Why these students are those who have a low performance in PISA reading test 2018 : A Latent Class Analysis of low-performance Typology

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Background & Purpose

- Low performance in academics could possibly result in dropout during the stage of senior high school
- Justify previous study's conclusion: SES, Parent-child relationship(Parent's education), learning motivation and reading ability.
- The purpose of this study is to examine the different typologies of 2018 PISA reading test participants who scores (below 482, a bottom line score for level 3 reader, defined by PISA(national average score: 505) from a representative sample using latent class analysis (LCA)

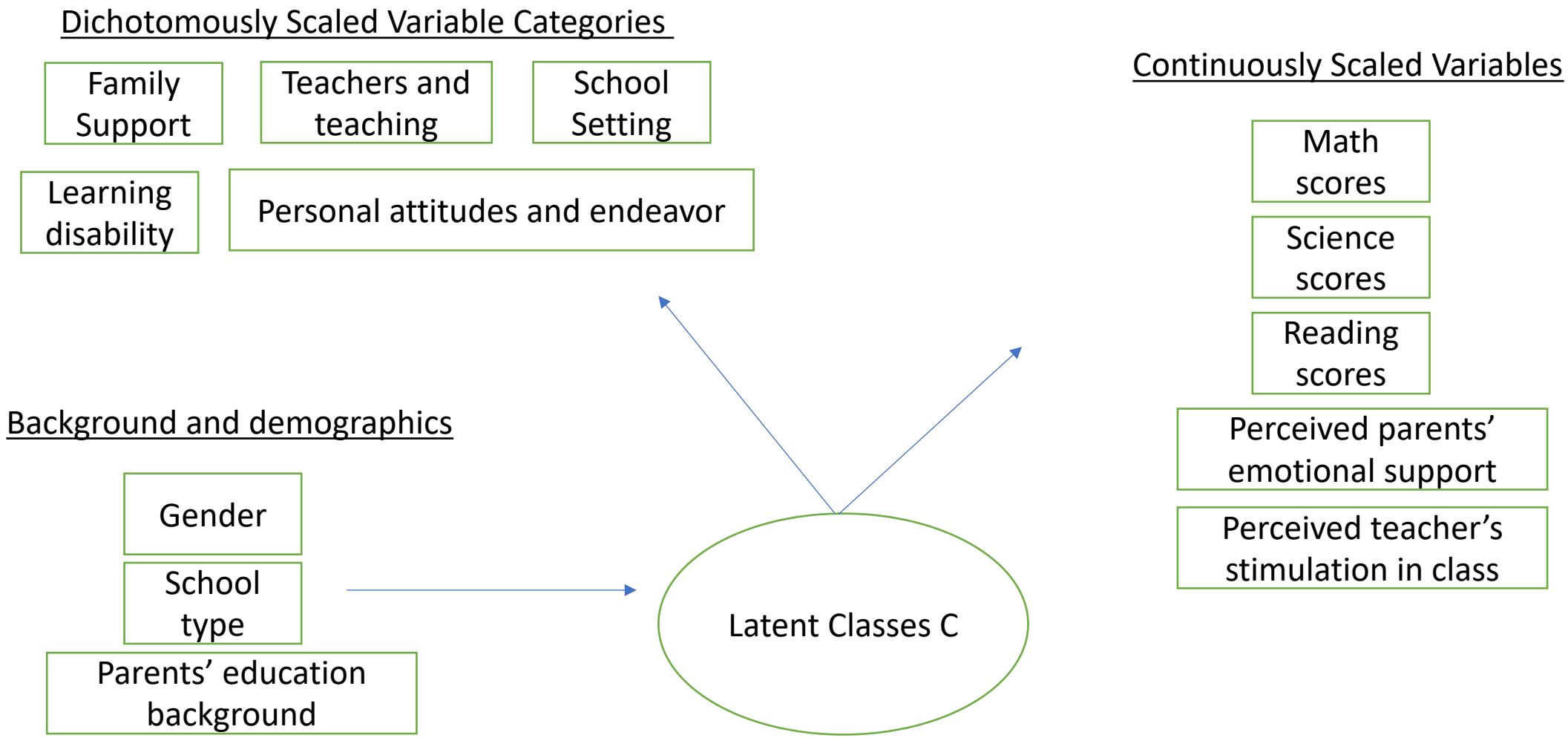
Research Questions

- How many low performance typologies are significantly different from each other?
- What are the specific characteristics that identify the different typologies of low performance?
- If n subgroups have been identified, what are the sample size in each group? How accurate we can trust in the classification?

Sample & Method

- Sample: Student Common part questionnaire of 2018 (CY07_MSU_STU_QQQ)
- – Survey of about 4838 students aged 15 or higher in 2018 using stratified sampling method across the United States
- – Sample: n=2048 students with reading scores below 481
- Method: Latent Class Analysis (LCA)
- – LCA using multinomial logistic regression within a structural equation mixture model (SEM)
- – LCA identifies the extent to which a distribution of survey responses fit to one distribution or multiple distributions (typologies)
- 3- step LCA

Latent Class Analysis Model for Low-performance



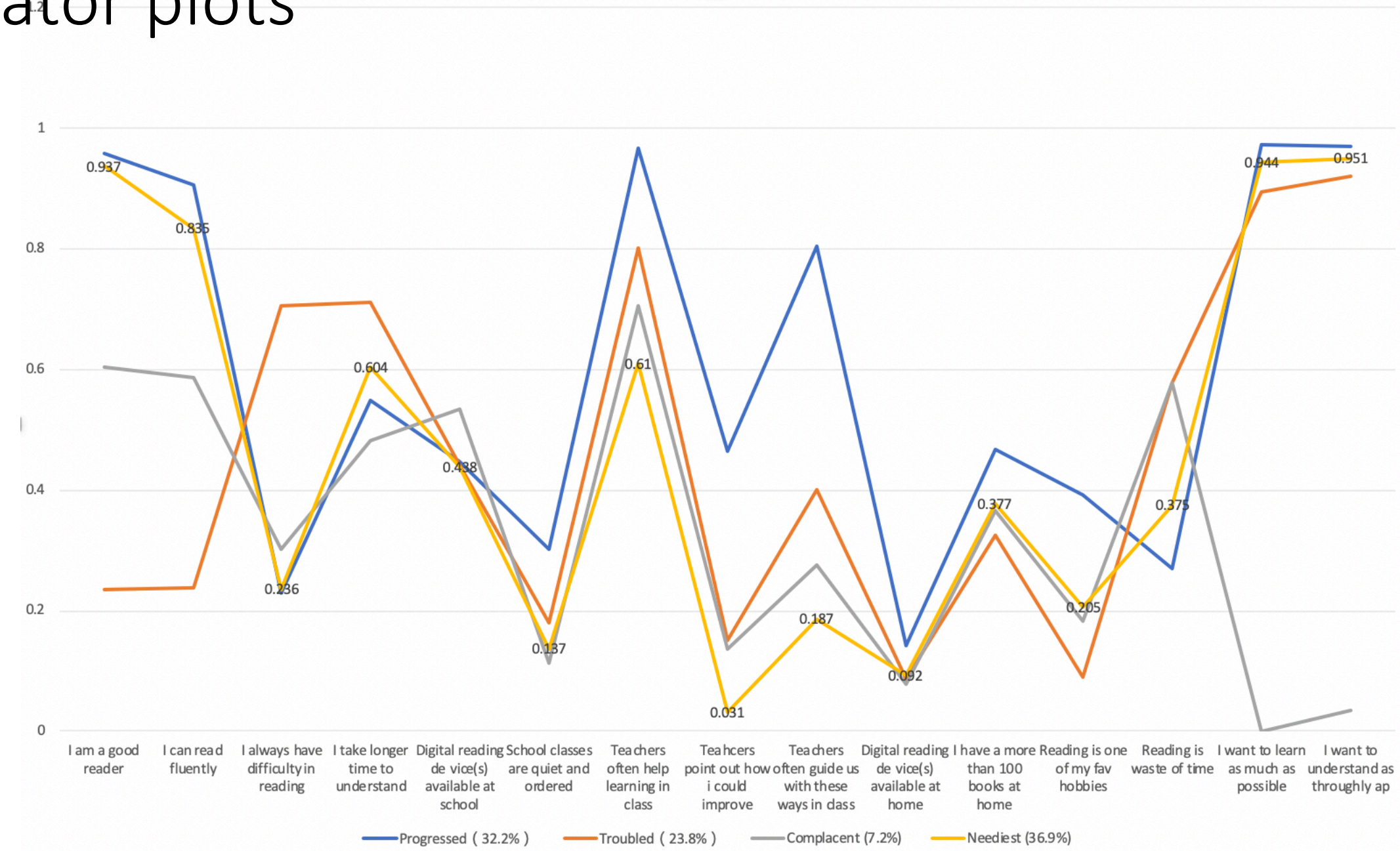
Latent class analysis (LCA) results and fit indices

Model	*BIC*	*AIC*	*-Log likelihood*	*% decrease in -LL*	*LMR Test for k-1 classes*	*p*	*Entropy*
Two -class	31782.835	31608.822	16222.485	---	890.835	<0.001	0.620
Three -class	31531.792	31267.966	15773.411	2.8	369.820	<0.001	0.603
Four- class	**31326.969**	**30973.330**	**15586.983**	**1.2**	**323.976**	**<0.001**	**0.680**
Five-class	31274.205	30830.753	15423.665	1	173.156	<0.05 (0.0203)	0.688
Six-class	31295.710	30762.445	15336.376	0.6	99.491	>0.05 (0.3678)	0.712

Classification table

	1	2	3	4
1	**0.845**	0.029	0.003	0.123
2	0.058	**0.818**	0.013	0.110
3	0.010	0.042	**0.907**	0.040
4	0.131	0.063	0.004	**0.802**

Indicator plots



Means and odds ratios for covariates with Neediest as the reference group

	Progressed (32.2%)		Troubled (23.8%)		Complacent (7.2%)		**Neediest (36.9%)**
Variable	Mean	OR	Mean	OR	Mean	OR	Mean
Female	0.2438095		0.2205128		0.1834862		0.2140351
Public (vs. private)	0.9483776	0.364*	0.9678112		0.9790210		0.9783198
At least one of the Parents graduated from college	0.4587021		0.4291845		0.2797203		0.4661247

Means and chi-square p value for distal outcome variables

Variable	Progressed (32.2%) /1	Troubled (23.8%) /2	Complacent (7.2%)/3	Neediest (36.9%)/4	p-Value 1 vs. 2	p-Value 1 vs. 3	p-Value 1 vs. 4	p-Value 2 vs. 3	p-Value 2 vs. 4	p-Value 3 vs. 4
Mean PISA 2018 Math scores	409.973	390.986	378.691	403.002	<0.001*	<0.001*	0.114	0.097	0.011*	0.001*
Mean PISA 2018 Science scores	406.654	403.596	382.825	390.494	0.465	<0.001*	<0.001*	0.001*	0.002*	0.182
Mean PISA 2018 Reading scores	422.275	412.819	401.556	408.006	0.037*	0.001*	0.001*	0.100	0.309	0.314
Mean perceived parents' emotional support	0.430	-0.168	-0.747	-0.156	<0.001*	<0.001*	<0.001*	<0.001*	0.889	<0.001*
Mean perceived teacher's stimulation in class	1.178	-0.069	-0.436	-0.848	<0.001*	<0.001*	<0.001*	0.002*	<0.001*	<0.001*

Note. Significance tests are Pearson's χ

Conclusions & Future Work

- Identified four statistically significant categories
- These low-performance students are commonly lacking support
- Attitude and learning motivation are not singularly representative factors determining children's reading ability/performance

Future work

- Replicating using the same data to compare countries/regions globally
- To look deeper into the reasons why reading scores remain flat
- Deeper and more research in teacher teaching approach and support, providing impactful boost