

BEAVERTON SCHOOL DISTRICT

English Language Development Minutes, Models, and Outcomes

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Technical Appendix

This appendix provides additional explanations and data to support the findings from the report. This includes descriptions of the data we used, additional data about ELD program participation, as well as regression tables. We also discuss alternative regression models that we tested, and provide regression tables for them.

Data collection and methods

Beaverton School District provided Education Northwest with multiple administrative datasets that were combined to construct the analytic data set. Table A1 illustrates the data we used for this project.

Table A1. Data sources and years

	Baseline 2015-16	Year 1 2016-17	Year 2 2017-18
Demographics (gender, language, race/ethnicity)		✓	✓
Enrollment (year, school, grade)	✓	✓	✓
ELL status	✓	✓	✓
Special education, federal lunch program enrollment	✓	✓	✓
Smarter Balanced English language arts assessment scores	✓	✓	✓
English language proficiency ELPA/ELPA21 scores	✓	✓	✓
Behavior and attendance		✓	✓
ELD program model		✓	✓
ELD minutes		✓	

✓Indicates that these data were used for this project.

ELD Program Models

Beaverton's ELL students were associated with one or more ELD program models. There were 16 different combinations of program models, many of which had very few students associated with them (table A2).

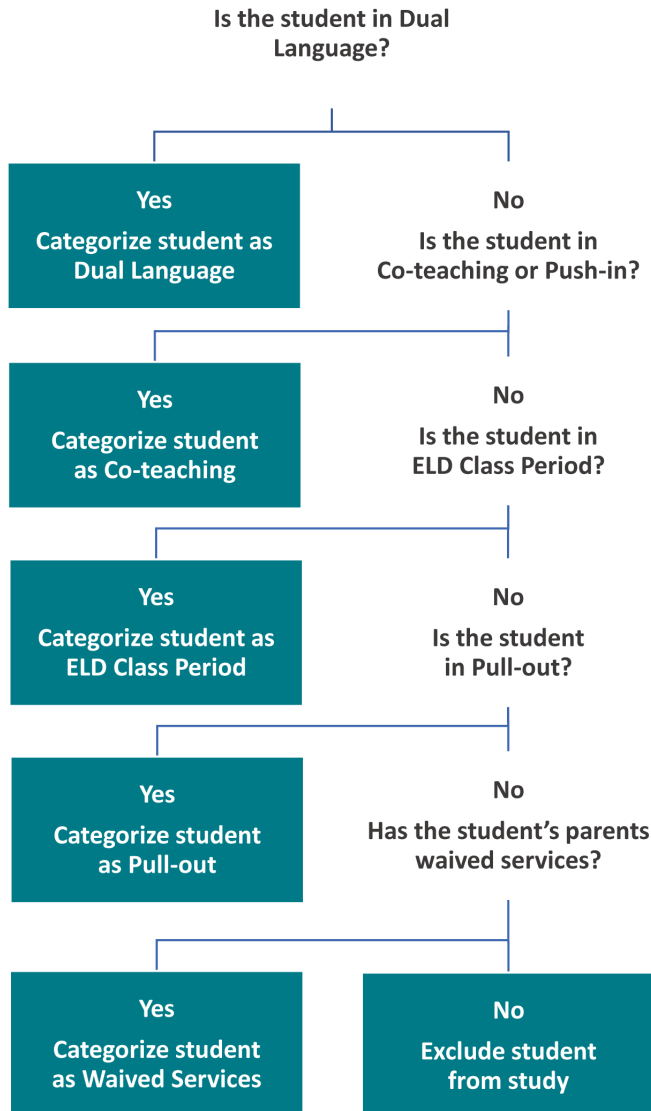
Table A2: Possible program model combinations and their designation in 2016-17

Program Model	Total	Analytic Program Designation	Analytic Sample
Elementary	3,500		3,500
Co-teaching	1,141	Co-teaching	1,530
Co-teaching, Pull-out	72		
Co-teaching, Push-in	83		
Co-teaching, Push-in, Pull-out	10		
Push-in	224		
Dual language	87	Dual language	570
Dual language, Push-in	84		
Dual language, Co-teaching	172		
Dual language, ELD class period	151		
Dual language, Pull-out	76		
ELD class period	166	ELD Class	213
ELD class period, Push-in	47		
Pull-out	1,080	Pull-out	1,187
Pull-out, Push-in	107		
Secondary	1,257		1,229
Co-teaching	85	Other	129
Co-teaching, ELD class period	44		
Dual language, Co-teaching	1	Dual language	73
Dual language, ELD class period	62		
Dual language, ELD class period, Co-teaching	10		
ELD class period	1,027	ELD Class	1,027
Newcomer program	21	Excluded from study	28
Pull-out	7		
Total	4,757		4,729

Source: Education Northwest's analysis of 2016-17 ELL student data from Beaverton School District.

The large number of program combinations and small N sizes made it difficult to detect the relationship between ELD program models and student outcomes. To address this limitation, Education Northwest worked with the Beaverton Multilingual Department and created logic to identify all students with one of five ELD program models—dual language, co-teaching, ELD class period, pull-out, and students whose parents waived ELD services for them—using a set of decision rules to categorize students (Box A1)

Box A1: Education Northwest created a set of decision rules to categorize ELD models



Dual language: If one of the programs associated with the student is dual language program, then that student will be categorized as dual language regardless of other programs.

Collaborative **Co-teaching:** If one of the programs associated with the student is co-teaching or push-in and they are not receiving dual language, then they will be categorized as co-teaching.

ELD class period: Students will be classified as ELD class period if one of the programs associated with the student is ELD class period, and they are not receiving dual language or co-teaching. Students who are participating in ELD class period may receive pull-out and are so marked. We differentiated between secondary ELLs who received only ELD class period and those who received ELD class period and/or other supports, such as pull-out.

Pull-out: For a student to be labeled as pull-out, they must not have dual language or co-teaching associated with them. The student can be labeled either pull-out or pull-out in combination with push-in.

Waived: For a student to be labeled as waived services, they must have a waived services flag in the data set and not be associated with any other program.

Not all students remained in the same ELD program model both years—25 percent of elementary students and 40 percent of secondary students changed ELD program model from 2016-17 to 2017-18 (table A3). We do not know why students changed their ELD program model. Some likely changed schools, moving to a different neighborhood school or being promoted to middle or high school. Schools also may have changed their program model.

Table A3. Most ELLs remained in the same ELD program model in 2016-17 and 2017-18

ELD program type	2016-17		2017-18		ELL students participating in the same program both years	
	Number	Percent	Number	Percent	Number	Percent
Elementary grades K–5	3,692		3,714		1,963	75%
Co-teaching	1,544	42%	1,873	50%	968	74%
Pull-out	1,206	33%	1,150	31%	593	78%
Dual language	573	16%	410	11%	272	85%
ELD class period	219	6%	200	5%	70	48%
Waived services	150	4%	81	2%	60	80%
Secondary grades 6–12	1,573		1,801		896	60%
ELD class period	1,049	67%	1,149	64%	618	67%
Other ELD services	135	9%	272	15%	32	15%
Waived services	315	20%	265	15%	192	74%
Dual language	74	5%	115	6%	54	64%

Source: Education Northwest's analysis of 2016-17 and 2017-18 ELL student data from Beaverton School District.

Regardless of the reason, changing programs makes it difficult for us to attribute outcomes to ELD programs. We explain our approach to this problem below, in the regression results section examining ELD program models and English language proficiency outcomes.

Regression results examining minutes of ELD instruction among elementary school ELL students

We used two different regression models to examine the relationship of minutes of ELD instruction to assessment outcomes among elementary school ELL students. The first model, “categorical output,” examined the relationship of more than 50 minutes of ELD instruction on assessment outcomes in comparison to less than 50 minutes (table A4). The second model, “constant output,” compared the relationship of each minute of instruction on assessment outcomes (table A5).

We did not find a substantial difference between the two models. Both models found that all four English language proficiency domains—reading, writing, listening, and speaking—were significantly and negatively associated with more instructional time. We used the categorical output model in the text of the report because it was easier to explain and create displays illustrating the relationship between minutes and outcomes.

Table A4. Regression results from elementary ELL students using categorical output for minutes

	Standardized 2016-17 assessment outcomes				
	SBAC ELA	ELPA21 Reading	ELPA21 Writing	ELPA21 Listening	ELPA21 Speaking
50 Minutes or more	0.0093 [0.13]	-0.23*** [0.062]	-0.14* [0.055]	-0.21** [0.060]	-0.21* [0.10]
Race (white is reference)					
Hispanic	0.040 [0.24]	-0.089 [0.12]	-0.059 [0.096]	-0.076 [0.13]	-0.050 [0.15]
Asian Pacific Islander	0.17 [0.19]	0.12 [0.075]	0.032 [0.064]	0.074 [0.075]	-0.0088 [0.064]
Other race	-0.32* [0.12]	-0.30** [0.10]	-0.30** [0.085]	-0.25* [0.10]	-0.25** [0.082]
Program type in 2016-17 (pull-out is reference)					
Co-teaching	0.17 [0.087]	0.050 [0.043]	0.029 [0.041]	0.051 [0.047]	0.046 [0.049]
Dual language	0.12 [0.077]	0.0038 [0.045]	-0.031 [0.052]	-0.16* [0.068]	-0.069 [0.068]
ELD class period	0.085 [0.083]	-0.077 [0.051]	-0.00059 [0.058]	-0.086 [0.043]	-0.035 [0.070]
Student characteristics					
Spanish home language	-0.34 [0.24]	-0.16 [0.13]	-0.19 [0.10]	-0.063 [0.11]	-0.19 [0.15]
Federal lunch program	-0.085 [0.13]	-0.18* [0.075]	-0.16* [0.061]	-0.19* [0.081]	-0.090 [0.055]
Male	-0.036 [0.044]	-0.022 [0.033]	-0.046 [0.030]	-0.035 [0.040]	-0.17*** [0.031]
Attendance rate in 2016-17	-0.0039 [0.0074]	0.00010 [0.0041]	-0.000010 [0.0036]	0.011** [0.0038]	0.0037 [0.0040]
Prior performance					
2015-16 assessments	0.55*** [0.049]	0.55*** [0.023]	0.58*** [0.019]	0.42*** [0.026]	0.37*** [0.026]
ELP level in 2015-16	0.52** [0.15]	0.18* [0.075]	0.21** [0.062]	0.37*** [0.092]	0.35*** [0.079]
Regression data					
Constant	0.19 [0.74]	0.31 [0.39]	0.32 [0.38]	-0.87* [0.40]	0.022 [0.41]
Observations	522	1,883	1,883	1,883	1,883
R-squared	0.420	0.452	0.520	0.381	0.307

*Significant at $p < 0.05$, ** significant at $p < 0.01$, *** significant at $p < 0.001$.

Note: Robust standard errors in brackets.

Source: Education Northwest's analysis of 2015-16 and 2016-17 ELL student data from Beaverton School District.

Table A5. Regression results from elementary ELL students using constant output for minutes

	Standardized 2016-17 assessment outcomes				
	SBAC ELA	ELPA21 Reading	ELPA21 Writing	ELPA21 Listening	ELPA21 Speaking
Minutes in 2016-17	0.0012 [0.0028]	-0.0041*** [0.00062]	-0.0026*** [0.00052]	-0.0036*** [0.00071]	-0.0041** [0.0012]
Race (white is reference)					
Hispanic	0.042 [0.23]	-0.092 [0.12]	-0.061 [0.097]	-0.079 [0.13]	-0.053 [0.15]
Asian Pacific Islander	0.16 [0.19]	0.12 [0.076]	0.032 [0.065]	0.074 [0.075]	-0.0092 [0.064]
Other Race	-0.32* [0.12]	-0.30** [0.10]	-0.30** [0.086]	-0.25* [0.10]	-0.25** [0.083]
Program type in 2016-17 (pull-out is reference)					
Co-teaching	0.15 [0.092]	0.072 [0.043]	0.045 [0.040]	0.070 [0.048]	0.075 [0.050]
Dual language	0.12 [0.067]	-0.027 [0.042]	-0.049 [0.050]	-0.19** [0.064]	-0.097 [0.060]
ELD class period	0.091 [0.084]	-0.084 [0.049]	-0.0050 [0.058]	-0.092* [0.043]	-0.042 [0.070]
Student characteristics					
Spanish home language	-0.35 [0.23]	-0.15 [0.14]	-0.18 [0.10]	-0.054 [0.12]	-0.18 [0.15]
Federal lunch program	-0.083 [0.13]	-0.18* [0.074]	-0.16* [0.061]	-0.19* [0.079]	-0.095 [0.053]
Male	-0.037 [0.044]	-0.021 [0.033]	-0.046 [0.029]	-0.035 [0.039]	-0.17*** [0.030]
Attendance rate in 2016-17	-0.0042 [0.0073]	0.00042 [0.0042]	0.00019 [0.0037]	0.011** [0.0038]	0.0040 [0.0041]
Prior performance					
2015-16 assessments	0.55*** [0.048]	0.55*** [0.023]	0.58*** [0.019]	0.42*** [0.026]	0.37*** [0.026]
ELP Level in 2015-16	0.51** [0.15]	0.17* [0.080]	0.21** [0.063]	0.36*** [0.093]	0.34*** [0.085]
Regression data					
Constant	0.17 [0.73]	0.42 [0.39]	0.39 [0.38]	-0.78 [0.41]	0.13 [0.43]
Observations	522	1,883	1,883	1,883	1,883
R-squared	0.421	0.452	0.521	0.381	0.309

*Significant at $p < 0.05$, ** significant at $p < 0.01$, *** significant at $p < 0.001$.

Note: Robust standard errors in brackets.

Source: Education Northwest's analysis of 2015-16 and 2016-17 ELL student data from Beaverton School District.

Regression results examining minutes of ELD instruction among secondary school ELL students

We used the same regression models among secondary students to examine the relationship of minutes of ELD instruction to assessment outcomes. Using the categorical output model, we found that secondary ELL students who received 50 minutes or more of ELD instruction had significantly lower English language proficiency scores in reading compared to students who had less than the average amount of ELD instruction (table A6).

The constant output model found that among ELL students in secondary grades, more minutes of ELD instruction were significantly and negatively correlated with reading and writing performance on the ELPA21 English language proficiency assessment (table A7).

Table A6. Regression results from secondary ELL students using categorical output for minutes

	Standardized 2016-17 assessment outcomes				
	SBAC ELA	ELPA21 Reading	ELPA21 Writing	ELPA21 Listening	ELPA21 Speaking
50 minutes or more	0.017 [0.095]	-0.11 [0.059]	-0.13* [0.057]	-0.079 [0.059]	-0.025 [0.078]
Race (white is reference)					
Hispanic	-0.64* [0.28]	-0.36 [0.30]	-0.62* [0.28]	-0.36 [0.29]	-0.49 [0.39]
Asian/Pacific Islander	-0.13 [0.13]	-0.17* [0.084]	-0.19* [0.080]	-0.15 [0.083]	-0.19 [0.11]
Other race	-0.17 [0.18]	-0.31** [0.11]	-0.37*** [0.11]	-0.31** [0.11]	-0.10 [0.15]
Student data					
ELD program	0.23** [0.074]	0.19** [0.067]	0.21** [0.064]	0.20** [0.066]	0.27** [0.088]
Spanish home language	0.57* [0.28]	0.26 [0.29]	0.47 [0.28]	0.29 [0.29]	0.30 [0.38]
Federal lunch program	-0.28* [0.12]	-0.33*** [0.072]	-0.17* [0.068]	-0.23** [0.072]	-0.36*** [0.093]
Male	-0.21*** [0.058]	-0.061 [0.049]	-0.14** [0.047]	-0.094 [0.049]	-0.20** [0.064]
Attendance rate in 2016-17	0.016* [0.0065]	0.0084** [0.0031]	0.0081** [0.0029]	0.012*** [0.0030]	0.0097* [0.0040]
Grade (Grade 6 is reference)					
Grade 7	0.10 [0.087]	-0.0094 [0.068]	-0.028 [0.065]	0.023 [0.068]	0.10 [0.089]
Grade 8	0.052 [0.13]	0.079 [0.077]	0.030 [0.074]	0.062 [0.077]	0.039 [0.10]
Grade 9		-0.045 [0.093]	-0.035 [0.088]	0.0055 [0.092]	0.19 [0.12]
Grade 10		-0.063 [0.096]	0.015 [0.091]	-0.0030 [0.095]	0.10 [0.13]
Grade 11	0.043 [0.099]	-0.11 [0.11]	-0.13 [0.10]	-0.056 [0.11]	0.048 [0.14]
Grade 12	0.66** [0.20]	-0.13 [0.098]	-0.12 [0.093]	-0.15 [0.097]	-0.10 [0.13]
Prior performance					
2015-16 assessments	0.55*** [0.043]	0.63*** [0.033]	0.60*** [0.034]	0.59*** [0.036]	0.40*** [0.041]
ELP Level in 2015-16	0.47*** [0.10]	0.091 [0.090]	0.035 [0.098]	0.10 [0.10]	0.25* [0.12]
Regression data					
Constant	-1.32* [0.57]	-0.40 [0.32]	-0.24 [0.31]	-0.79* [0.32]	-0.46 [0.42]
Observations	378	571	571	571	571
R-squared	0.465	0.629	0.623	0.622	0.369

*Significant at $p < 0.05$, ** significant at $p < 0.01$, *** significant at $p < 0.001$.

Note: Robust standard errors in brackets.

Source: Education Northwest's analysis of 2015-16 and 2016-17 ELL student data from Beaverton School District.

Table A7. Regression results from secondary ELLs using constant output for minutes

	Standardized 2016-17 assessment outcomes				
	SBAC ELA	ELPA21 Reading	ELPA21 Writing	ELPA21 Listening	ELPA21 Speaking
50 minutes or more	-0.0025 [0.0028]	-0.0028* [0.0014]	-0.0039** [0.0013]	-0.0021 [0.0014]	-0.0013 [0.0018]
Race (white is reference)					
Hispanic	-0.61* [0.25]	-0.33 [0.30]	-0.58* [0.28]	-0.33 [0.29]	-0.47 [0.39]
Asian/Pacific Islander	-0.15 [0.13]	-0.17* [0.084]	-0.19* [0.080]	-0.15 [0.083]	-0.19 [0.11]
Other race	-0.19 [0.18]	-0.30** [0.11]	-0.36** [0.11]	-0.31** [0.11]	-0.10 [0.15]
Student data					
ELD program	0.22** [0.067]	0.19** [0.067]	0.20** [0.063]	0.20** [0.066]	0.27** [0.087]
Spanish home language	0.52* [0.24]	0.24 [0.29]	0.43 [0.28]	0.27 [0.29]	0.28 [0.38]
Federal lunch program	-0.27* [0.12]	-0.33*** [0.072]	-0.18** [0.068]	-0.24*** [0.072]	-0.36*** [0.093]
Male	-0.21*** [0.058]	-0.064 [0.049]	-0.14** [0.047]	-0.096* [0.049]	-0.20** [0.064]
Attendance rate in 2016-17	0.016* [0.0065]	0.0084** [0.0031]	0.0083** [0.0029]	0.012*** [0.0030]	0.0098* [0.0040]
Grade (Grade 6 is reference)					
Grade 7	0.11 [0.084]	-0.012 [0.068]	-0.032 [0.065]	0.021 [0.068]	0.10 [0.089]
Grade 8	0.061 [0.13]	0.088 [0.077]	0.043 [0.074]	0.069 [0.077]	0.044 [0.10]
Grade 9		-0.040 [0.093]	-0.021 [0.088]	0.011 [0.092]	0.20 [0.12]
Grade 10		-0.056 [0.096]	0.032 [0.092]	0.0044 [0.096]	0.11 [0.13]
Grade 11	0.081 [0.086]	-0.098 [0.11]	-0.11 [0.10]	-0.048 [0.11]	0.058 [0.14]
Grade 12	0.63** [0.21]	-0.12 [0.098]	-0.10 [0.094]	-0.15 [0.098]	-0.090 [0.13]
Prior performance					
2015-16 assessments	0.54*** [0.043]	0.63*** [0.032]	0.60*** [0.034]	0.59*** [0.036]	0.40*** [0.041]
ELP Level in 2015-16	0.40** [0.14]	0.064 [0.095]	-0.013 [0.10]	0.081 [0.11]	0.22 [0.13]
Regression data					
Constant	-1.13 [0.58]	-0.25 [0.33]	-0.024 [0.32]	-0.68* [0.33]	-0.38 [0.43]
Observations	378	571	571	571	571
R-squared	0.467	0.629	0.625	0.622	0.369

*Significant at $p < 0.05$, ** significant at $p < 0.01$, *** significant at $p < 0.001$.

Note: Robust standard errors in brackets.

Source: Education Northwest's analysis of 2015-16 and 2016-17 ELL student data from Beaverton School District.

Regression results examining ELD program models and English language proficiency outcomes

We conducted two different kinds of analysis to account for ELL students who changed their ELD program model. The first, intent-to-treat, analyzed the relationship of each student's 2016-17 ELD program model regardless of whether they changed program models the next year. This analysis ignores the impact of the second program (table A8).

The second method, average treatment effects on the treated, excluded the students who changed ELD program model from the analysis. This analysis only examines the effect of ELD program models on ELL students who remained in the same program model in both years. This model has substantially fewer students in the sample (1,738 compared to 3,263) and may not have the statistical power to differentiate effect from chance (table A9). Even though there were some differences between the two analyses, we found that the trends remained the same and that students in dual language and co teaching outperformed their peers in pull-out in both analyses.

Table A8. English language proficiency regression results from elementary ELD program models with intent-to-treat analysis model

	SBAC ELA	Standardized 2017-18 assessment outcomes			
		ELPA21 Reading	ELPA21 Writing	ELPA21 Speaking	ELPA21 Listening
Program model in 2016-17 (pull-out is reference)					
Co-teaching	-0.460** [0.00182]	-0.171*** [1.13e-06]	-0.204*** [5.10e-09]	-0.111** [0.00273]	-0.152*** [2.46e-05]
Dual language	-0.390* [0.0281]	-0.332*** [0]	-0.476*** [0]	-0.389*** [0]	-0.364*** [0]
Waived services	1.046** [0.00245]	0.460*** [1.92e-05]	0.469*** [1.02e-05]	0.600*** [1.12e-07]	0.394*** [0.000236]
Interaction effects					
Co-teaching and grade level	0.121** [0.00145]	0.0559*** [3.47e-05]	0.0689*** [2.48e-07]	0.0188 [0.184]	0.0461*** [0.000877]
Dual language and grade level	0.0707 [0.122]	0.0584** [0.00104]	0.0852*** [1.34e-06]	0.0620*** [0.000912]	0.0386* [0.0353]
Waived services and grade level	-0.180* [0.0347]	-0.0249 [0.484]	-0.0321 [0.364]	-0.0888* [0.0174]	-0.0627 [0.0767]
Race/ethnicity (white is reference)					
American Indian/Alaska Native	-0.410 [0.0941]	-0.285 [0.181]	-0.390 [0.0643]	0.0789 [0.724]	-0.231 [0.293]
Asian	0.0980 [0.0714]	0.162*** [1.29e-05]	0.157*** [2.00e-05]	-0.0420 [0.282]	0.0910* [0.0168]
Black	-0.0991 [0.227]	-0.169** [0.00749]	-0.261*** [3.18e-05]	-0.0662 [0.319]	-0.137* [0.0343]
Pacific Islander	-0.0340 [0.842]	-0.0562 [0.629]	-0.00445 [0.969]	-0.0988 [0.419]	-0.0933 [0.437]
Multiracial	-0.0380 [0.774]	0.280** [0.00231]	0.221* [0.0153]	0.259** [0.00733]	0.321*** [0.000653]
Latino	0.00881 [0.847]	0.0354 [0.281]	-0.0349 [0.283]	0.000365 [0.992]	0.0941** [0.00530]

Table A8. Continued

	SBAC ELA	Standardized 2017-18 assessment outcomes			
		ELPA21 Reading	ELPA21 Writing	ELPA21 Speaking	ELPA21 Listening
Student characteristics					
Female	0.0501* [0.0499]	0.141*** [0]	0.116*** [8.66e-10]	0.167*** [0]	0.0875*** [7.87e-06]
Grade level	-0.0683* [0.0188]	0.0562*** [4.32e-07]	0.0286** [0.00921]	0.00775 [0.507]	0.0255* [0.0256]
Federal lunch program	-0.127*** [0.000828]	-0.0154 [0.563]	-0.0143 [0.587]	0.0818** [0.00344]	0.0414 [0.128]
Attendance in 2017-18	0.0139*** [4.8e-07]	0.0202*** [0]	0.0216*** [0]	0.0170*** [0]	0.0217*** [0]
Time in EL program	-0.0957*** [0]	-0.112*** [0]	-0.0774*** [0]	-0.0223* [0.0117]	-0.0575*** [0]
Special education	-0.469*** [0]	-0.558*** [0]	-0.652*** [0]	-0.497*** [0]	-0.577*** [0]
Interrupted formal education	-0.701*** [0]	-1.006*** [0]	-1.044*** [0]	-0.842*** [0]	-0.928*** [0]
Migrant program	-0.124 [0.0514]	-0.0943 [0.0585]	-0.0854 [0.0832]	-0.0683 [0.192]	-0.0657 [0.198]
At or above the 97th percentile in reading	0.959** [0.00298]	0.937*** [0.000558]	0.927*** [0.000556]	0.447 [0.117]	0.497 [0.0760]
At or above the 97th percentile in math	0.699*** [4.82e-05]	1.102*** [5.87e-11]	0.952*** [1.09e-08]	0.893*** [7.12e-07]	1.110*** [1.67e-10]
Regression data					
Constant	-0.951*** [0.000941]	-1.636*** [0]	-1.735*** [0]	-1.560*** [0]	-1.918*** [0]
Observations	3,263	8,954	8,949	8,957	9,053
R-squared	0.199	0.148	0.165	0.081	0.107

*Significant at $p < 0.05$, ** significant at $p < 0.01$, *** significant at $p < 0.001$.

Note: Robust standard errors in brackets.

Source: Education Northwest's analysis of 2015-16 to 2017-18 ELL student data from Beaverton School District.

Table A9. English language proficiency regression results from elementary ELD program models with average-treatment-effect-on-treated analysis model

	Standardized 2017-18 Assessment Outcomes				
	SBAC ELA	ELPA21 Reading	ELPA21 Writing	ELPA21 Speaking	ELPA21 Listening
Program Model in 2016-17 and 2017-18 (pull-out is category)					
Co-teaching	-0.120 [0.558]	-0.0784 [0.0948]	-0.155*** [0.000775]	-0.0398 [0.421]	-0.0748 [0.122]
Dual language	0.0957 [0.708]	-0.210** [0.00123]	-0.358*** [2.33e-08]	-0.376*** [4.40e-08]	-0.305*** [6.08e-06]
Waived Services	1.160* [0.0171]	0.565*** [1.10e-05]	0.556*** [1.04e-05]	0.678*** [5.00e-07]	0.411** [0.00114]
Interaction Effects					
Co-teaching and Grade Level	0.0292 [0.593]	0.0124 [0.511]	0.0410* [0.0267]	-0.0193 [0.330]	0.00180 [0.926]
Dual language and Grade Level	-0.0271 [0.686]	0.0321 [0.192]	0.0589* [0.0151]	0.0506 [0.0511]	0.0202 [0.428]
Waived Services and Grade Level	-0.292* [0.0168]	-0.159*** [0.000420]	-0.164*** [0.000217]	-0.216*** [5.00e-06]	-0.202*** [5.24e-06]

Table A9, Continued

	SBAC ELA	Standardized 2017-18 Assessment Outcomes			
		ELPA21 Reading	ELPA21 Writing	ELPA21 Speaking	ELPA21 Listening
Race/Ethnicity (White is reference)					
American Indian/Alaska Native	-0.198 [0.634]	-0.597* [0.0426]	-0.523 [0.0707]	-0.288 [0.353]	-0.530 [0.0835]
Asian	0.187* [0.0169]	0.157** [0.00151]	0.179*** [0.000223]	-0.0748 [0.150]	0.0701 [0.168]
Black	0.0548 [0.635]	-0.213** [0.00621]	-0.324*** [2.26e-05]	-0.0693 [0.398]	-0.146 [0.0695]
Pacific Islander	-0.0202 [0.931]	0.0154 [0.919]	0.195 [0.189]	-0.248 [0.119]	-0.0639 [0.684]
Multiracial	0.0206 [0.911]	0.264* [0.0328]	0.270* [0.0262]	0.319* [0.0145]	0.386** [0.00221]
Latino	0.0720 [0.277]	0.0482 [0.263]	0.0241 [0.569]	0.0162 [0.721]	0.131** [0.00319]
Student Characteristics					
Female	0.0190 [0.581]	0.125*** [1.39e-07]	0.1000*** [1.83e-05]	0.168*** [0]	0.0612* [0.0127]
Grade Level	0.0191 [0.663]	0.107*** [0]	0.0766*** [8.45e-07]	0.0632*** [0.000148]	0.0810*** [7.55e-07]
Federal Lunch Program	-0.152** [0.00499]	-0.0398 [0.250]	-0.0289 [0.395]	0.0621 [0.0883]	0.0254 [0.476]
Attendance in 2017-18	0.0103** [0.00820]	0.0144*** [1.36e-08]	0.0167*** [0]	0.0129*** [1.50e-06]	0.0176*** [0]
Time in EL Program	-0.0845*** [3.08e-08]	-0.133*** [0]	-0.101*** [0]	-0.0526*** [4.71e-05]	-0.0832*** [5.51e-11]
Special Education	-0.464*** [0]	-0.545*** [0]	-0.672*** [0]	-0.503*** [0]	-0.563*** [0]
Interrupted formal education	-0.702*** [3.44e-10]	-1.264*** [0]	-1.331*** [0]	-1.193*** [0]	-1.258*** [0]
Migrant program	-0.215** [0.00932]	-0.145* [0.0179]	-0.152* [0.0117]	-0.0877 [0.172]	-0.112 [0.0767]
At or above the 97th percentile in reading	0.702 [0.163]	1.039** [0.00501]	0.780* [0.0319]	0.417 [0.284]	0.362 [0.347]
At or above the 97th percentile in math	0.673** [0.00499]	1.071*** [3.42e-06]	0.831*** [0.000244]	0.880*** [0.000286]	1.014*** [2.28e-05]
Regression data					
Constant	-1.077** [0.00964]	-1.161*** [1.85e-06]	-1.357*** [1.59e-08]	-1.197*** [3.32e-06]	-1.582*** [2.00e-10]
Observations	1,738	4,938	4,933	4,935	4,999
R-squared	0.160	0.152	0.180	0.100	0.119

*Significant at $p < 0.05$, ** significant at $p < 0.01$, *** significant at $p < 0.001$.

Note: Robust standard errors in brackets.

Source: Education Northwest's analysis of 2015-16 to 2017-18 ELL student data from Beaverton School District.

Regression results examining ELD program models and English language arts outcomes

We conducted two different kinds of analysis to examine the relationship of ELD program models to outcomes on the 2017-18 Smarter Balanced English language arts outcomes. The first used propensity score matching to create comparison groups among students who appear equally likely be in the same ELD program model (table A10). The second analysis controlled for differences, rather than matching students (table A11). Both analyses found that students in dual language significantly outperformed students in pull-out on the 2017-18 Smarter Balanced English language arts outcomes.

Table A10. English language arts regression results from elementary ELD program models using propensity score matching

Program model	Standardized 2017-18 assessment outcomes		
	Co-teaching and Pull-out	Dual language and Pull-out	Co-teaching and Dual language
Co-teaching	0.0627 [0.596]		-0.197 [0.114]
Dual language		0.322* [0.0290]	
Race/ethnicity (white is reference)			
Asian	0.586* [0.0176]	0.564 [0.165]	0.207 [0.668]
Black	0.0431 [0.904]	0.289 [0.599]	-0.129 [0.769]
Pacific Islander	0.199 [0.793]		0.0924 [0.902]
Multiracial	0.430 [0.575]	-0.647 [0.366]	-0.690 [0.365]
Latino	0.322 [0.425]	0.0416 [0.911]	0.366 [0.239]
Student characteristics			
Female	0.155 [0.251]	-0.0636 [0.659]	-0.0704 [0.532]
Migrant program	0.265 [0.293]	-0.150 [0.621]	-0.0834 [0.744]
Special education	-0.482*** [0.000256]	-0.734*** [6.98e-05]	-0.509*** [0.000920]
At or above the 97th percentile in math	1.194 [0.118]	0.292 [0.452]	0.190 [0.651]
Attendance grade	0.0246* [0.0480]	-0.00225 [0.897]	0.0274* [0.0299]
Federal lunch program	0.0852 [0.622]	0.332 [0.498]	0.0243 [0.961]
Regression data			
Propensity score	-0.543 [0.610]	0.0992 [0.840]	1.001 [0.198]
Constant	-2.968* [0.0150]	-0.770 [0.650]	-3.878* [0.0112]
Observations	202	104	165
R-squared	0.154	0.282	0.140

*Significant at $p < 0.05$, ** significant at $p < 0.01$, *** significant at $p < 0.001$.

Note: Robust standard errors in brackets.

Source: Education Northwest's analysis of 2015-16 to 2017-18 ELL student data from Beaverton School District.

Table A11. English language arts regression results from elementary ELD program models

Program Model	Standardized 2017-18 Assessment Outcomes			
	All ELD Program Models	Co-teaching and Pull-out	Dual Language and Pull-out	Dual Language and Co-teaching
Co-teaching	0.0517 [0.627]	0.0410 [0.707]		-0.204 [0.0844]
Dual language	0.259 [0.0545]		0.290* [0.0421]	
Waived services	0.639*** [4.50e-05]			
Race/Ethnicity (white is reference)				
Asian	0.487 [0.0573]	0.476 [0.0947]	0.391 [0.319]	0.617 [0.143]
Black	-0.0985 [0.660]	-0.133 [0.580]	0.00801 [0.983]	-0.0657 [0.830]
Pacific Islander	0.250 [0.202]	0.344 [0.112]		0.304 [0.289]
Multiracial	-0.436 [0.132]	-0.142 [0.495]	-0.744 [0.110]	-0.896** [0.00540]
Latino	0.466 [0.454]	0.483 [0.471]	-0.592 [0.0833]	1.466*** [1.64e-07]
Student Characteristics				
Female	0.00596 [0.944]	0.0654 [0.505]	-0.0655 [0.614]	-0.0227 [0.824]
Migrant program	0.0522 [0.815]	0.252 [0.244]	-0.124 [0.738]	-0.0996 [0.719]
Special Education	-0.414** [0.00471]	-0.365* [0.0277]	-0.537* [0.0116]	-0.328 [0.0735]
At or above the 97th percentile in math	0.520 [0.104]	1.369*** [9.57e-05]	0.286 [0.337]	0.512 [0.130]
Spanish Home Language	-0.470 [0.457]	-0.525 [0.442]	0.447* [0.0376]	-1.309** [0.00118]
Attendance Grade	0.0174 [0.105]	0.0214 [0.0743]	0.000271 [0.988]	0.0200 [0.0899]
Federal Lunch Program	0.00316 [0.984]	0.0815 [0.648]	0.00259 [0.994]	0.0825 [0.673]
Student Prior Achievement				
ELPA21 Reading Baseline	0.108 [0.0686]	0.162* [0.0167]	0.0890 [0.490]	0.0530 [0.457]
ELPA21 Writing Baseline	0.0210 [0.706]	-0.0185 [0.765]	0.0580 [0.533]	0.0449 [0.499]
ELPA21 Speaking Baseline	0.128 [0.0531]	0.133 [0.109]	0.129 [0.206]	0.168* [0.0268]
Regression data				
Constant	-2.146* [0.0358]	-2.598* [0.0237]	-0.329 [0.854]	-2.343* [0.0415]
Observations	268	206	125	189
R-squared	0.219	0.203	0.237	0.197

*Significant at $p < 0.05$, ** significant at $p < 0.01$, *** significant at $p < 0.001$.

Note: Robust standard errors in brackets.

Source: Education Northwest's analysis of 2015-16 to 2017-18 ELL student data from Beaverton School District.

We could not analyze the impact of ELD program models in secondary grades

We were unable to reliably compare ELD program models in grades 6–12. This is because only one program model—ELD class period—was clearly defined and had a substantial number and percentage of students participating in both years. Among the other secondary ELD program models:

- Dual language had too few secondary students, with only 54 students participating in both 2016-17 and 2017-18.
- Secondary ELL students whose parents waived ELD services were a substantially different student population than in other program models. For example, more than two-thirds (69%) of students whose parents waived ELD services qualified for special education, compared to less than a third (28%) of students in ELD class period programs who had special education status.
- One in 10 secondary ELL students participated in combinations of ELD class period with co-teaching and pull-out, and only 15 percent of these students had the same combination in both 2016-17 and 2017-18.