Hierarchical Linear Modeling of Passage Reading Fluency Growth as a Function of Student Characteristics

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Abstract

All students from grades 3 through 8 were tested in the fall, winter, and spring of 2009 on passage reading fluency (PRF) measures from easyCBM®. Student characteristics were analyzed for influence on reading growth. The results showed the negative effects from being a male or a student of color, coming from an economically disadvantaged environment, and receiving either special education or Title I services. Student characteristics influenced both intercept and slope, with the models occasionally revealing overall effects. Nevertheless, the patterns changed considerably over grades in the relation between intercept and slope as well as the values for student characteristics.

Hierarchical Linear Modeling of Passage Reading Fluency Growth

as a Function of Student Characteristics

In an earlier technical report (Tindal, Nese, Alonzo, 2009), we analyzed the results from several reading measures (including passage reading fluency as well as vocabulary and comprehension) using multiple linear regression at each grade level and time period. We included several student characteristics to understand how all of these measures were related to state test scores (the Oregon Assessment of Knowledge and Skills – OAKS). These results are useful but reflect a static view of the relation between the easyCBM® measures and student characteristics in the relation with state test performance. It would be better to use a more dynamic view in which the linear analysis includes both intercept and slope, controlling for student characteristics (that is, both intercept and slope are nested within students, creating a 2-level analysis).

In yet another publication we have completed and prepared for submission to the professional literature (Nese, Anderson, Lai, & Tindal, 2009), we used a non-linear analysis at two levels (time and student). The main conclusion was that differing patterns occurred across grade levels.

In this report, we present the results from an analysis of district wide reading fluency measures using hierarchical linear modeling with level 1 begin time (3 administrations in the fall, winter, and spring) and level 2 comprised of different student characteristics. In this current study, we use a linear analysis. One of the reasons for using HLM is to ensure that the dependencies inherent in most school data sets do not influence the outcomes. In this data set, time is analyzed at level 1 and student characteristics t level to remove their confounding influence.

Methods

Setting and Subjects

The third grade sample (n=1184 students) consisted of 49% female, 26% historically low-achieving, 45% economically disadvantaged, 16% receiving special education services and 54% receiving Title 1 services. The fourth grade sample consisted of 1,229 students; 51% female, 26% historically low-achieving, 42% economically disadvantaged, and 17% receiving special education services and 51% receiving Title 1 services. The fifth grade sample consisted of 1,129 students; 49% female, 24% historically low-achieving, 42% economically disadvantaged, and 18% receiving special education services and 52% receiving Title 1 services. The sixth grade sample consisted of 1,011 students; 51% female, 26% historically low-achieving, 38% economically disadvantaged, and 15% receiving special education services. The seventh grade sample consisted of 1,137 students; 49% female, 26% historically low-achieving, 39% economically disadvantaged, and 13% receiving special education services. The eighth grade sample consisted of 1,217 students; 50% female, 25% historically low-achieving, 36% economically disadvantaged, and 13% receiving special education services.

Measurement/Instrument Development

A complete description of the development of the passage reading fluency measure is presented in Alonzo, J., & Tindal, G. (2007). *Examining the technical adequacy of word and passage reading fluency measures in a progress monitoring assessment system* (Technical Report No. 40). Eugene, OR: Behavioral Research and Teaching: University of Oregon.

Data Preparation and Analysis

For this study, students were assessed on the CBM measures at three time periods: (a) fall – September through October, (b) winter – January through February, and (c) spring – May through June. Trained assessors administered the passage reading fluency measures in a one-on-

one testing environment. The test administrators were retired teachers who had been hired

specifically to test students on all oral reading fluency measures; all test administrators had been

previously trained in earlier district-wide initiatives (the past three years); furthermore, they

received a refresher training prior to each normative period.

Data Preparation and Analysis

Data from the easyCBM database were merged with district test files and demographics

using the following codes.

Variable	Description	Values
ORDER	Order of test administration	0=0th month (Sept.), 4=4th month (Jan.), 8=8th month (May)
DSID	District Student ID	9 digit code (from district files)
PRF	Passage reading fluency	Words read correctly per minute
Gender–n	Gender numeric	0=Male, 1=Female
EthnicCd	Ethnic Code	1=Amer Ind/AK Nat, 2=Asian/Pac Isl, 3=Black, 4=Hispanic, 5=White, 6=Multi-ethnic, 7=Decline
Ethnicity	Ethnicity (historically high- and low-achieving)	0=White or Asian, 1=Non-white; 7=System missing
Econdis	Economic Disadvantage	0=No, 1=Yes
Title1	Title 1 Services	0=No, 1=Yes
Speced	Special Education Status	0=No, 1=Yes

Results

In grade 3, the relation between intercept and slope was large (.90). The intercept was 108 words correct per minute with the effect of varying student characteristics showing only positive effects from being female (though not significantly different); otherwise, significant negative effects were reflected from all other student characteristics (-8 from ethnicity, -12 from economic disadvantage, -28 from special education, and -6 from Title 1). The same results appeared from slope as the outcome (and in the same proportions) from approximately 4 words per month growth, though the effects from ethnicity, economic disadvantage, and Title 1 were not significant. See tables on pages 7-8. For the overall model, the variance around the intercept was significant but not for slope.

Grade 4 results were somewhat different with only a modest relation between intercept and slope. With an intercept of 131 words correct per minute, gender and ethnicity were not significant while economic disadvantage (-14), special education status (-28) and Title 1 (-11) all significant. The average slope was approximately 3.5 words growth per month with all student characteristics significant or nearly significant. The only unusual finding for slope was the positive influence from Title. The overall model was significant for both intercept and slope. See tables on pages 9-10.

Grade 5 results were different from either of the previous grades and reflected the only negative relation between intercept and slope (-.24). With an average intercept of 161 words correct per minute, all student characteristics were significant (or nearly so with Title). However, with slope, the average was 2.3 words growth per month and only ethnicity being significant. The overall model was significant for both intercept and slope. See tables on pages 11-12.

In grade 6, the results were similar to those obtained in grade 4: A modest positive correlation appeared between intercept and slope. With an average intercept of 161 words correct

per minute, all student characteristics were significant. For slope, the average was 2.5 and all

characteristics except economic disadvantage showing significant effects (positive for gender

and negative for ethnicity and special education). The overall model was significant for both

intercept and slope. See tables on pages 13-14.

Grade 7 was similar to grade 3 results with a strong correlation between intercept and

slope (.72). The average intercept at time 0 (September) was 168 words correct and other than

ethnicity, the effects of varying student characteristics were significant (+6 from gender, -12 for

economic disadvantage, and -35 for special education). The analysis of slope showed only

special education to be significant (-.60) from an average of 1 word growth per month. See pages

15-16 for the tables of results.

Results in grade 8 were generally different from all previous grades: No relation was

found between intercept and slope (.08). For the intercept, the average was 185 words correct per

minute with all student characteristics significant; in contrast, the average slope was negative (-

.72) and no student characteristics were significant. The overall model showed significant effects

for both intercept and slope. See tables on pages 17-18.

Discussion

Although we expected consistency across the grades, it was not apparent. Instead, we found that

both intercept and growth was unevenly influenced by student characteristics. We also found the

model was not uniformly significant for slope (in some grades, an overall significant effect was

found while in other grades, it was not found. The data probably indicated differential

functioning of student groups, in which case further analyses are warranted.

References

Nese, J., Anderson, D., Lai, C. F., & Tindal, G. (2009). *Within-year reading growth by student group: An application of hierarchical linear modeling with curriculum-based measurement*. Unpublished manuscript.

Tindal, G., Nese, J., & Alonzo, J. (2009). *Criterion-related evidence using easyCBM® reading measures and student demographics to predict state test performance in grades 3 – 8.* (Technical Report No. 0910). Eugene, OR: Behavioral Research and Teaching: University of Oregon.

<div align="center"><u>GRADE 3</u></div>

LEVEL-1 DESCRIPTIVE STATISTICS

VARIABLE NAME	N	MEAN	SD	MINIMUM	MAXIMUM
ORDER	3474	4.06	3.26	0.00	8.00
ORF	3474	109.89	42.79	4.00	287.00

LEVEL-2 DESCRIPTIVE STATISTICS

VARIABLE NAME	N	MEAN	SD	MINIMUM	MAXIMUM
GENDER	1184	0.49	0.50	0.00	1.00
ETHNICIT	1184	0.26	0.44	0.00	1.00
ECONDIS	1184	0.45	0.50	0.00	1.00
SPECED	1184	0.16	0.37	0.00	1.00
TITLE1	1184	0.54	0.50	0.00	1.00

<u>Summary of the model specified (in equation format)</u>

Level-1 Model
$Y = B0 + B1*(ORDER) + R$

Level-2 Model
$B0 = G00 + G01*(GENDER\_N) + G02*(ETHNICIT) + G03*(ECONDIS) + G04*(SPECED)$
$\quad + G05*(TITLE1) + U0$
$B1 = G10 + G11*(GENDER\_N) + G12*(ETHNICIT) + G13*(ECONDIS) + G14*(SPECED)$
$\quad + G15*(TITLE1) + U1$

******* ITERATION 1635 *******

 Sigma squared = 231.47625

Tau		
INTRCPT1, B0	1107.26259	10.24258
ORDER, B1	10.24258	0.11712

Tau (as correlations)		
INTRCPT1, B0	1.000	0.899
ORDER, B1	0.899	1.000

Random level-1 coefficient	Reliability estimate
INTRCPT1, B0	0.840
ORDER, B1	0.016

Note: The reliability estimates reported above are based on only 1166 of 1184 units that had sufficient data for computation. Fixed effects and variance components are based on all the data.

The value of the likelihood function at iteration 1637 = -1.602029E+004

The outcome variable is   ORF

Final estimation of fixed effects (with robust standard errors)

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, B0					
INTRCPT2, G00	108.162890	2.209773	48.948	1179	0.000
GENDER_N, G01	2.973282	2.086324	1.425	1179	0.154
ETHNICIT, G02	-8.365752	2.317773	-3.609	1179	0.001
ECONDIS, G03	-12.428387	2.233262	-5.565	1179	0.000
SPECED, G04	-28.080798	3.064685	-9.163	1179	0.000
TITLE1, G05	-5.936200	2.217209	-2.677	1179	0.008
For ORDER slope, B1					
INTRCPT2, G10	3.837612	0.139847	27.441	1179	0.000
GENDER_N, G11	0.390181	0.144789	2.695	1179	0.008
ETHNICIT, G12	-0.146109	0.160325	-0.911	1179	0.363
ECONDIS, G13	-0.296448	0.157092	-1.887	1179	0.059
SPECED, G14	-0.731443	0.197035	-3.712	1179	0.000
TITLE1, G15	0.155391	0.148360	1.047	1179	0.296

Final estimation of variance components:

Random Effect	Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1, U0	33.27556	1107.26259	1161	7580.99654	0.000
ORDER slope, U1	0.34223	0.11712	1161	1004.84403	>.500
level-1, R	15.21145	231.38830			

Note: The chi-square statistics reported above are based on only 1167 of 1185 units that had sufficient data for computation. Fixed effects and variance components are based on all the data.

Statistics for current covariance components model
Deviance   = 32064.583986
 Number of estimated parameters = 4
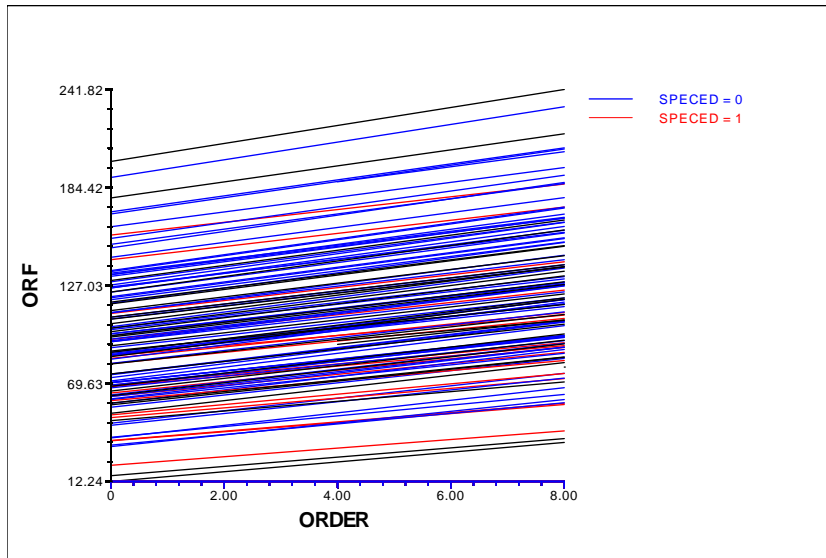
GRADE 4

LEVEL-1 DESCRIPTIVE STATISTICS

VARIABLE NAME	N	MEAN	SD	MINIMUM	MAXIMUM
ORDER	3599	4.06	3.26	0.00	8.00
ORF	3599	130.06	39.84	5.00	287.00

LEVEL-2 DESCRIPTIVE STATISTICS

VARIABLE NAME	N	MEAN	SD	MINIMUM	MAXIMUM
GENDER_N	1229	0.51	0.50	0.00	1.00
ETHNICIT	1229	0.26	0.44	0.00	1.00
ECONDIS	1229	0.42	0.49	0.00	1.00
SPECED	1229	0.17	0.37	0.00	1.00
TITLE1	1229	0.51	0.50	0.00	1.00

Summary of the model specified (in equation format)

Level-1 Model
$Y = B0 + B1*(ORDER) + R$

Level-2 Model
$B0 = G00 + G01*(GENDER\_N) + G02*(ETHNICIT) + G03*(ECONDIS) + G04*(SPECED)$
    $+ G05*(TITLE1) + U0$
$B1 = G10 + G11*(GENDER\_N) + G12*(ETHNICIT) + G13*(ECONDIS) + G14*(SPECED)$
    $+ G15*(TITLE1) + U1$

******* ITERATION 21 *******

 Sigma squared = 159.06707

Tau
INTRCPT1, B0	853.83223	13.26143
ORDER, B1	13.26143	2.55503

Tau (as correlations)
INTRCPT1, B0	1.000	0.284
ORDER, B1	0.284	1.000

Random level-1 coefficient   Reliability estimate
INTRCPT1, B0	0.853
ORDER, B1	0.331

Note: The reliability estimates reported above are based on only 1211 of 1229 units that had sufficient data for computation. Fixed effects and variance components are based on all the data.

The value of the likelihood function at iteration 21 = -1.624208E+004
The outcome variable is   ORF

Final estimation of fixed effects (with robust standard errors)

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, B0					
INTRCPT2, G00	130.719152	1.744473	74.933	1223	0.000
GENDER_N, G01	2.680722	1.822656	1.471	1223	0.142
ETHNICIT, G02	-1.662709	2.126561	-0.782	1223	0.435
ECONDIS, G03	-13.774085	1.927922	-7.145	1223	0.000
SPECED, G04	-28.659542	2.588477	-11.072	1223	0.000
TITLE1, G05	-10.713772	1.874972	-5.714	1223	0.000
For ORDER slope, B1					
INTRCPT2, G10	3.468371	0.158661	21.860	1223	0.000
GENDER_N, G11	0.524128	0.159230	3.292	1223	0.001
ETHNICIT, G12	-0.398577	0.165767	-2.404	1223	0.016
ECONDIS, G13	-0.290824	0.169894	-1.712	1223	0.087
SPECED, G14	-0.600367	0.208647	-2.877	1223	0.005
TITLE1, G15	0.281948	0.167891	1.679	1223	0.093

Final estimation of variance components:

Random Effect	Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1, U0	29.22041	853.83223	1205	8555.69508	0.000
ORDER slope, U1	1.59845	2.55503	1205	1811.07351	0.000
level-1, R	12.61218	159.06707			

Note: The chi-square statistics reported above are based on only 1211 of 1229 units that had sufficient data for computation. Fixed effects and variance components are based on all the data.

Statistics for current covariance components model
 Deviance   = 32484.169413
 Number of estimated parameters = 4
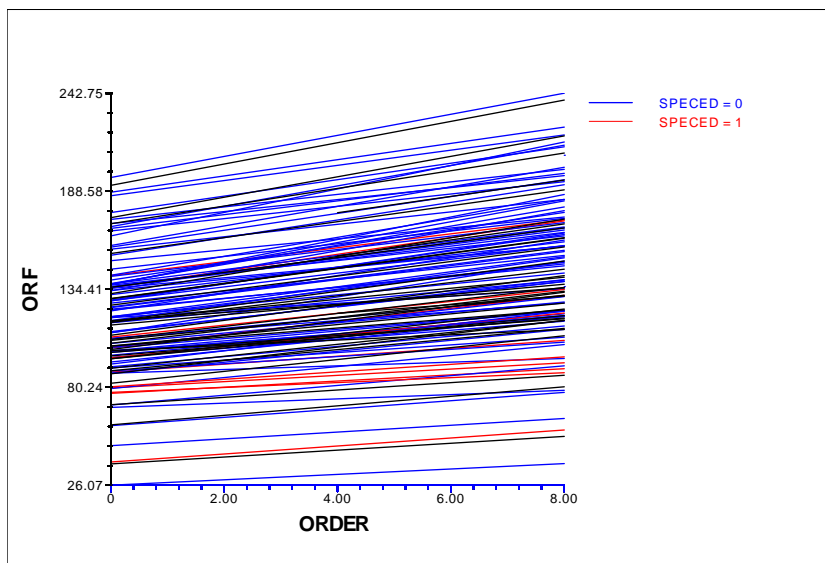
GRADE 5

LEVEL-1 DESCRIPTIVE STATISTICS

VARIABLE NAME	N	MEAN	SD	MINIMUM	MAXIMUM
ORDER	3300	4.06	3.27	0.00	8.00
ORF	3300	157.51	40.94	0.00	361.00

LEVEL-2 DESCRIPTIVE STATISTICS

VARIABLE NAME	N	MEAN	SD	MINIMUM	MAXIMUM
GENDER	1129	0.49	0.50	0.00	1.00
ETHNICIT	1129	0.24	0.43	0.00	1.00
ECONDIS	1129	0.42	0.49	0.00	1.00
SPECED	1129	0.18	0.39	0.00	1.00
TITLE1	1129	0.52	0.50	0.00	1.00

Summary of the model specified (in equation format)

Level-1 Model
$Y = B0 + B1*(ORDER) + R$

Level-2 Model
$B0 = G00 + G01*(GENDER) + G02*(ETHNICIT) + G03*(ECONDIS) + G04*(SPECED)$
$\quad + G05*(TITLE1) + U0$
$B1 = G10 + G11*(GENDER) + G12*(ETHNICIT) + G13*(ECONDIS) + G14*(SPECED)$
$\quad + G15*(TITLE1) + U1$

******* ITERATION 9 *******

 Sigma squared = 178.40357

Tau		
INTRCPT1, B0	1132.24353	-7.91135
ORDER, B1	-7.91135	0.94681

Tau (as correlations)		
INTRCPT1, B0	1.000	-0.242
ORDER, B1	-0.242	1.000

Random level-1 coefficient	Reliability estimate
INTRCPT1, B0	0.876
ORDER, B1	0.142

Note: The reliability estimates reported above are based on only 1103 of 1129 units that had sufficient data for computation. Fixed effects and variance components are based on all the data.

The value of the likelihood function at iteration 9 = -1.495889E+004
The outcome variable is   ORF

Final estimation of fixed effects (with robust standard errors)

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, B0					
INTRCPT2, G00	161.117662	1.947197	82.743	1123	0.000
GENDER, G01	5.432519	2.150372	2.526	1123	0.012
ETHNICIT, G02	-6.124802	2.590221	-2.365	1123	0.018
ECONDIS, G03	-16.183894	2.351843	-6.881	1123	0.000
SPECED, G04	-36.869076	2.896383	-12.729	1123	0.000
TITLE1, G05	-4.002424	2.270045	-1.763	1123	0.078
For ORDER slope, B1					
INTRCPT2, G10	2.333031	0.155302	15.022	1123	0.000
GENDER, G11	0.082932	0.155514	0.533	1123	0.594
ETHNICIT, G12	0.369527	0.169152	2.185	1123	0.029
ECONDIS, G13	0.192233	0.170715	1.126	1123	0.261
SPECED, G14	0.161095	0.190002	0.848	1123	0.397
TITLE1, G15	0.043902	0.171412	0.256	1123	0.798

Final estimation of variance components:

Random Effect	Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1, U0	33.64883	1132.24353	1097	9273.69688	0.000
ORDER slope, U1	0.97304	0.94681	1097	1278.80977	0.000
level-1, R	13.35678	178.40357			

Note: The chi-square statistics reported above are based on only 1103 of 1129 units that had sufficient data for computation. Fixed effects and variance components are based on all the data.

 Statistics for current covariance components model
Deviance   = 29917.781352
Number of estimated parameters = 4
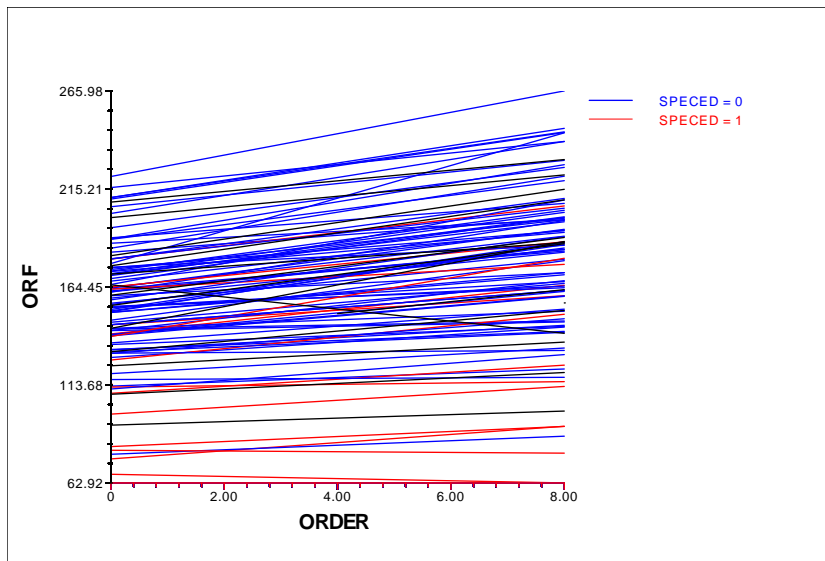
<u>GRADE 6</u>

LEVEL-1 DESCRIPTIVE STATISTICS

VARIABLE NAME	N	MEAN	SD	MINIMUM	MAXIMUM
ORDER	2067	4.07	3.91	0.00	8.00
ORF	2067	161.07	42.65	31.00	335.00

LEVEL-2 DESCRIPTIVE STATISTICS

VARIABLE NAME	N	MEAN	SD	MINIMUM	MAXIMUM
GENDER_N	1011	0.51	0.50	0.00	1.00
ETHNICIT	1011	0.26	0.44	0.00	1.00
ECONDIS	1011	0.38	0.49	0.00	1.00
SPECED_M	1011	0.15	0.36	0.00	1.00

<u>Summary of the model specified (in equation format)</u>

Level-1 Model
Y = B0 + B1*(ORDER) + R

Level-2 Model
B0 = G00 + G01*(GENDER_N) + G02*(ETHNICIT) + G03*(ECONDIS) + G04*(SPECED) + U0
B1 = G10 + G11*(GENDER_N) + G12*(ETHNICIT) + G13*(ECONDIS) + G14*(SPECED) + U1

******* ITERATION 21 *******

 Sigma squared =147.82708

Tau		
INTRCPT1, B0	948.84578	12.62037
ORDER, B1	12.62037	4.19795

Tau (as correlations)		
INTRCPT1, B0	1.000	0.200
ORDER, B1	0.200	1.000

Random level-1 coefficient	Reliability estimate
INTRCPT1, B0	0.865
ORDER, B1	0.474

Note: The reliability estimates reported above are based on only 972 of 1011 units that had sufficient data for computation. Fixed effects and variance components are based on all the data.

The value of the likelihood function at iteration 21 = -9.769973E+003
The outcome variable is   ORF

Final estimation of fixed effects (with robust standard errors)

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, B0					
INTRCPT2, G00	161.108529	1.764887	91.285	1006	0.000
GENDER_N, G01	4.928770	2.098506	2.349	1006	0.019
ETHNICIT, G02	-5.972079	2.410991	-2.477	1006	0.014
ECONDIS, G03	-15.271321	2.258131	-6.763	1006	0.000
SPECED, G04	-36.149786	3.092995	-11.688	1006	0.000
For ORDER slope, B1					
INTRCPT2, G10	2.549894	0.174173	14.640	1006	0.000
GENDER_N, G11	0.830793	0.193280	4.298	1006	0.000
ETHNICIT, G12	-0.741818	0.207814	-3.570	1006	0.001
ECONDIS, G13	-0.121192	0.202795	-0.598	1006	0.550
SPECED, G14	-1.056912	0.246037	-4.296	1006	0.000

Final estimation of variance components:

Random Effect	Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1, U0	30.80334	948.84578	967	7203.31954	0.000
ORDER slope, U1	2.04889	4.19795	967	1847.39854	0.000
level-1, R	12.15842	147.82708			

Note: The chi-square statistics reported above are based on only 972 of 1011 units that had sufficient data for computation. Fixed effects and variance components are based on all the data.

Statistics for current covariance components model
Deviance   = 19539.946262
Number of estimated parameters = 4
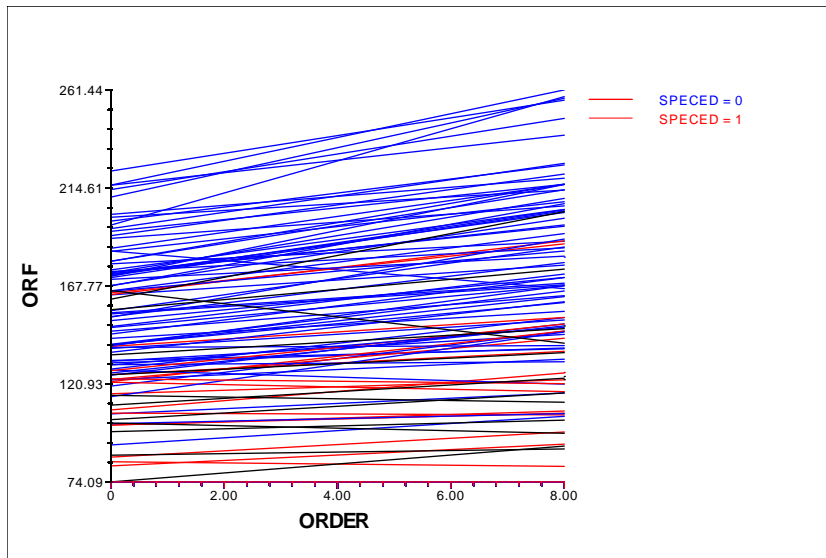
<u>GRADE 7</u>

LEVEL-1 DESCRIPTIVE STATISTICS

VARIABLE NAME	N	MEAN	SD	MINIMUM	MAXIMUM
ORDER	2270	4.10	3.93	0.00	8.00
ORF	2270	164.03	36.91	0.00	291.00

LEVEL-2 DESCRIPTIVE STATISTICS

VARIABLE NAME	N	MEAN	SD	MINIMUM	MAXIMUM
GENDER	1137	0.49	0.50	0.00	1.00
ETHNICIT	1137	0.26	0.44	0.00	1.00
ECONDIS	1137	0.39	0.49	0.00	1.00
SPECED	1137	0.13	0.34	0.00	1.00

<u>Summary of the model specified (in equation format)</u>

Level-1 Model
$Y = B0 + B1*(ORDER) + R$

Level-2 Model
$B0 = G00 + G01*(GENDER\_N) + G02*(ETHNICIT) + G03*(ECONDIS) + G04*(SPECED) + U0$
$B1 = G10 + G11*(GENDER\_N) + G12*(ETHNICIT) + G13*(ECONDIS) + G14*(SPECED) + U1$

******* ITERATION 1648 *******

 Sigma squared = 185.53517

Tau		
INTRCPT1, B0	833.18708	10.11053
ORDER, B1	10.11053	0.23737

Tau (as correlations)		
INTRCPT1, B0	1.000	0.719
ORDER, B1	0.719	1.000

Random level-1 coefficient	Reliability estimate
INTRCPT1, B0	0.818
ORDER, B1	0.039

Note: The reliability estimates reported above are based on only 1066 of 1137 units that had sufficient data for computation. Fixed effects and variance components are based on all the data.

The value of the likelihood function at iteration 1648 = -1.050297E+004
The outcome variable is   ORF

Final estimation of fixed effects (with robust standard errors)

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, B0					
INTRCPT2, G00	167.679639	1.506339	111.316	1132	0.000
GENDER_N, G01	5.767319	1.912609	3.015	1132	0.003
ETHNICIT, G02	-2.186498	2.225812	-0.982	1132	0.327
ECONDIS, G03	-11.888724	2.032822	-5.848	1132	0.000
SPECED, G04	-35.636627	3.119286	-11.425	1132	0.000
For ORDER slope, B1					
INTRCPT2, G10	0.953732	0.112710	8.462	1132	0.000
GENDER_N, G11	0.022611	0.147716	0.153	1132	0.879
ETHNICIT, G12	0.088134	0.161913	0.544	1132	0.586
ECONDIS, G13	-0.108114	0.156462	-0.691	1132	0.490
SPECED, G14	-0.600754	0.208650	-2.879	1132	0.005

Final estimation of variance components:

Random Effect	Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1, U0	28.86498	833.18708	1061	5798.25697	0.000
ORDER slope, U1	0.48721	0.23737	1061	1077.30910	0.357
level-1, R	13.62113	185.53517			

Note: The chi-square statistics reported above are based on only 1066 of 1137 units that had sufficient data for computation. Fixed effects and variance components are based on all the data.

Statistics for current covariance components model
Deviance   = 21005.945630
Number of estimated parameters = 4
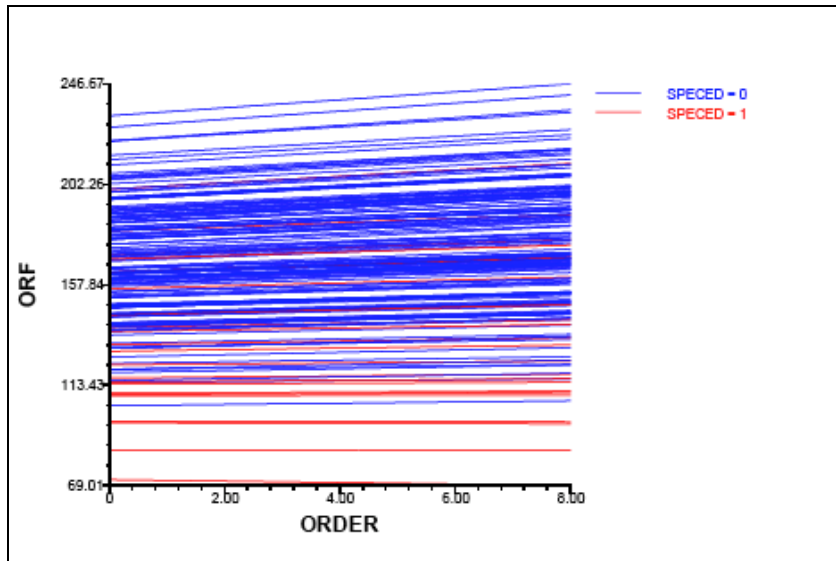
<div align="center">GRADE 8</div>

LEVEL-1 DESCRIPTIVE STATISTICS

VARIABLE NAME	N	MEAN	SD	MINIMUM	MAXIMUM
ORDER	2447	3.96	3.90	0.00	8.00
ORF	2447	175.15	38.61	37.00	340.00

LEVEL-2 DESCRIPTIVE STATISTICS

VARIABLE NAME	N	MEAN	SD	MINIMUM	MAXIMUM
GENDER_N	1217	0.50	0.50	0.00	1.00
ETHNICIT	1217	0.25	0.43	0.00	1.00
ECONDIS	1217	0.36	0.48	0.00	1.00
SPECED_M	1217	0.13	0.34	0.00	1.00

Summary of the model specified (in equation format)

Level-1 Model
$Y = B0 + B1*(ORDER) + R$

Level-2 Model
$B0 = G00 + G01*(GENDER\_N) + G02*(ETHNICIT) + G03*(ECONDIS) + G04*(SPECED) + U0$
$B1 = G10 + G11*(GENDER\_N) + G12*(ETHNICIT) + G13*(ECONDIS) + G14*(SPECED) + U1$

Iterations stopped due to small change in likelihood function

******* ITERATION 1048 *******

 Sigma squared = 177.64775

Tau		
INTRCPT1, B0	992.36057	1.55109
ORDER, B1	1.55109	0.40042

Tau (as correlations)		
INTRCPT1,B0	1.000	0.078
ORDER,B1	0.078	1.000

Random level-1 coefficient	Reliability estimate
INTRCPT1, B0	0.849
ORDER, B1	0.065

Note: The reliability estimates reported above are based on only 1164 of 1217 units that had sufficient data for computation. Fixed effects and variance\ components are based on all the data.

The value of the likelihood function at iteration 1048 = -1.136670E+004
The outcome variable is   ORF

Final estimation of fixed effects (with robust standard errors)

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, B0					
INTRCPT2, G00	185.379007	1.658585	111.769	1212	0.000
GENDER_N, G01	9.875223	1.961743	5.034	1212	0.000
ETHNICIT, G02	-9.950520	2.321850	-4.286	1212	0.000
ECONDIS, G03	-12.662480	2.193945	-5.772	1212	0.000
SPECED, G04	-36.176189	3.304185	-10.949	1212	0.000
For ORDER slope, B1					
INTRCPT2, G10	-0.726933	0.115489	-6.294	1212	0.000
GENDER_N, G11	-0.275166	0.144826	-1.900	1212	0.057
ETHNICIT, G12	0.280367	0.187889	1.492	1212	0.136
ECONDIS, G13	0.064711	0.160073	0.404	1212	0.686
SPECED, G14	-0.300663	0.248768	-1.209	1212	0.227

Final estimation of variance components:

Random Effect	Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1, U0	31.50175	992.36057	1159	7637.19618	0.000
ORDER slope, U1	0.63278	0.40042	1159	1258.31794	0.022
level-1, R	13.32846	177.64775			

Note: The chi-square statistics reported above are based on only 1164 of 1217 units that had sufficient data for computation. Fixed effects and variance components are based on all the data.

Statistics for current covariance components model
 Deviance   = 22733.404666
 Number of estimated parameters = 4