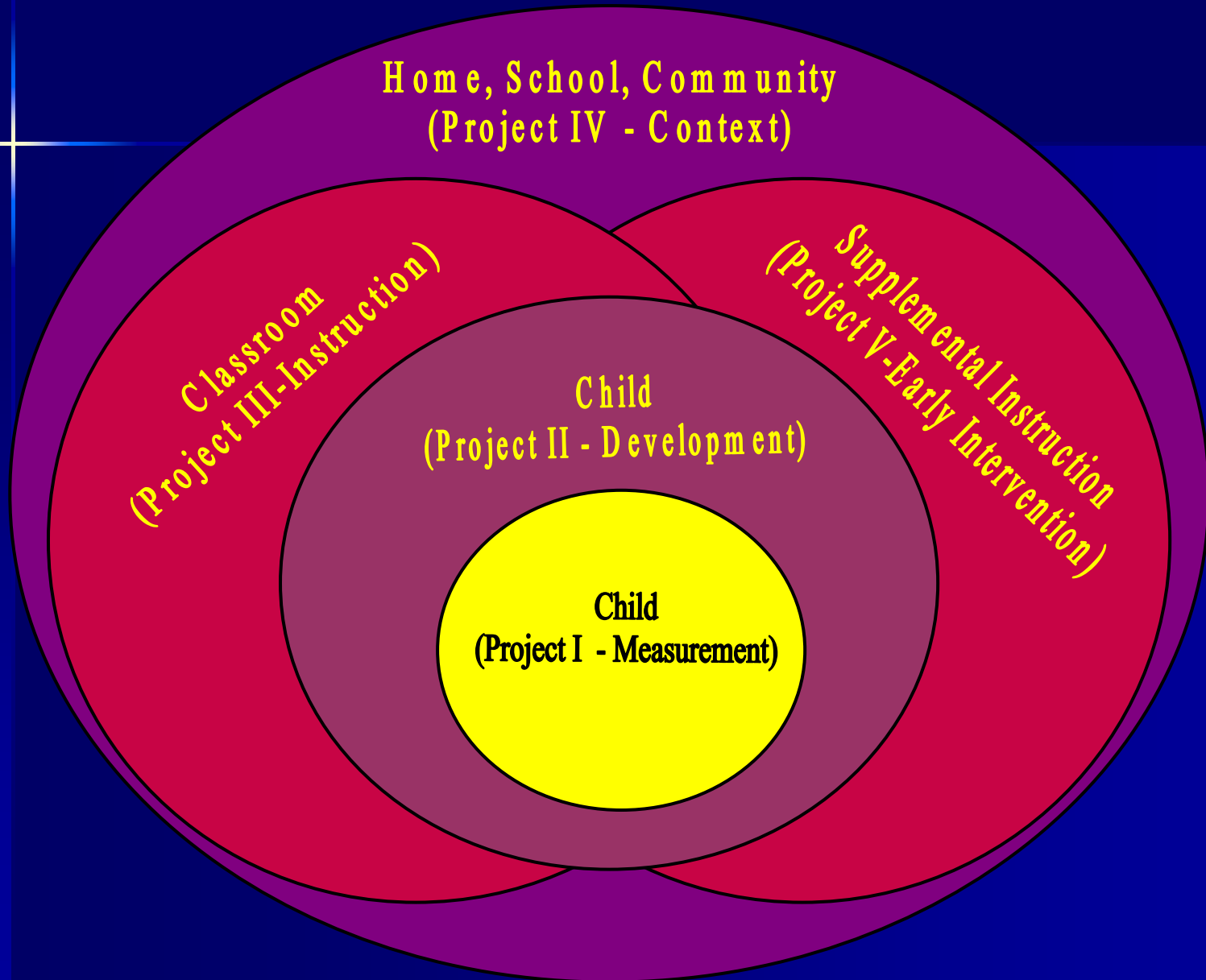
Tejas Lee Kinder Composite Predicting Grade 1 Fluency: Student Score X Class Mean Interaction



Tejas Lee Results: Summary

- Students low in word reading and fluency in kindergarten perform poorly at the end of Grade 1 in low performing classrooms
- The effect of classroom on Grade 1 word reading and fluency is not as apparent for high ability students taking the Tejas Lee as it is for high ability students taking the TPRI

Oracy/Literacy Development in Spanish-Speaking Children



Research Question

- Are there contextual effects in the impact of bilingual program models on beginning reading outcomes?
- Specifically, does bilingual program interact with locale in predicting reading comprehension gains in first grade?

Bilingual Program Models

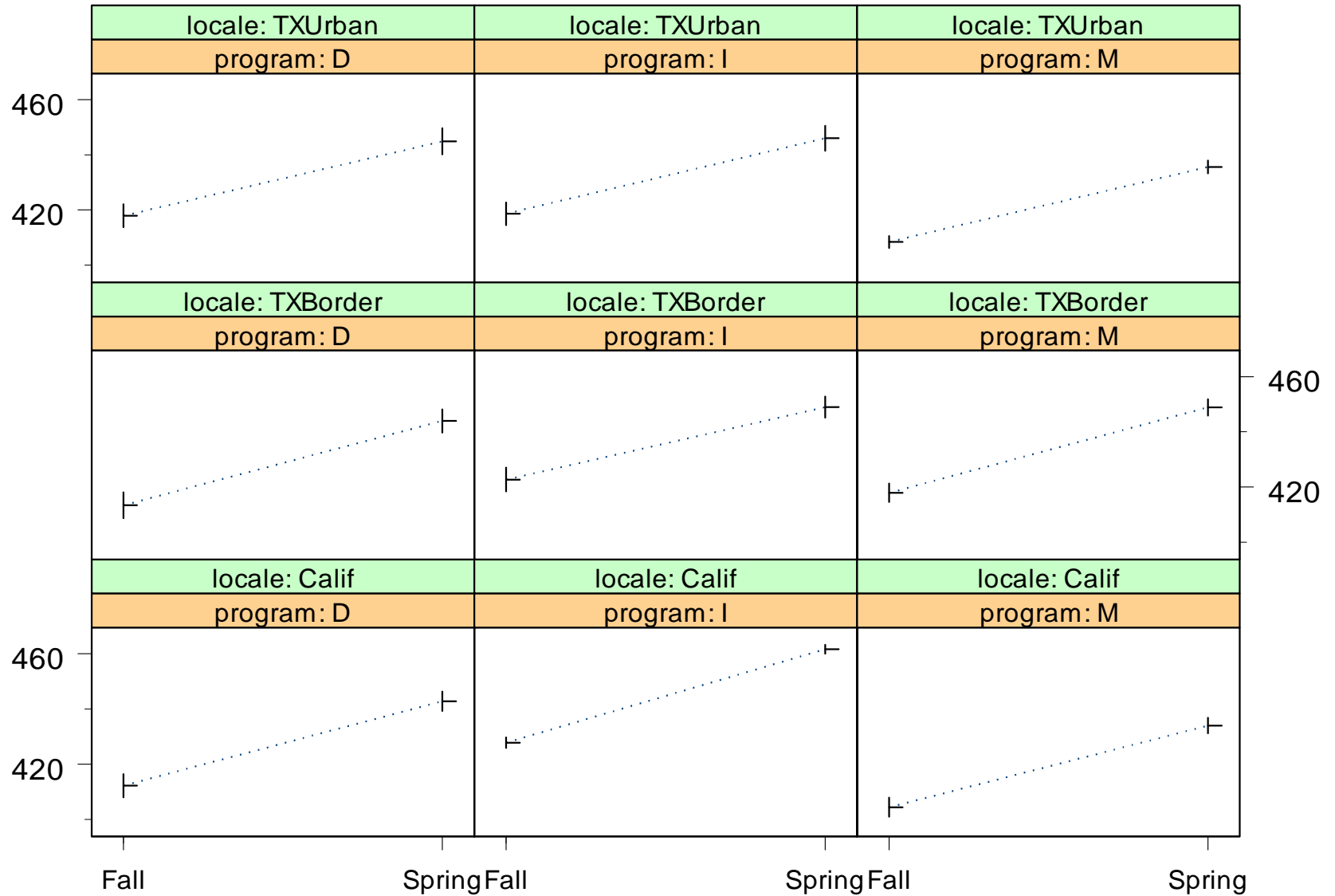
- Dual: Emphasis on dual-language instruction (primary & English)
- Immersion: Emphasis on English instruction
- Maintenance/Transition: Emphasis on maintaining primary language and transitioning to English

Bilingual Sample & Analysis

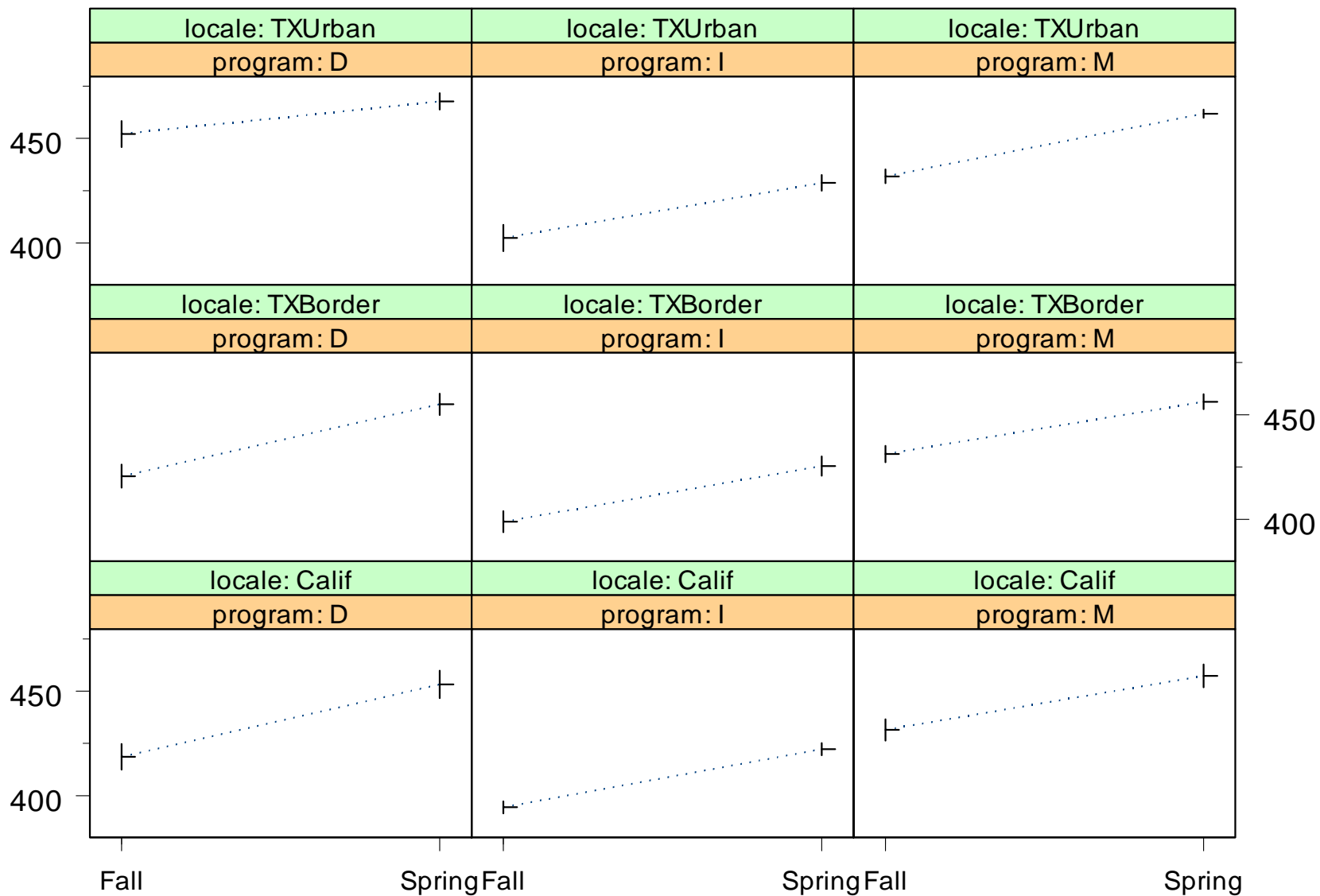
Locale	Students	Classroom Programs:	
		Dual, Immersion, Maint./Trans.	Total Classrooms
California	399	14, 40, 9	63
TX Border	507	34, 20, 19	73
TX Urban	481	26, 7, 7	40

- Maintenance includes Transitional programs
- Outcomes are WLPB-R, administered in Fall and Spring to students in first grade
- Models are random intercepts (students in classrooms), Spring predicted from Fall
 - tested locale vs. program vs. program-locale variance differences

English W score for WLPB-R Passage Comprehension Grade 1



Spanish W score for WLPB-R Passage Comprehension Grade 1



Random Effects: English Passage Comprehension

Time	Locale	Classroom Variance	SE	Student Variance	SE	ICC
Fall	California	89.8	29.3	405.5	28.8	0.18
	TX Border	222.8	62.3	733.1	48.2	0.23
	TX Urban	71.1	25.7	458.2	30.5	0.13
Spring	California	57.6	20.2	296.6	21.6	0.16
	TX Border	187.9	50.4	455.5	31.6	0.29
	TX Urban	91.6	32.0	430.8	29.9	0.18

Random Effects: Spanish Passage Comprehension

Time	Locale	Classroom Variance	SE	Student Variance	SE	ICC
Fall	California	222.4	56.2	659.8	46.2	0.25
	TX Border	286.5	80.9	1110.1	72.3	0.21
	TX Urban	182.9	59.5	850.0	56.1	0.18
Spring	California	289.0	78.8	527.9	39.3	0.35
	TX Border	283.5	78.1	614.3	43.2	0.32
	TX Urban	61.5	23.7	337.0	23.4	0.15

Fixed Effects1: English Passage Comprehension

<i>Effect</i>	<i>locale</i>	<i>Prog.</i>	<i>Est.</i>	<i>SE</i>	<i>df</i>	<i>t Value</i>	<i>Pr > |t|</i>
<i>Intercept</i> <i>(TX Urban M)</i>			441.46	1.76	170	250.8	<.0001
<i>pretest</i>			0.56	0.03	1174	21.0	<.0001
<i>class mean pretest</i>			0.12	0.05	1174	2.4	0.019
<i>student*class pretest</i>			0.00	0.00	1174	-1.9	0.056
<i>program</i>		D	3.06	3.81	1174	0.8	0.423
<i>program</i>		I	3.05	3.68	1174	0.8	0.408
<i>program</i>		M	0.00	.	.	.	.
<i>locale</i>	Calif		1.29	2.68	170	0.5	0.630
<i>locale</i>	TXBorder		5.34	2.60	170	2.1	0.041
<i>locale</i>	TXUrban		0.00	.	.	.	.

Fixed Effects2: English Passage Comprehension

<i>Effect</i>	<i>locale</i>	<i>Prog.</i>	<i>Est.</i>	<i>SE</i>	<i>df</i>	<i>t Value</i>	<i>Pr > |t|</i>
<i>locale*program</i>	Calif	D	1.47	5.03	1174	0.3	0.770
<i>locale*program</i>	Calif	I	8.89	4.40	1174	2.0	0.043
<i>locale*program</i>	TXBorder	D	-4.44	5.06	1174	-0.9	0.380
<i>locale*program</i>	TXBorder	I	-3.26	4.90	1174	-0.7	0.505
<i>pretest*program</i>		D	0.08	0.05	1174	1.5	0.135
<i>pretest*program</i>		I	-0.03	0.04	1174	-0.8	0.444

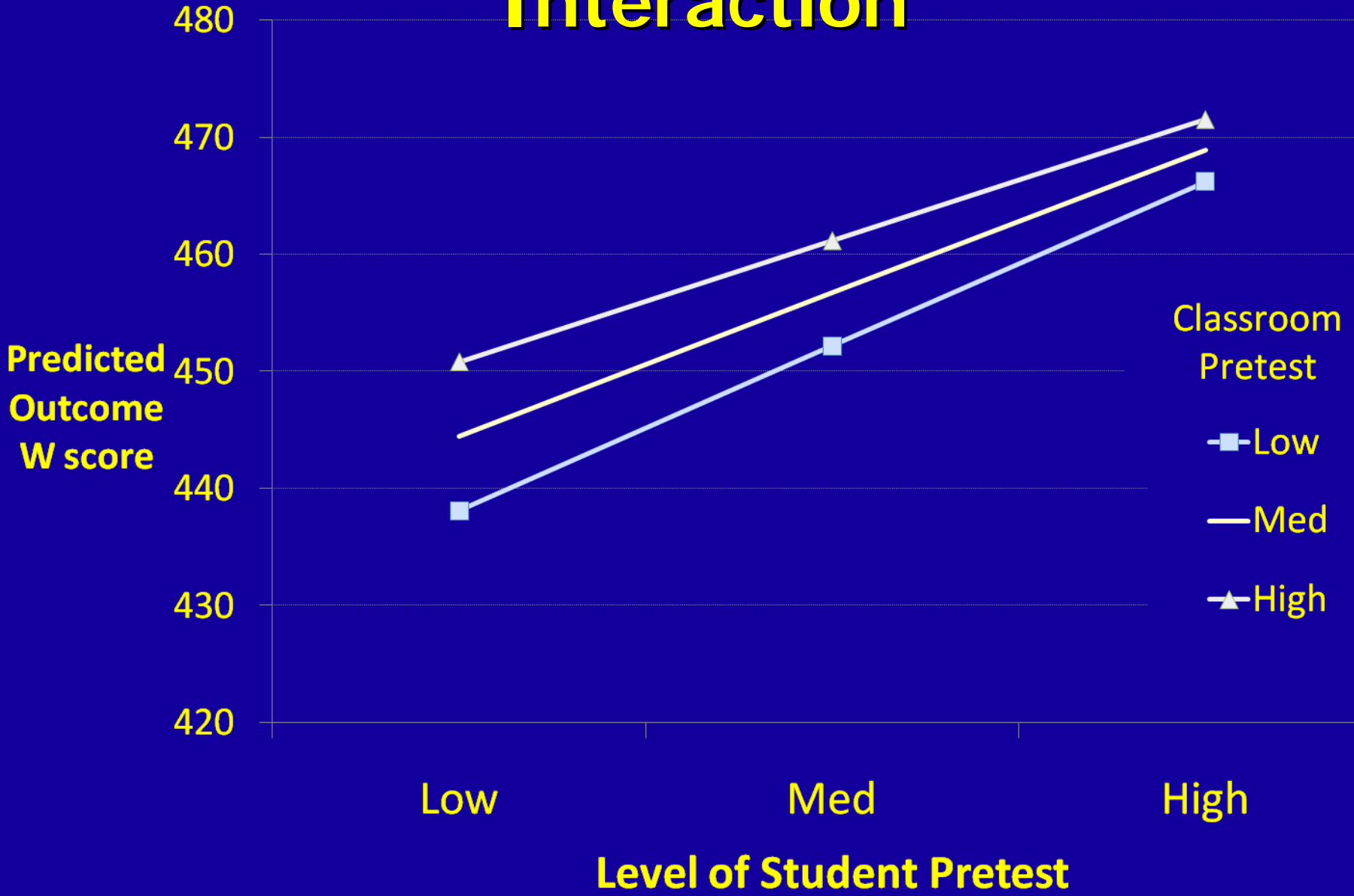
Fixed Effects1: Spanish Passage Comprehension

<i>Effect</i>	<i>locale</i>	<i>Prog.</i>	<i>Est.</i>	<i>SE</i>	<i>df</i>	<i>t Value</i>	<i>Pr > |t|</i>
<i>Intercept</i> <i>(TX Urban M)</i>			456.68	1.65	169	277.4	<.0001
<i>pretest</i>			0.33	0.03	1175	13.0	<.0001
<i>class mean pretest</i>			0.18	0.05	1175	3.6	0.000
<i>student*class pretest</i>			0.00	0.00	1175	-2.0	0.048
<i>program</i>		D	-3.78	3.80	1175	-1.0	0.319
<i>program</i>		I	-15.70	3.54	1175	-4.4	<.0001
<i>program</i>		M	0.00	.	.	.	.
<i>locale</i>	Calif		-1.13	3.66	169	-0.3	0.757
<i>locale</i>	TXBorder		-5.03	2.95	169	-1.7	0.090
<i>locale</i>	TXUrban		0.00	.	.	.	.

Fixed Effects2: Spanish Passage Comprehension

<i>Effect</i>	<i>locale</i>	<i>Prog.</i>	<i>Est.</i>	<i>SE</i>	<i>df</i>	<i>t Value</i>	<i>Pr > |t|</i>
<i>locale*program</i>	Calif	D	4.31	6.62	1175	0.7	0.516
<i>locale*program</i>	Calif	I	1.51	5.06	1175	0.3	0.765
<i>locale*program</i>	TXBorder	D	5.34	5.87	1175	0.9	0.363
<i>locale*program</i>	TXBorder	I	6.07	5.30	1175	1.1	0.253
<i>pretest*program</i>		D	0.03	0.05	1175	0.5	0.588
<i>pretest*program</i>		I	0.17	0.05	1175	3.5	0.001

Spanish Student-Classroom Pretest Interaction



Bilingual Conclusions, random effects

- Classrooms differ widely, and students within those classrooms differ, even after controlling for program & locale differences
- These differences suggest implementation, policy, and other contextual differences which cannot be ignored
- They also suggest more complex models to unpack the change of variances over time—e.g., convergence/divergence of classrooms and students about average performance

Bilingual Conclusions, fixed effects

- English: TX border scores higher. Programs quite close.
- Spanish: TX border scores lower. Immersion scores lower. Pretest knowledge is more important in Immersion.
- There are specific comparisons which remain to be tested, such as equivalence of pretest slopes.

Future Directions

- These models are complex: much remains to be tested
- Locale differences contain community and other differences which affect language performance and learning
- Test bilingual models of English & Spanish simultaneously to address “transfer” effects by locale & program

Thank
You

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