The Effects of Ability Grouping of Gifted Students on Gifted and Non-Gifted Achievement Growth

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Research Questions

1. What is the impact of within-class and between-class grouping of gifted students on the academic growth of gifted and non-gifted students?
2. Do the effects of ability grouping differ by socio-economic status, race/ethnicity, and English learner status?
3. Are these findings influenced by the opportunity to learn (e.g. academic curriculum) in gifted classes?

Overview of Data and Methods

Data: Administrative data 3rd grade students from the 2011 cohort in 3 states, tracked from 3rd-5th grade. And a survey of school gifted coordinators in these 3states.

Methods: 4-level growth curve models of Math and Reading achievement growth

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Why is grouping an important topic?

1. There has been an increase in ability grouping in the U.S. **For example, national surveys of teachers show an increase in ability grouping for reading instruction between 1998 to 2009, from 28% to 71%.** (Loveless 2013)

2. Regularly teachers, administrators and policy makers ask the following questions:
   - How to best organize the instruction of students with different abilities?
   - Should they use heterogeneous or homogeneous instructional groups?
   - Should they organize grouping between classes or within classes?

3. Contradictory empirical findings about the effects of grouping

4. Contradictory theoretical predictions about the effect of ability grouping

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Contradictory Research on the Effects of Grouping

Sociology or Education Literature

Extensive Literature on the negative effects of Tracking and Grouping (Slavin 1985, Oakes 2005).

- A negative effect of grouping for low ability students in low tracks, A positive effect of heterogeneous classes for low ability students
- Minimal or no negative effects for high ability students in heterogeneous classes

- Some find a positive effect of grouping for high ability students in Language Arts (Gamoran et al 1996)
- Some argue that an improvement in the technology of tracking can improve achievement and diminish the negative effects (Hallinan 2007)

Gifted Education Literature

- Meta-Analysis of 100 years of research that finds a positive effect of grouping overall and also a positive effect of grouping (Steenbergen-Hu, Makel, & Olszewski-Kubilius, 2016)
- Some quasi-experimental evidence of the effect of high quality gifted programs (Callahan et al. 2015), Reis et al. 2011), and Gavin et al. 2007; 2009).
- Recent contradictory quasi-experimental evidence that finds no effect of gifted education based on from a propensity score analysis of a nationally representative sample of elementary school students (ECLS) (Adelson et al. 2012).

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Contradictory Theories about Grouping Effects

Differential Opportunities to Learn: grouping arrangements influence the opportunities to learn (i.e. that difficulty and amount of the curriculum that a student is exposed to) that occur in instructional groups (Barr and Dreeben 1983). Grouping of gifted students into separate classes or instructional groups could lead to different rates of learning if gifted students are provided more opportunities to learn than non-gifted students

Peer Effects: High achieving peers could also improve achievement of other peers through positive pro-academic behavior, peer-instruction, and high academic expectations. With gifted grouping this could increase the achievement of gifted students and decrease the achievement of non-gifted students.

Academic Self-Concept and Labeling: Students grouped into gifted classes might have a higher academic self-concept and more positive labeling than students in low ability classes. However, if there are "big fish in small pond effects" then grouping might lead to lower achievement for gifted students and higher achievement for high-achieving and mid-achieving non-gifted students

Teaching Efficiency: Less variation in student ability might reduce the planning load through diminished need for differentiated instruction and might improve achievement for both high and low ability groups by letting teachers focus more on quality of lessons than breadth of lesson material

Zone of Proximal Development Grouping might lead increased alignment of instruction with a students zone of proximal development for both gifted and non-gifted students

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Theories of the Effects of Grouping on Students

Theory	Performance of High Ability Students in grouped classes vs. non-grouped classes	Performance of Low Ability Students in grouped classes vs. non-grouped classes
Differences in Opportunity to Learn	Increase	Decrease
Peer-Effects	Increase	Decrease
Academic Self Concept (if gifted grouping = positive label, and non-gifted = negative label)	Increase	Decrease
Academic Self Concept (if there is a big fish in small pond effect)	Decrease	Increase
Teacher Efficiency	Increase	Increase
Proximal Zone of Development	Increase	Increase

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Diversity of Elementary School Gifted Grouping in Practice

Homogeneous Grouping in Separate Classes: In some cases, gifted students are grouped together in classes that are separated from non-gifted students (i.e. homogeneous grouping). These classes provide gifted instruction all day every day during the week.

Pull-out instruction: In other cases, students are pulled out from their regular classes for instruction with other gifted students only a couple times a week (i.e. pull-out instruction).

Clustered instruction: Some schools provide gifted instruction by clustering gifted students together within regular classes. For example, cluster grouping in a school with three fourth grade classes and six gifted students could consist of grouping all six of the gifted students in fourth grade in one regular class and none would be placed in the other two classes.

Push-in Instruction: Last, schools might provide gifted in instruction by having a gifted education teacher visit a regular class and provide additional instruction within a class (i.e. push-in instruction)

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Diversity of Elementary School Gifted Grouping in Practice

Table 1: Intensity vs. Location of Ability Grouping

		Intensity	
		All week, all day	Less than all week (often only once or twice a week for only a couple hours)
Location	Within-Class	Cluster grouping *	Push-in instruction
	Between-Class	Homogeneous between class grouping	Pull-out instruction

* = Cluster grouping fits in this category if it is done administratively for classroom assignment. Some respondents might have viewed cluster grouping simply as within class differentiated instruction for ability groups.

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Which Theoretical Effects Would We Expect in Which Groups?

Theory	Homogeneous Grouping	Push In	Pull Out	Cluster Grouping
Differences in Opportunity to Learn	yes	maybe	Limited or negative	limited
Differential Peer-Effects	yes	limited	limited	limited
Academic Self Concept (if gifted grouping = positive label, and non-gifted = negative label)	yes	yes	yes	maybe
Academic Self Concept (if there is a big fish in small pond effect)	Yes (neg. effect for gifted)	Mixed	Mixed	Yes (pos. effect for gifted)
Teacher Efficiency	yes	yes	Yes	no
Proximal Zone of Development	yes	limited	limited	maybe

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Data

- Data from three states that mandate gifted identification and practices
- Longitudinal Student Level Administrative Data for all of the 2011-12 3rd grade cohort from three states. Longitudinal data from these students from 3rd, 4th, and 5th grades. Includes variables on identification as gifted, FRPL status, EL status, race ethnicity, and academic achievement for three academic years from 2011/12, 12/13, and 13/14.
- School and District Survey of all districts in three states conducted in 2014/15.

Table 1: *Sample Sizes after list wise deletion*

	State 1		**State 2**		**State 3**	
	Full Sample	Analytic Sample	Full Sample	Analytic Sample	Full Sample	Analytic Sample
Students	95,587	66,460	58,154	18,192	168,184	55,695
Schools	1,293	793	1025	298	2,235	637
Districts	115	97	180	83	73	53

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Data: Comparison of Demographic and SES Characteristics of Students and Schools within and outside of sample

	State 1		State 2		State 3	
	Analytic Sample	Not in Analytic Sample	Analytic Sample	Not in Analytic Sample	Analytic Sample	Not in Analytic Sample
Student Level						
% Free and Reduced Lunch	59%	64%	54%	50%	64%	69%
% English Learner	11%	13%	23%	21%	18%	20%
% Under- Represented Minority	39%	45%	43%	39%	50%	54%
School Level						
%Free and Reduced Lunch	59%	64%	54%	50%	64%	69%
% English Learner	13%	11%	23%	21%	18%	20%
% Under- Represented Minority	45%	40%	43%	39%	50%	54%
District Level						
% Free and Reduced Lunch	60%	62%	56%	49%	67%	67%
% English Learner	11%	12%	24%	20%	19%	19%
% Under- Represented Minority	40%	44%	44%	39%	53%	52%

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Data: Achievement growth of students within and outside of sample

	In Sample		Out of Sample	
	Intercept	Slope	Intercept	Slope
Math				
State 2	571.0 (0.5)	19.0 (0.5)	566.7 (2.9)	20.3 (0.4)
State 3	229.9 (0.7)	8.4 (0.1)	229.2 (0.6)	8.3 (0.1)
Reading				
State 1	450.0 (0.2)	5.0 (0.03)	450.0 (0.2)	5.0 (0.04)
State 2	634.7 (2.4)	22.1 (0.4)	631.1 (2.2)	21.8 (0.3)
State 3	228.9 (0.6)	9.2 (0.1)	228.2 (0.5)	9.2 (0.1)

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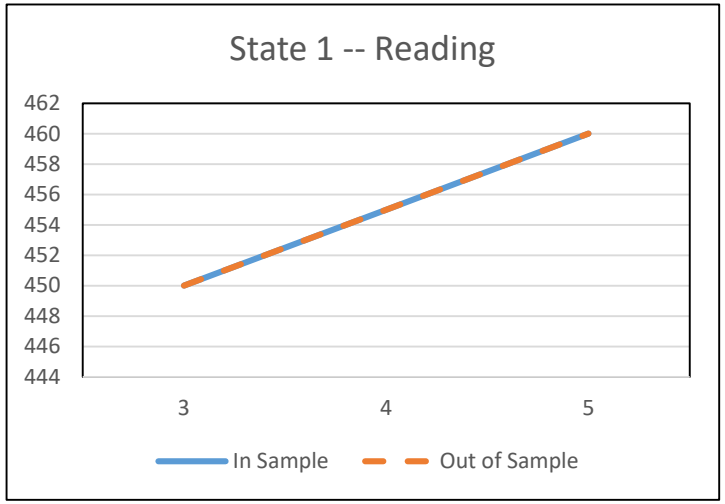
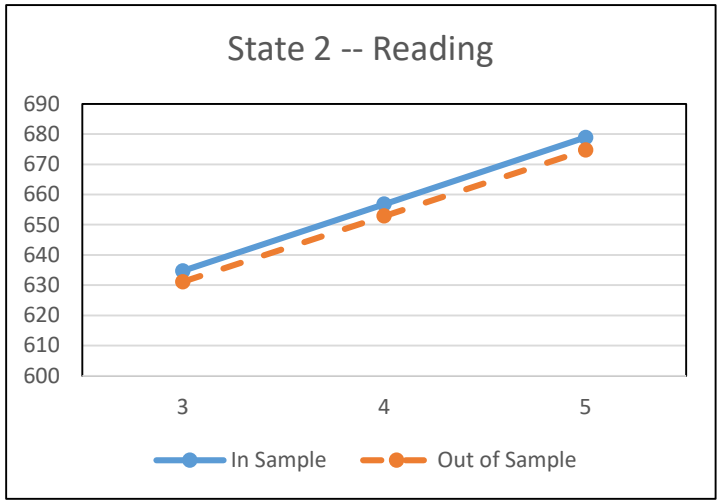
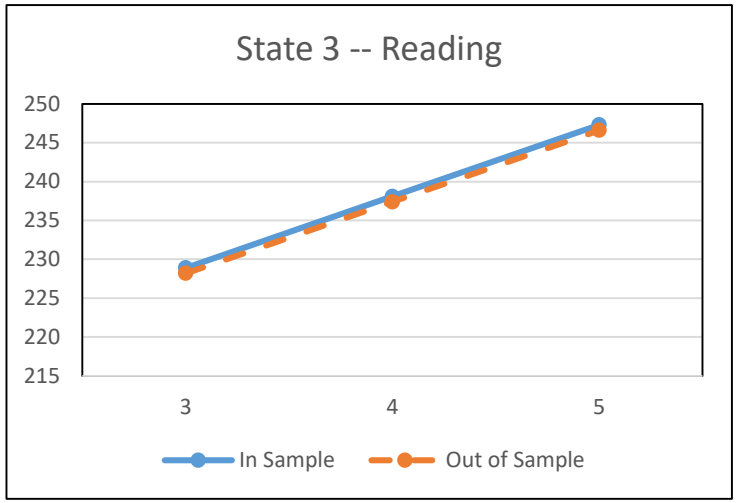
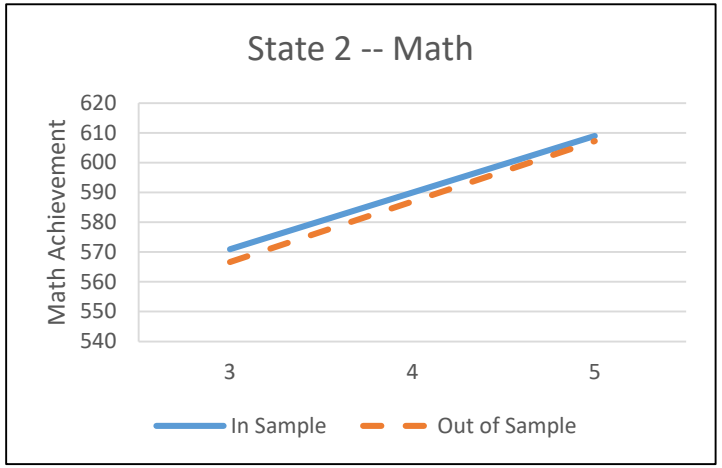
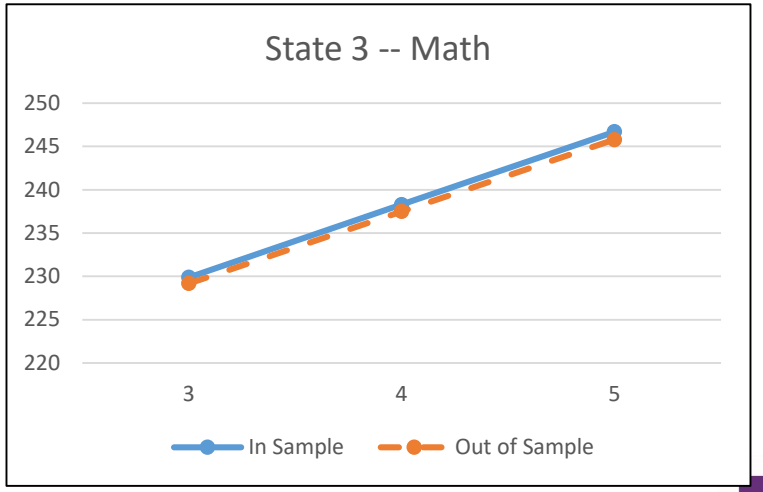
Data: Achievement growth of students within and outside of sample











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Data: Variables for level 1 and 2

Dependent Variable: Math or Reading Achievement

Independent Variables:

Level 1 Variables (Time Level)

- Time (3^{rd} = 0, 4^{th}=1, 5^{th}=2)

Level 2 Variables (Student Level; Group Centered) –

- Free or Reduced Price Lunch (FRPL) status any time from 3^{rd}-5th,
- English Language Learner (ELL) status any time from 3^{rd}-5th,
- Under identified racial/ethnic group (Latino, Black or Other (1) vs White or Asian (0)),

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Data: Variables for levels 3 and 4

Independent Variables:

- **Level 3 Variables (School Level)**
  - Grouping Variables
    - Homogeneous Grouping
    - Cluster grouping
    - Pull-out grouping
    - Push-in grouping
  - Controls (Group mean centered)
    - percent gifted
    - percent Black or Latino
    - percent EL
    - percent FRPL
  - Gifted Curriculum Variables
    - Existence of a gifted Math or Language Arts Curriculum
    - Does the gifted Math or Language Arts Curriculum teach above grade level content
    - Hours spent in gifted content classes
- **Level 4 Variables (District Level) – Controls (Grand mean centered)**
  - percent gifted
  - percent Black or Latino
  - percent EL
  - percent FRPL

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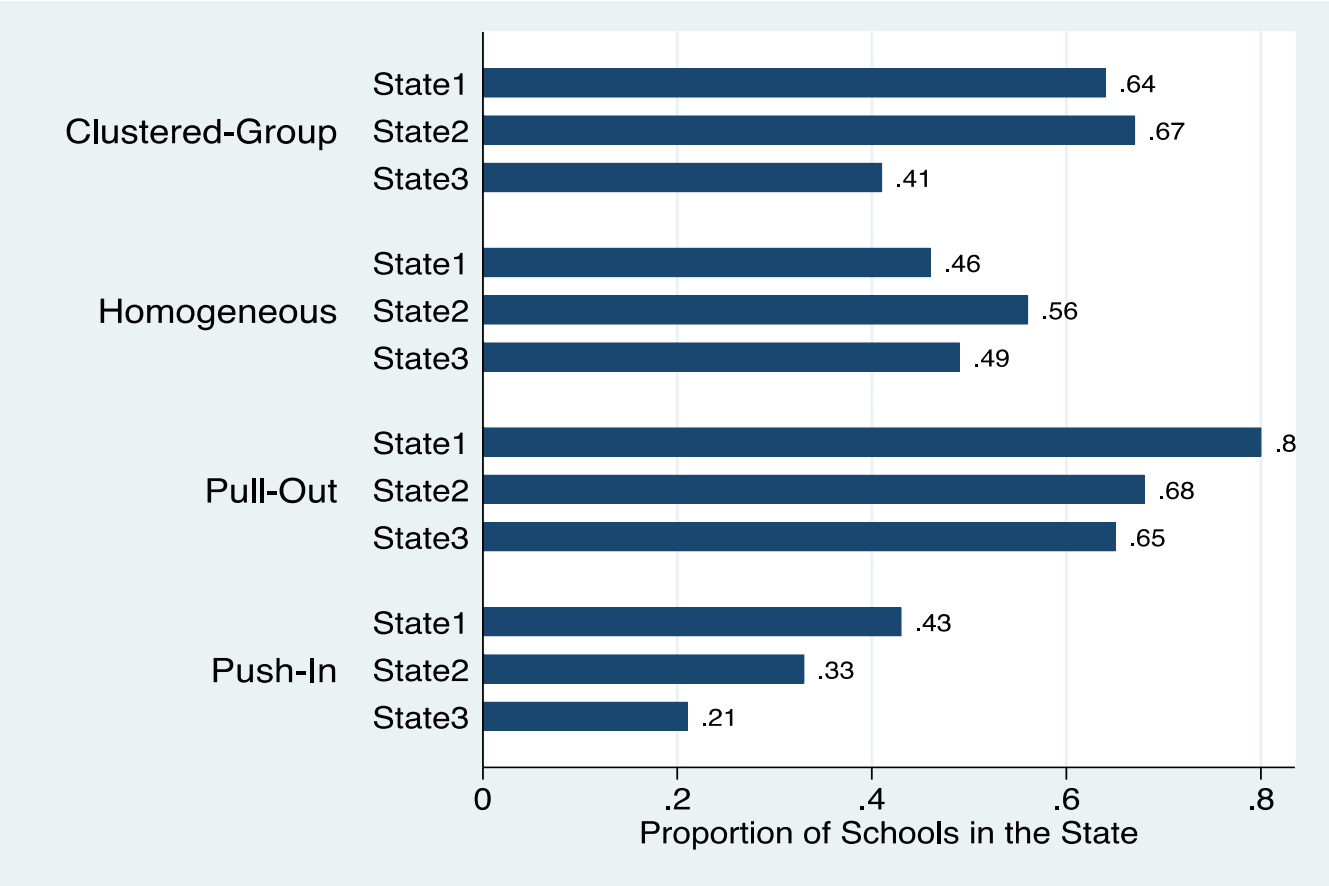
Descriptive Statistics: Types of Grouping

Figure 1: Proportion of School using Within and Between Grouping of Gifted Students



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Descriptive Statistics: Within and Between grouping in State 1 (in percent)

		Between-Grouping				
		no between grouping	homogeneous only	Pull-out only	homogeneous & pull-out	Total Within:
Within-Grouping	no within grouping	0.18	3.59	12.85	6.91	23.54
	Cluster only	3.58	5.40	13.10	11.13	33.44
	Push-in only	0.84	0.61	7.87	3.57	12.89
	cluster & push-in	3.00	2.96	12.12	12.27	30.35
	Total Between:	7.61	12.56	45.95	33.88	100

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Descriptive Statistics: Within and Between grouping in State 2 (in percent)

		Between-Grouping				
		no between grouping	homogeneous only	Pull-out only	homogeneous & pull-out	Total Within:
Within-Grouping	no within grouping	2.83	4.35	9.18	6.26	22.63
	Cluster only	9.05	10.73	8.77	14.84	43.39
	Push-in only	0.48	0.00	4.75	5.22	10.46
	cluster & push-in	3.34	2.39	6.16	11.64	23.53
	Total Between:	15.70	17.47	28.87	37.96	100

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Descriptive Statistics: Within and Between grouping in State 3 (in percent)

		Between-Grouping				
		no between grouping	homogeneous only	Pull-out only	homogeneous & pull-out	Total Within:
Within-Grouping	no within grouping	5.89	13.39	23.40	8.52	51.20
	Cluster only	4.47	6.38	6.99	8.84	26.68
	Push-in only	0.58	0.99	3.57	1.95	7.09
	cluster & push-in	3.86	2.96	1.93	6.27	15.03
	Total Between:	14.80	23.73	35.88	25.59	100

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Methods: Multi-Level Growth Curve Model

- Four Level Linear Multilevel Growth Curve Model
  - Level 1: Time
  - Level 2: Students
  - Level 3: School
  - Level 4: Districts

- Separate estimates for math and reading growth and for each state. Did not estimate growth in math for State 1 because the State 1 math test was not vertically aligned.

- Estimated 5 sets of models:
  1. State 1 reading
  2. State 2 reading
  3. State 3 reading
  4. State 2 Math
  5. State 3 Math

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Methods: Models

- Estimate 5 Models for Gifted and Non-Gifted Students Estimated Separately for Math and Reading and separately for each state

Model 1: Math or Reading = f(pull-out, homogenous groups, push-in, cluster groups)

Model 2: Math or Reading = f(pull-out, homogenous groups, push-in, cluster groups, race/EL/FRL)

Model 3: Math or Reading= f(pull-out, homogenous groups, push-in, cluster groups, race/EL/FRL, race/%EL/%FRL at the school and district levels)

Model 4: Math or Reading= f(pull-out, homogenous groups, push-in, cluster groups, pull-out by race/EL/FRL, homogenous groups by race/EL/FRL, push-in by race/EL/FRL, cluster groups by race/EL/FRL, race/EL/FRL, race/%EL/%FRL at the school and district levels)

Model 5: Model 2 + Curriculum Variables (the existence of a math or language arts curriculum, the use of above grade level content in the gifted curriculum, and hours per week of the gifted curriculum)

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Growth Curve Models: Fit Statistics for Gifted Academic Growth Models

Model Fit Statistics

	State 1	State 2		State 3	
	Reading	Math	Reading	Math	Reading
Gifted Students					
Model 1: Only Grouping	213043.5	67373.25	63613.81	154668.2	154668.2
Model 2: Model 1 + Student Dem. & SES	212409.5	67194.49	63416.18	154507.7	154507.7
Model 3: Model 3 + District & School Dem. & SES	212445.1	67223.78	63486.58	154583.6	154583.6
Model 4: Model 3 & Interactions	212679.1	67400.64	63650.93	154789.5	154789.5

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Growth Curve Models: Fit Statistics for Non-Gifted Academic Growth Models

Model Fit Statistics

	State 1	State 2		State 3	
	Reading	Math	Reading	Math	Reading
Non-Gifted Students					
Model 1: Only Grouping	965388.5	462686.6	458849.4	1157258	1157258
Model 2: Model 1 + Student Dem. & SES	959742.8	460596.4	457757.6	1153690	1153690
Model 3: Model 3 + District & School Dem. & SES	959500.8	460289.3	457662.8	1153481	1153481
Model 4: Model 3 & Interactions	959743	460494.6	457868.5	1153700	1153700

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Growth Curve Models: Intercept and Slope for Model 2 for Gifted Students

Growth Curve Models for Gifted Students

	Math		Reading		
	State 2	State 3	State 1	State 2	State 3
Intercept	583.67***	232.23***	451.06***	645.72***	231.57***
By pull-out	-2.48	0.24	-.022	4.05	-0.19
By Homogeneous Grouping	6.73*	-0.14	0.06	-0.60	-0.22
By push-in	0.16	-0.08	-0.07	-2.39	-0.27
By cluster grouping	-0.72	0.09	0.00	-3.90	-0.09
Slope	17.68***	8.55***	4.84***	18.38***	9.09***
By pull-out	1.61	-0.24	0.27***	1.02	-0.08
By Homogeneous Grouping	-2.87***	0.02	0.14**	0.15	0.46*
By push-in	-1.04	0.07	0.05	0.94	-0.09
By cluster grouping	-0.17	-0.16	-0.10	1.47	-0.17

* = p-value<.05, **=p-value<.01, ***=p-value<.001; Negative Statistically Significant Coefficients with a p-value>.01 are highlighted yellow; Positive Statistically Significant Coefficients with a p-value>.01 are highlighted green; These models control for student level measures of FRPL, EL status, and race/ethnicity at the intercept and slope

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Growth Curve Models: Intercept and Slope for Model 2 for Non-Gifted Students

Growth Curve Models for Non-Gifted Students

	Math		Reading		
	State 2	State 3	State 1	State 2	State 3
Intercept	476.20***	211.72***	441.72***	537.72***	210.68***
By pull-out	6.24	-0.95	-0.40	4.84	-1.10*
By Homogeneous Grouping	6.09*	0.65	-0.08	0.25	0.65
By push-in	-3.86	-0.02	0.15	-2.98	0.37
By cluster grouping	3.98	-0.83	-0.10	2.02	-0.65
Slope	25.30***	9.60***	5.00***	23.26***	9.39***
By pull-out	-0.23	-0.07	0.10***	1.42***	-0.33***
By Homogeneous Grouping	-1.62***	-0.10	0.17***	0.75*	0.08
By push-in	1.03***	.004	0.06*	0.66	-0.16*
By cluster grouping	-1.35***	-0.21**	0.03	0.10	0.00

* = p-value<.05, **=p-value<.01, ***=p-value<.001; Negative Statistically Significant Coefficients with a p-value>.01 are highlighted yellow; Positive Statistically Significant Coefficients with a p-value>.01 are highlighted green; These models control for student level measures of FRPL, EL status, and race/ethnicity at the intercept and slope

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Growth Curve Models for Gifted and Non-Gifted Students

Growth Curve Models for Gifted Students

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By push-in	0.16	-0.08	-0.07	-2.39	-0.27
By cluster grouping	-0.72	0.09	0.00	-3.90	-0.09
Slope	17.68***	8.55***	4.84***	18.38***	9.09***
By pull-out	1.61	-0.24	0.27***	1.02	-0.08
By Homogeneous Grouping	-2.87***	0.02	0.14**	0.15	0.46*
By push-in	-1.04	0.07	0.05	0.94	-0.09
By cluster grouping	-0.17	-0.16	-0.10	1.47	-0.17

Growth Curve Models for Non-Gifted Students

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By pull-out	-0.23	-0.07	0.10***	1.42***	-0.33***
By Homogeneous Grouping	-1.62***	-0.10	0.17***	0.75*	0.08
By push-in	1.03***	.004	0.06*	0.66	-0.16*
By cluster grouping	-1.35***	-0.21**	0.03	0.10	0.00

* = p-value<.05, **=p-value<.01, ***=p-value<.001; Negative Statistically Significant Coefficients with a p-value>.01 are highlighted yellow; Positive Statistically Significant Coefficients with a p-value>.01 are highlighted green; These models control for student level measures of FRPL, EL status, and race/ethnicity at the intercept and slope

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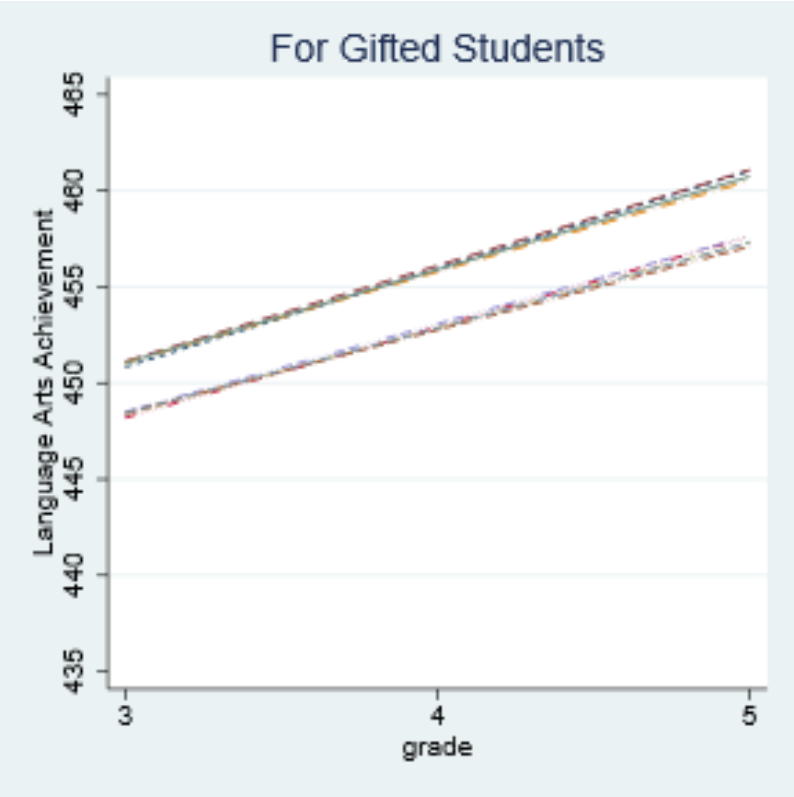
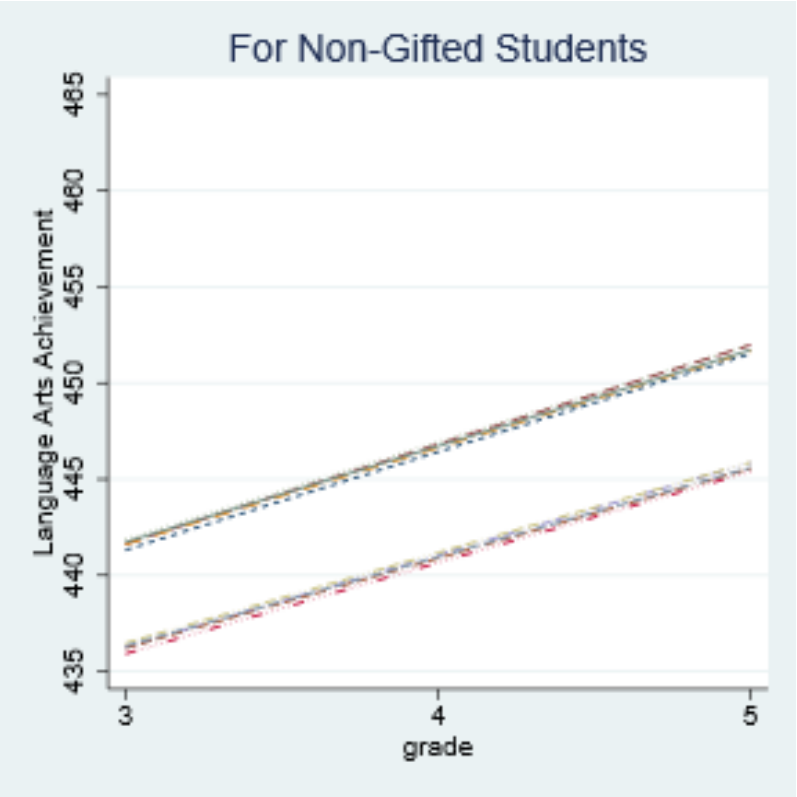
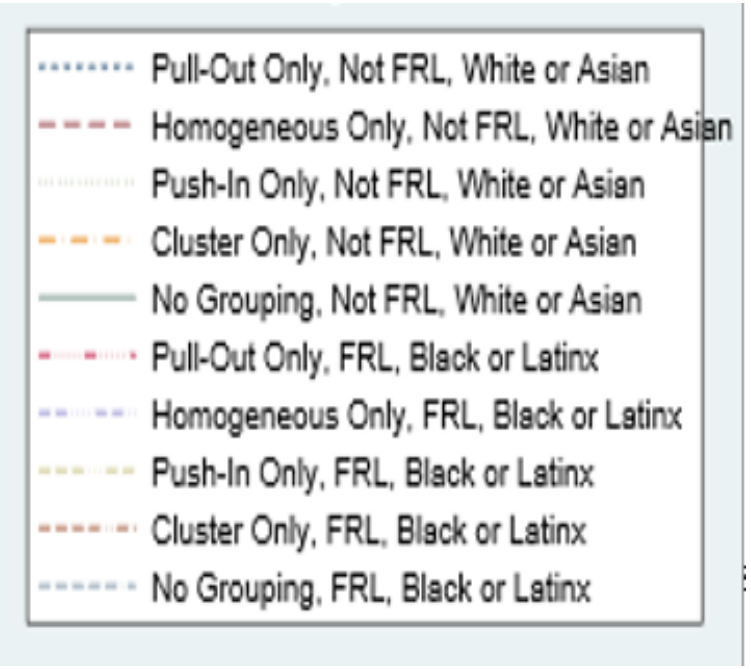
Predicted Growth Models for Reading in State 1







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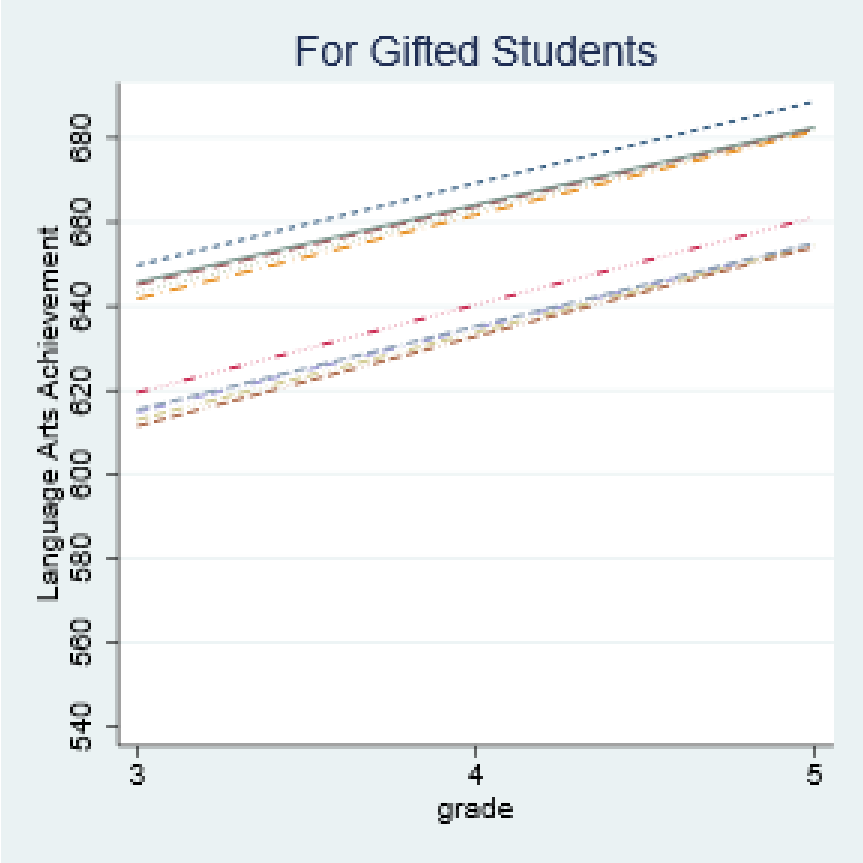
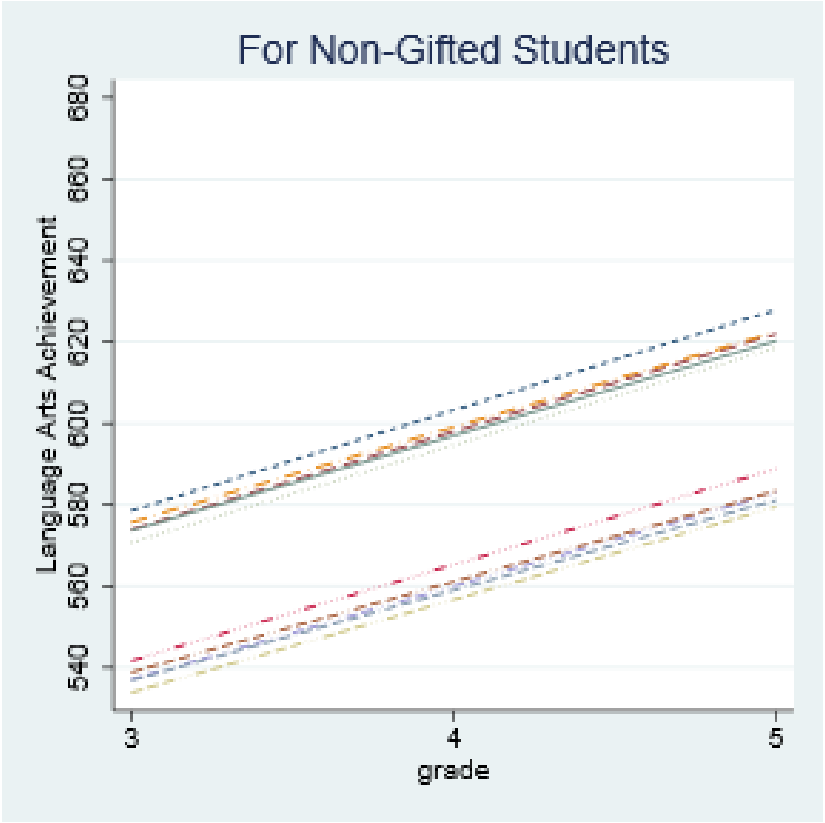
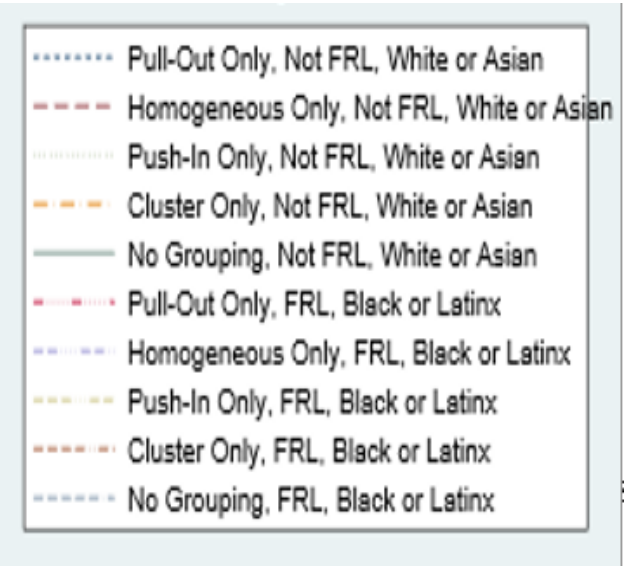
Predicted Growth Models for Reading in State 2







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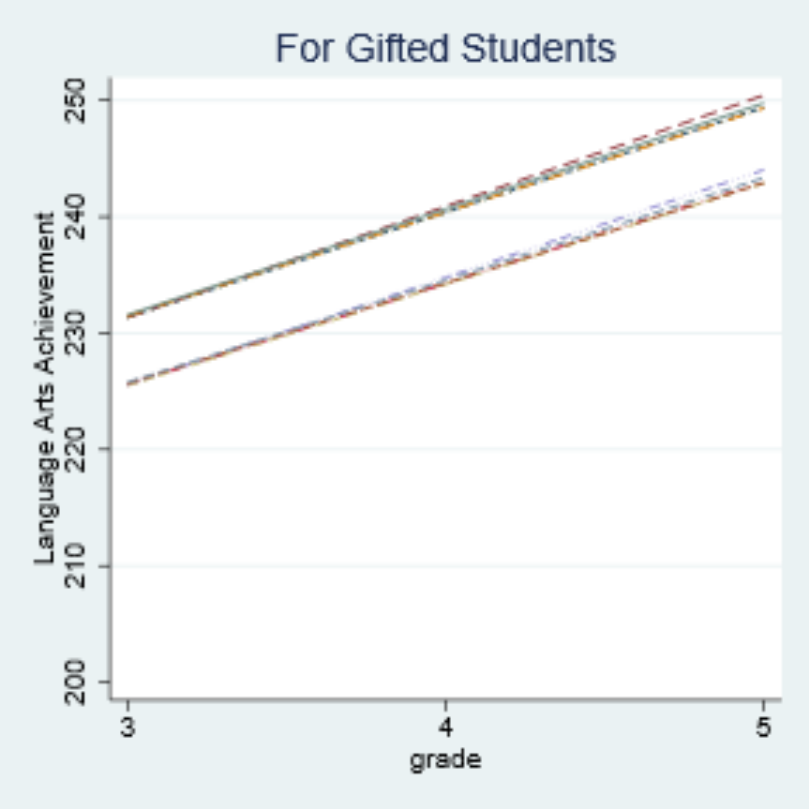
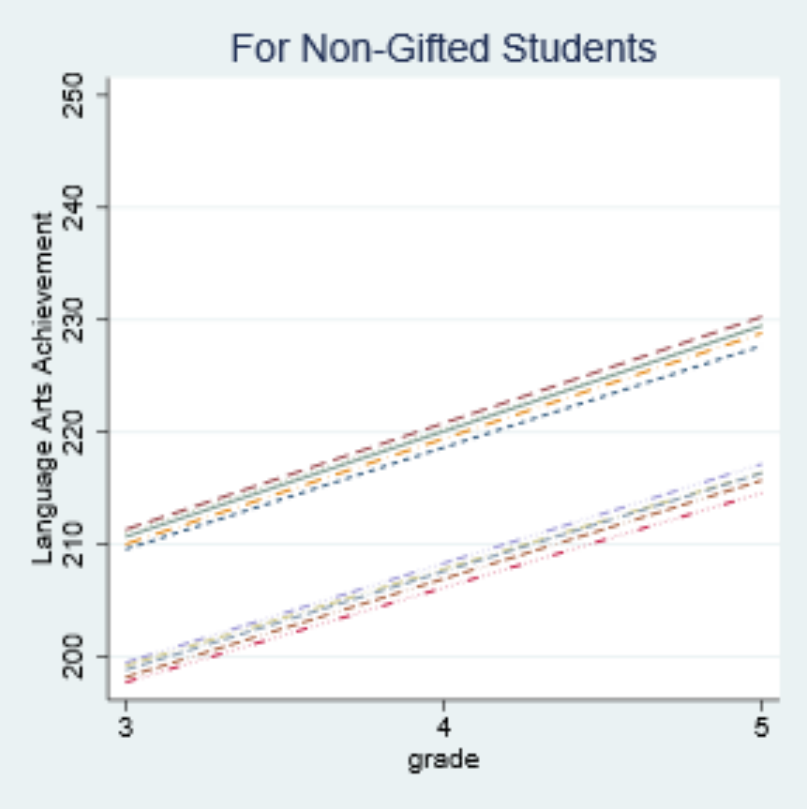
Predicted Growth Models for Reading in State 3





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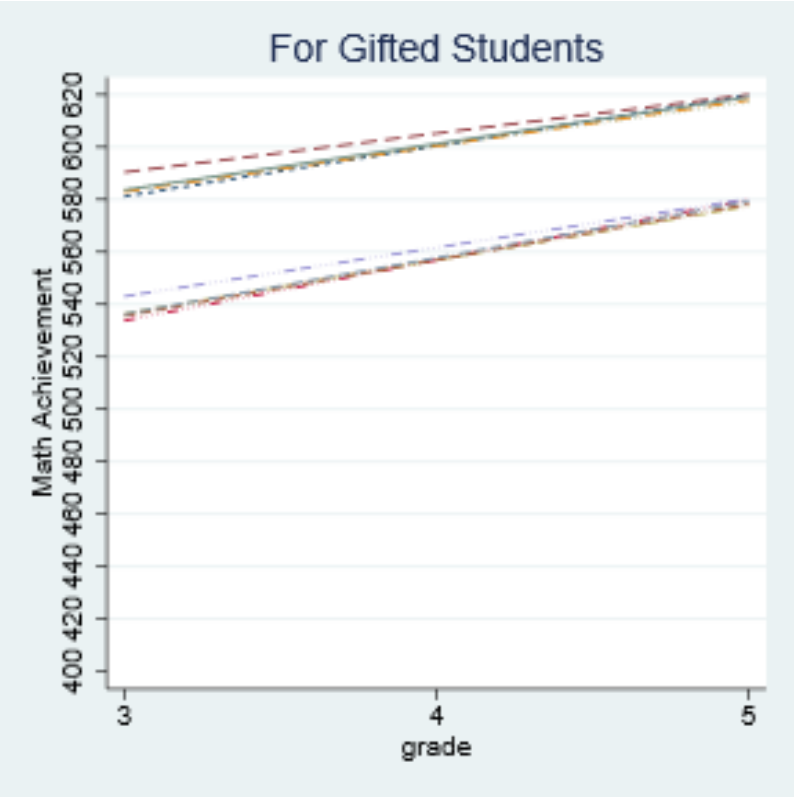
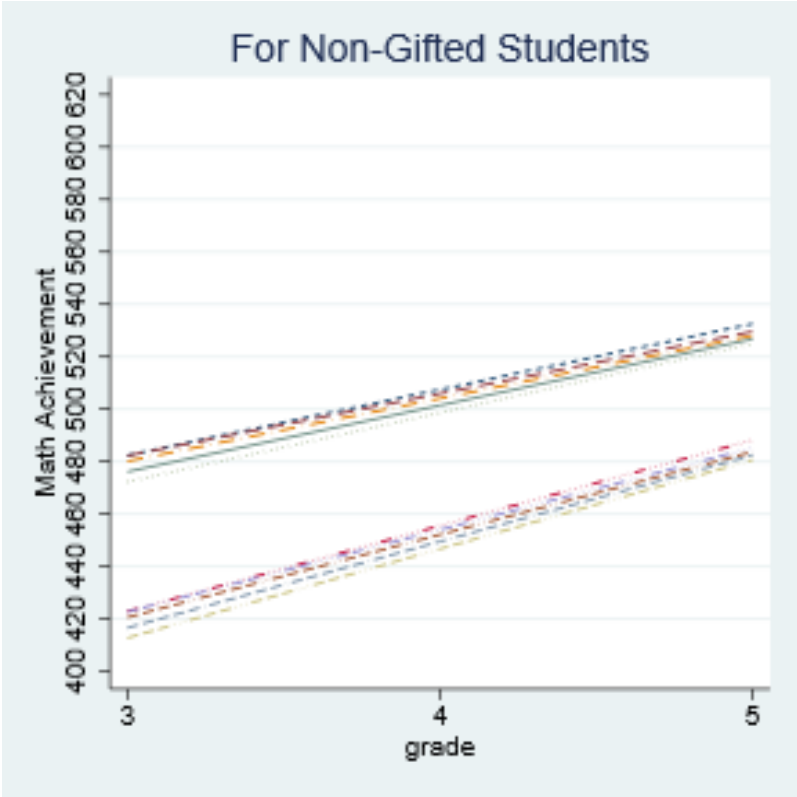
Predicted Growth Models for Math in State 2





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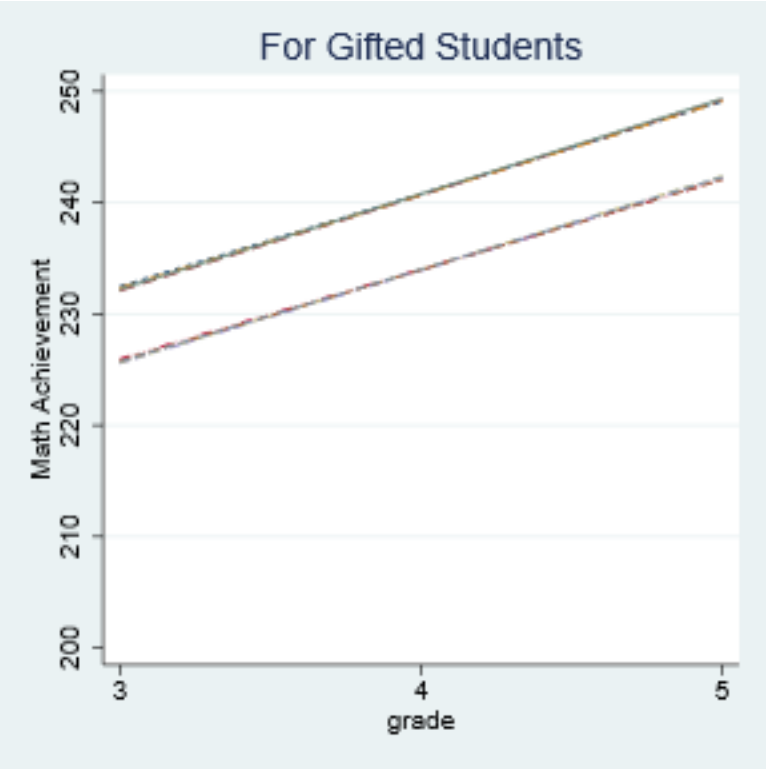
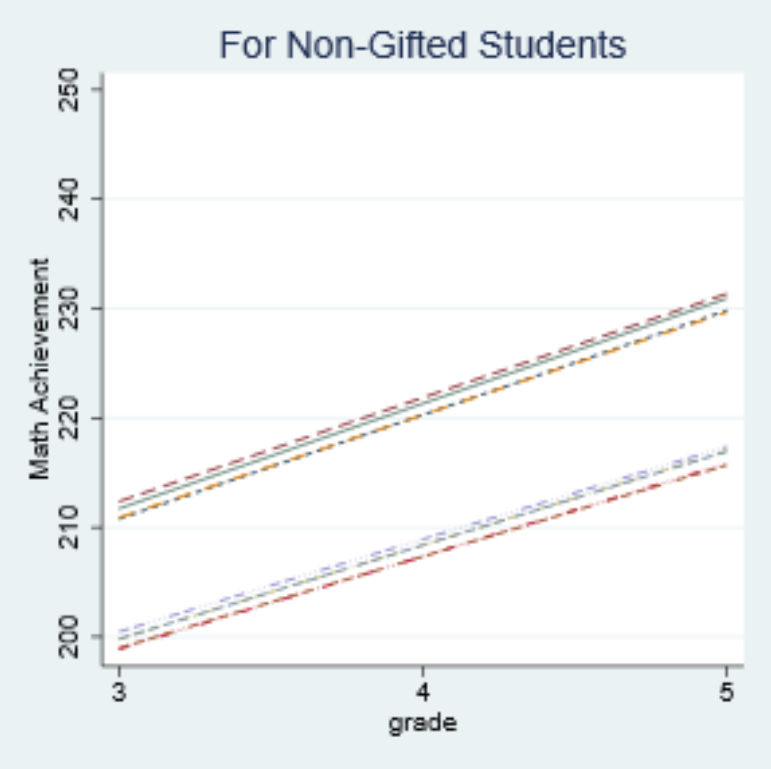
Predicted Growth Models for Math in State 3





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Could the small cell size of schools with no-grouping influence our findings?

- 0.18% of schools in state 1 report no gifted grouping?
- 2.83% of schools in state 2 report no gifted grouping?
- 5.89% of schools in state 3 report no gifted grouping?

Do the results change when we use a reverse coding of the gifted variables?

We repeat out analysis with a reverse coding of the grouping variables from Yes =1 and no = 0 to no =1 and yes=0

Our findings do not change with reverse coding

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Growth Curve Models Gifted Students: Standard and reverse coded grouping variables

Standard Coding: Grouping coded as yes=1 and no = 0

	Math		Reading		
	State 2	State 3	State 1	State 2	State 3
Intercept	583.67***	232.23***	451.06***	645.72***	231.57***
By pull-out	-2.48	0.24	-.022	4.05	-0.19
By Homogeneous Grouping	6.73*	-0.14	0.06	-0.60	-0.22
By push-in	0.16	-0.08	-0.07	-2.39	-0.27
By cluster grouping	-0.72	0.09	0.00	-3.90	-0.09
Slope	17.68***	8.55***	4.84***	18.38***	9.09***
By pull-out	1.61	-0.24	0.27***	1.02	-0.08
By Homogeneous Grouping	-2.87***	0.02	0.14**	0.15	0.46*
By push-in	-1.04	0.07	0.05	0.94	-0.09
By cluster grouping	-0.17	-0.16	-0.10	1.47	-0.17

Reverse Coding: Grouping coded as yes=0 and no = 1

	Math		Reading		
	State 2	State 3	State 1	State 2	State 3
Intercept	587.36***	232.34***	450.83***	642.88***	230.79***
By pull-out	2.48	-0.24	0.22	-4.05	0.19
By Homogeneous Grouping	-6.73*	0.14	-0.06	0.60	0.22
By push-in	-0.16	0.08	0.07	2.39	0.27
By cluster grouping	0.72	-0.09	0.00	3.90	0.09
Slope	18.22***	8.25***	5.20***	21.97***	9.21***
By pull-out	-1.61	0.24	-0.27***	-1.02	0.08
By Homogeneous Grouping	2.87***	-0.02	-0.14**	-0.15	-0.46*
By push-in	1.04	-0.07	-0.05	-0.94	0.09
By cluster grouping	0.17	0.16	0.10	-1.47	0.17

* = p-value<.05, **=p-value<.01, ***=p-value<.001; Negative Statistically Significant Coefficients with a p-value>.01 are highlighted yellow; Positive Statistically Significant Coefficients with a p-value>.01 are highlighted green; These models control for student level measures of FRPL, EL status, and race/ethnicity at the intercept and slope

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Growth Curve Models Non-Gifted Students : Standard and reverse coded grouping variables

Standard Coding: Grouping coded as yes=1 and no = 0

	Math		Reading		
	State 2	State 3	State 1	State 2	State 3
Intercept	476.20***	211.72***	441.72***	537.72***	210.68***
By pull-out	6.24	-0.95	-0.40	4.84	-1.10*
By Homogeneous Grouping	6.09*	0.65	-0.08	0.25	0.65
By push-in	-3.86	-0.02	0.15	-2.98	0.37
By cluster grouping	3.98	-0.83	-0.10	2.02	-0.65
Slope	25.30***	9.60***	5.00***	23.26***	9.39***
By pull-out	-0.23	-0.07	0.10***	1.42***	-0.33***
By Homogeneous Grouping	-1.62***	-0.10	0.17***	0.75*	0.08
By push-in	1.03***	.004	0.06*	0.66	-0.16*
By cluster grouping	-1.35***	-0.21**	0.03	0.10	0.00

Reverse Coding: Grouping coded as yes=0 and no = 1

	Math		Reading		
	State 2	State 3	State 1	State 2	State 3
Intercept	488.64***	210.75***	441.29***	577.85***	209.95***
By pull-out	-6.24	0.95	0.40	-4.84	1.10*
By Homogeneous Grouping	-6.09*	-0.65	0.08	-0.25	-0.65
By push-in	-3.86	0.02	-0.15	2.98	-0.37
By cluster grouping	-3.98	0.83	0.10	-2.02	-0.65
Slope	23.13***	9.25***	5.36***	26.19***	8.99***
By pull-out	-0.23	0.07	-0.10***	-1.42**	0.33***
By Homogeneous Grouping	-1.62***	0.10	-0.17***	-0.75*	-0.08
By push-in	-1.03***	-.04	-0.06*	-0.66	0.16*
By cluster grouping	1.35***	0.21**	-0.03	-0.10	0.00

* = p-value<.05, **=p-value<.01, ***=p-value<.001; Negative Statistically Significant Coefficients with a p-value>.01 are highlighted yellow; Positive Statistically Significant Coefficients with a p-value>.01 are highlighted green; These models control for student level measures of FRPL, EL status, and race/ethnicity at the intercept and slope

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Could the academic curriculum in gifted classes influence the effects of grouping?

We replicate these models with three controls for curriculum:

- Existence of a gifted Math or Language Arts Curriculum
- Does the gifted Math or Language Arts Curriculum teach above grade level content
- Hours spent in gifted content classes

We find the same effect of grouping in models with and without curriculum variables.

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Growth Curve Models: Fit Statistics for Gifted Academic Growth Models

Model Fit Statistics

	State 1	State 2		State 3	
	Reading	Math	Reading	Math	Reading
Gifted Students					
Model 1: Only Grouping	213043.5	67373.25	63613.81	154668.2	154668.2
Model 2: Model 1 + Student Dem. & SES	212409.5	67194.49	63416.18	154507.7	154507.7
Model 3: Model 3 + District & School Dem. & SES	212445.1	67223.78	63486.58	154583.6	154583.6
Model 4: Model 3 & Interactions	212679.1	67400.64	63650.93	154789.5	154789.5
Model 2 + Curriculum Variables	206053.3	66722.57	60813.49	151186.7	149363.8

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Growth Curve Models: Fit Statistics for Non-Gifted Academic Growth Models

Model Fit Statistics

	State 1	State 2		State 3	
	Reading	Math	Reading	Math	Reading
Non-Gifted Students					
Model 1: Only Grouping	965388.5	462686.6	458849.4	1157258	1157258
Model 2: Model 1 + Student Dem. & SES	959742.8	460596.4	457757.6	1153690	1153690
Model 3: Model 3 + District & School Dem. & SES	959500.8	460289.3	457662.8	1153481	1153481
Model 4: Model 3 & Interactions	959743	460494.6	457868.5	1153700	1153700
Model 5: Model 2 + Curriculum Variables	936754.8	452522.2	447597.8	1128071	1108629

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Growth Curve Models for Gifted Students

Models with no controls for gifted curriculum

	Math		Reading		
	State 2	State 3	State 1	State 2	State 3
Intercept	583.67***	232.23***	451.06***	645.72***	231.57***
By pull-out	-2.48	0.24	-.022	4.05	-0.19
By Homogeneous Grouping	6.73*	-0.14	0.06	-0.60	-0.22
By push-in	0.16	-0.08	-0.07	-2.39	-0.27
By cluster grouping	-0.72	0.09	0.00	-3.90	-0.09
Slope	17.68***	8.55***	4.84***	18.38***	9.09***
By pull-out	1.61	-0.24	0.27***	1.02	-0.08
By Homogeneous Grouping	-2.87***	0.02	0.14**	0.15	0.46*
By push-in	-1.04	0.07	0.05	0.94	-0.09
By cluster grouping	-0.17	-0.16	-0.10	1.47	-0.17

Models with controls for gifted curriculum

	Math		Reading		
	State 2	State 3	State 1	State 2	State 3
Intercept	581.18***	231.85***	451.08***	643.53***	231.37***
By pull-out	-3.20	0.45	-.24	4.30	-0.01
By Homogeneous Grouping	6.60*	-0.12	0.05	-1.78	-0.07
By push-in	1.53	-0.10	-0.09	-1.95	-0.24
By cluster grouping	0.65	0.30	0.01	-2.84	-0.01
Slope	18.15***	8.53***	4.87***	19.02***	9.14***
By pull-out	2.19	-0.18	0.27***	0.67	-0.16
By Homogeneous Grouping	-2.63***	0.02	0.15**	0.47	0.46*
By push-in	-1.53	0.09	0.05	0.55	-0.21
By cluster grouping	-0.80	-0.14	-0.11	0.93	-0.11

* = p-value<.05, **=p-value<.01, ***=p-value<.001; Negative Statistically Significant Coefficients with a p-value>.01 are highlighted yellow; Positive Statistically Significant Coefficients with a p-value>.01 are highlighted green; These models control for student level measures of FRPL, EL status, and race/ethnicity at the intercept and slope

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Growth Curve Models for Non-Gifted Students

Models with no controls for gifted curriculum

	Math		Reading		
	State 2	State 3	State 1	State 2	State 3
Intercept	476.20***	211.72***	441.72***	537.72***	210.68***
By pull-out	6.24	-0.95	-0.40	4.84	-1.10*
By Homogeneous Grouping	6.09*	0.65	-0.08	0.25	0.65
By push-in	-3.86	-0.02	0.15	-2.98	0.37
By cluster grouping	3.98	-0.83	-0.10	2.02	-0.65
Slope	25.30***	9.60***	5.00***	23.26***	9.39***
By pull-out	-0.23	-0.07	0.10***	1.42***	-0.33***
By Homogeneous Grouping	-1.62***	-0.10	0.17***	0.75*	0.08
By push-in	1.03***	.004	0.06*	0.66	-0.16*
By cluster grouping	-1.35***	-0.21**	0.03	0.10	0.00

Models with controls for gifted curriculum

	Math		Reading		rerun
	State 2	State 3	State 1	State 2	State 3
Intercept	473.56***	211.72***	441.72***	573.38***	210.68***
By pull-out	5.30	-0.95	-0.40	4.47	-1.10*
By Homogeneous Grouping	5.82*	0.65	-0.08	-0.07	0.65
By push-in	-2.33	-0.02	0.15	-2.88	0.37
By cluster grouping	5.36	-0.83	-0.10	2.30	-0.65
Slope	25.35***	9.60***	5.00***	23.64***	9.39***
By pull-out	0.11	-0.07	0.10***	1.21*	-0.33***
By Homogeneous Grouping	-1.68***	-0.10	0.17***	0.47	0.08
By push-in	0.80*	.004	0.06*	0.49	-0.16*
By cluster grouping	-1.36***	-0.21**	0.03	0.09	0.00

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Summary of Results

- **Almost no effect of gifted grouping on the growth of academic achievement of gifted students in Math or Reading in States 1,2, or 3.**
  - Only 1 of 20 comparisons was positive at a p-value of .01 and only 1 of 20 comparisons was positive at a p-value of .01
  - Separate Homogenous grouping of gifted students into different classes in state 2 had a negative effect on math achievement growth for gifted students. Homogenous grouping had no effect for other comparisons
  - No notable differences between different types of grouping

- **Small but inconsistent effects of gifted grouping on the growth of academic achievement of non-gifted students in Math or Reading in States 1,2, or 3.**
  - Only 8 of 20 comparisons statistically significant at a p-value of .01
  - Effect sizes were small and inconsistent (largest effects had a standardized effect size of .02 to .04)

- **Gifted Curriculum (i.e. Opportunity to Learn measures) had almost no influence on the effects of grouping**

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Research Questions

1. What is the impact of within-class and between-class grouping of gifted students on the academic growth of gifted and non-gifted students?
   - **No effect for most comparison, some small and inconsistent effects for a subset of comparisons**
2. Do the effects of ability grouping differ by socio-economic status, race/ethnicity, and English learner status?
   - **Interaction effects did not improve the fit of the model, no evidence of differential effects**
3. Are these findings influenced by the opportunity to learn (e.g. academic curriculum) in gifted classes?
   - **Academic curriculum does not influence the effect of grouping**

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Caveats and Future Research

- **Caveats**
  - **We are measuring student growth and school level reports of grouping practices.** There could be within school variation of the type of grouping that a student experiences, which adds noise to our estimates. It is possible that we would have more precise measures of grouping if we had information on the type of grouping at the student level
  - **Gifted instruction and programming often focus on areas other than math or language arts such as critical thinking skills or promoting creativity.** Therefore we might not expect grouping to influence math or reading outcomes (see the graph comparing the focus of the gifted curriculum). We partially test for this given our models that control for curriculum.

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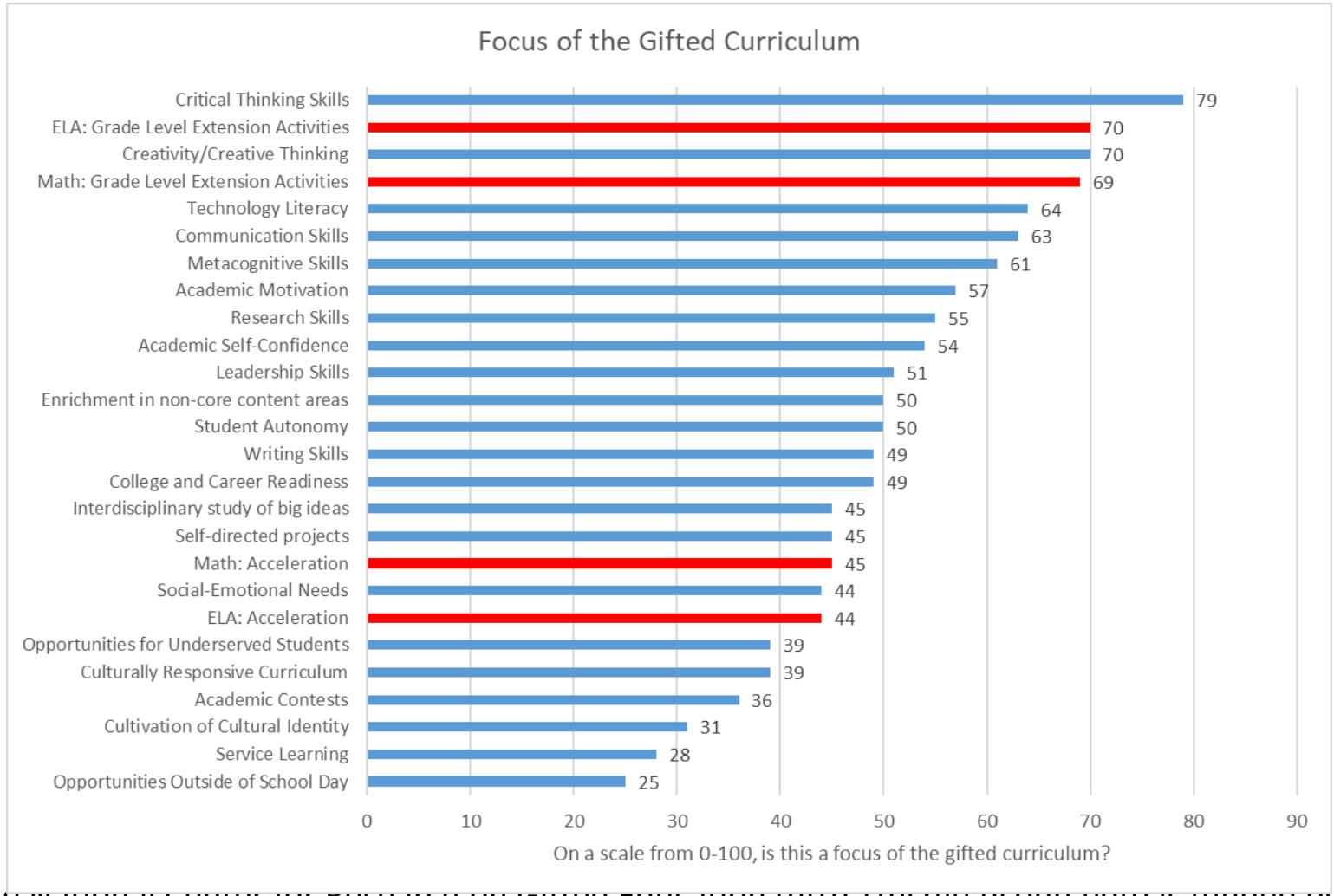
Focus of Gifted Programs (on a 1 to 100 scale)
In State 1, similar results in other states



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- **Future Research**
  - **Use the time in grifted group per week variable instead of just a dummy for whether in a gifted group or not**
  - **Use Multiple Imputation.** State 2 and 3 only include about 1/3 of schools after list wise deletion. If we use multiple imputation to account for missing data, we could increase the number of schools in the sample
  - **Control for Charter Schools.** We do not control for charter schools in this analysis. State 2 has a large % of charters schools. These schools might account for some of the negative effect of homogenous grouping in math for gifted students.

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Conclusion

1. **Findings contradict the pro-grouping findings from the gifted education literature.**
2. **Findings are consistent with the small or insignificant effects of grouping** for high achieving students in the **sociology of education literature.**
3. **These findings contradict the negative effects of grouping for low ability students in the sociology of education literature.** However, we did not directly test the influence of low ability groups on low ability students. Instead, we compared heterogeneous classrooms vs. classrooms that had high ability groups.

- **In sum, in these data, we find that gifted grouping does not help or hurt the achievement growth of gifted students nor does it help or hurt the achievement growth of non-gifted students**
  - Assessments of whether to use gifted grouping in a school need to use non-academic criteria such as:
    - Cost Effectiveness of different interventions
    - The impact on non-academic outcomes
    - The potential negative labeling impact for low achieving students
    - The potential academic self confidence impact on high and medium achieving students through big-fish in small pond effects

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