

Multitudes v3 (2024/25) Prediction Models

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2025-08-02

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1 Preliminaries

Cautionary Note

This document is WORK IN PROGRESS and will be updated as new data (e.g., additional demographic information, score database updates/fixes) become available.

To Do

- ~~recompute scores for universal screening tasks with updated 2025 item parameters once available~~
- ~~filter out implausible RAN score~~
- ~~add 23/24 data~~
- ~~align grades between years~~
- ~~align tasknames between years~~
- ~~re-run 23/24 models~~
- ~~run 24/25 models~~
- ~~run combined model~~
- ~~run two-year prediction models (K-G2)~~
- ~~recompute scores for remaining tasks with updated 2025 item parameters once available~~
- ~~isolate pooled models (pooled coefficients) for English model evaluations with 24/25 data~~
- as per decision in data meeting on 2025-07-25
 - ~~use combined (23/24 and 24/25) data for Spanish model~~
 - ~~check ELPD distribution for English samples to determine whether to use combined or only 23/24 data for English models~~

2 ENGLISH MODELS

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2.1 Sample

Table 1: Demographic Characteristics of the English Model Building and Evaluation Samples by Grade

Characteristic	AY 23/24			AY 24/25		
	K N = 650	G1 N = 515	G2 N = 663	K N = 435	G1 N = 552	G2 N = 330
Gender						
Female	331 (51%)	240 (47%)	331 (50%)	180 (47%)	289 (55%)	144 (46%)
Male	319 (49%)	275 (53%)	330 (50%)	202 (53%)	233 (45%)	170 (54%)
Unknown	0	0	2	53	30	16
Race						
Asian	81 (13%)	65 (13%)	65 (9.9%)	24 (7.8%)	47 (9.6%)	33 (10%)
Black/African American	85 (14%)	53 (10%)	95 (14%)	41 (13%)	65 (13%)	40 (12%)
Not reported	136 (22%)	94 (18%)	134 (20%)	51 (17%)	100 (20%)	40 (12%)
Other	88 (15%)	71 (14%)	80 (12%)	34 (11%)	57 (12%)	34 (11%)
White	215 (36%)	229 (45%)	282 (43%)	159 (51%)	219 (45%)	175 (54%)
Unknown	45	3	7	126	64	8
Ethnicity						
Hispanic/Latin(o/a)	350 (55%)	255 (50%)	357 (54%)	295 (81%)	416 (77%)	228 (70%)
Not Hispanic/Latin(o/a)	289 (45%)	258 (50%)	301 (46%)	71 (19%)	124 (23%)	98 (30%)
Unknown	11	2	5	69	12	4
ELPD						
EL	146 (24%)	85 (17%)	117 (19%)	212 (59%)	238 (48%)	119 (38%)
EO	395 (66%)	379 (75%)	451 (72%)	123 (34%)	211 (43%)	155 (50%)
EP	37 (6.2%)	43 (8.5%)	55 (8.8%)	19 (5.2%)	37 (7.5%)	36 (12%)
TBD	20 (3.3%)	1 (0.2%)	1 (0.2%)	8 (2.2%)	10 (2.0%)	0 (0%)
Unknown	52	7	39	73	56	20
Ever IEP/504	43 (7.9%)	41 (9.1%)	56 (12%)	32 (9.2%)	33 (7.3%)	30 (10%)
Unknown	107	62	181	89	99	35
Home Language						
English	463 (72%)	391 (76%)	448 (72%)	156 (36%)	237 (44%)	170 (52%)
Other	63 (9.8%)	50 (9.8%)	62 (10.0%)	11 (2.6%)	16 (3.0%)	15 (4.6%)
Spanish	115 (18%)	71 (14%)	113 (18%)	261 (61%)	289 (53%)	140 (43%)
Unknown	9	3	40	7	10	5
Lg. of Instruction						
Bilingual Instruction	145 (22%)	85 (17%)	64 (9.7%)	124 (29%)	146 (27%)	95 (29%)
English Instruction	505 (78%)	430 (83%)	594 (90%)	306 (71%)	401 (73%)	232 (71%)
Unknown	0	0	5	5	5	3

2.2 Descriptives

2.2.1 Distributions of English Multitudes Tasks in Fall '23

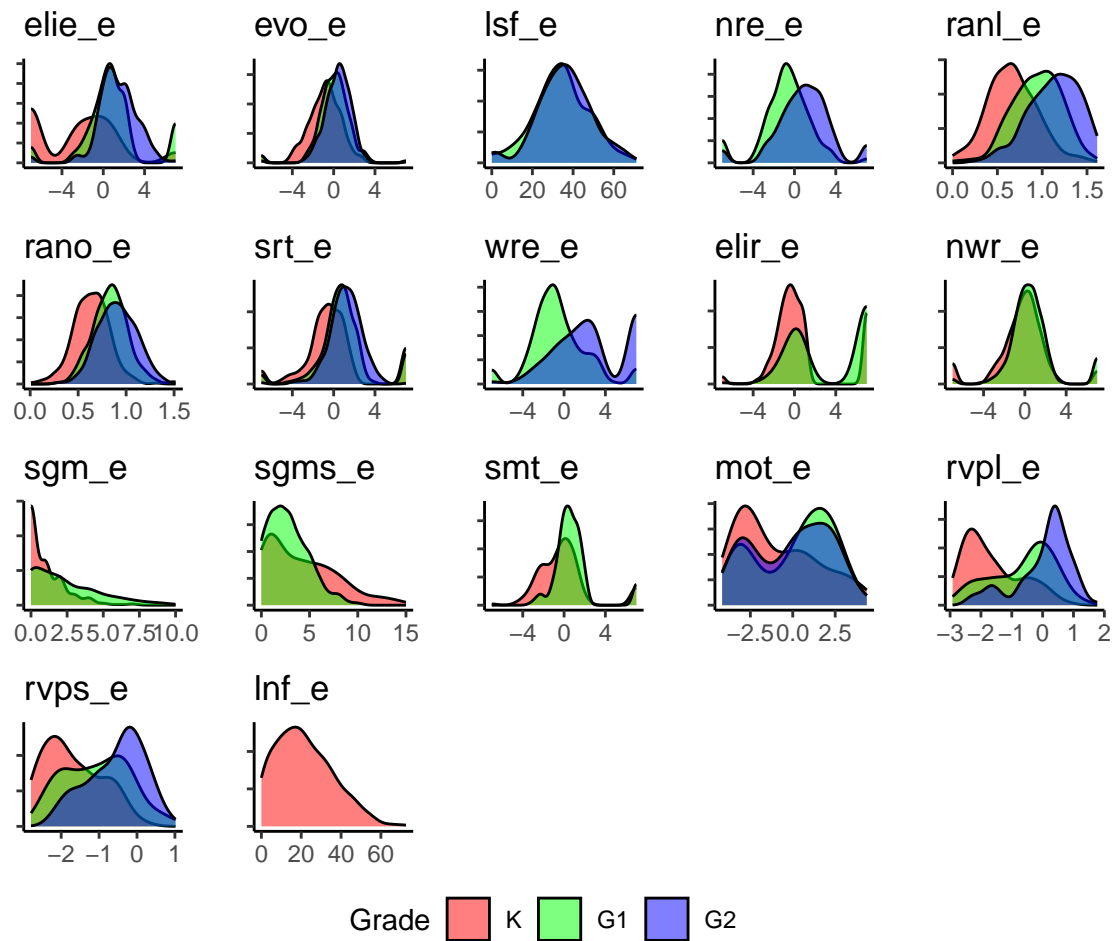


Figure 1: Distributions of English Multitudes Tasks by Grade (Fall '23)

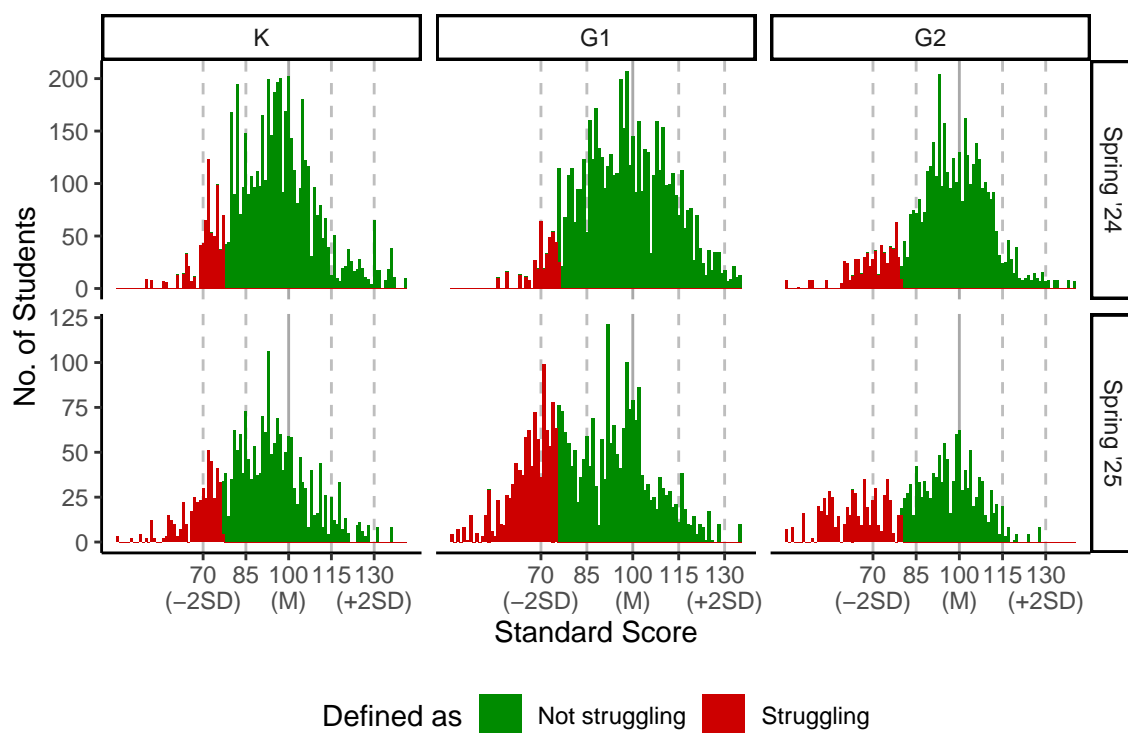


Figure 2: Distribution of Woodcock-Johnson Basic Reading Skills Cluster (for Kindergarten) Broad Reading Cluster (for Grades 1 and 2) by Grade and Language with Struggling Readers (\leq 20th Percentile) Highlighted (Spring '24 and Spring '25).

2.2.2 Distributions of English Outcome Measures (Spring '24 and Spring '25)

Table 2: Comparison of Proportions of Struggling Readers (\leq 20th Percentile) in the Study Sample Based on Overall Multitudes Sample and on Published Norms (Spring '24 and Spring '25).

Reference	Spring '24			Spring '25		
	K N = 650	G1 N = 515	G2 N = 663	K N = 435	G1 N = 552	G2 N = 330
Norm-based						
Not struggling	421 (65%)	372 (72%)	488 (74%)	228 (52%)	247 (45%)	192 (58%)
Struggling	229 (35%)	143 (28%)	175 (26%)	207 (48%)	305 (55%)	138 (42%)
Sample-based						
Not struggling	552 (85%)	472 (92%)	563 (85%)	332 (76%)	354 (64%)	229 (69%)
Struggling	98 (15%)	43 (8.3%)	100 (15%)	103 (24%)	198 (36%)	101 (31%)

2.3 LOGO Cross-validated Models (2023/24 Only)

Table 3: English-to-English Prediction Models Using Data from 2023/24 AY Only.

Grade	Predictors	All							EL							EO						
		n	Acc.	B.Acc.	Sens.	Spec.	Prev.	P.Prev.	n	Acc.	B.Acc.	Sens.	Spec.	Prev.	P.Prev.	n	Acc.	B.Acc.	Sens.	Spec.	Prev.	P.Prev.
K	LNF only	383	0.7362	0.7316	0.7255	0.7377	0.122	0.319	102	0.6604	0.6807	0.7143	0.6471	0.198	0.424	230	0.7328	0.7404	0.75	0.7308	0.103	0.319
K	LNF, RANO, ELIR	356	0.6778	0.7393	0.8158	0.6629	0.098	0.384	89	0.5591	0.6793	0.8462	0.5125	0.140	0.538	217	0.6941	0.7611	0.8421	0.68	0.087	0.365
K	LNF, RANO, ELIR, EVO	356	0.7036	0.7419	0.7895	0.6943	0.098	0.353	89	0.5699	0.6856	0.8462	0.525	0.140	0.527	217	0.7306	0.7334	0.7368	0.73	0.087	0.310
K	LNF, RANO, EVO	356	0.7371	0.7722	0.8158	0.7286	0.098	0.325	89	0.6022	0.7043	0.8462	0.5625	0.140	0.495	217	0.7671	0.7772	0.7895	0.765	0.087	0.283
G1	WRE only	468	0.6989	0.7836	0.8824	0.6848	0.072	0.356	74	0.6133	0.6586	0.7143	0.6029	0.093	0.427	348	0.7098	0.8088	0.9259	0.6916	0.078	0.356
G1	WRE, EVO	467	0.7089	0.8155	0.9394	0.6916	0.070	0.352	73	0.5811	0.6961	0.8333	0.5588	0.081	0.473	348	0.7241	0.8335	0.963	0.704	0.078	0.348
G1	WRE, RANO	279	0.7032	0.7712	0.8462	0.6963	0.046	0.329	39	0.5897	NA	NA	0.5897	0.000	0.410	212	0.7217	0.7799	0.8462	0.7136	0.061	0.321
G1	WRE, RANO, EVO	279	0.7067	0.8097	0.9231	0.6963	0.046	0.332	39	0.5385	NA	NA	0.5385	0.000	0.462	212	0.7311	0.8208	0.9231	0.7186	0.061	0.321
G1	WRE, RANO, LSF	274	0.7662	0.8408	0.9231	0.7585	0.047	0.273	38	0.6579	NA	NA	0.6579	0.000	0.342	208	0.7837	0.8487	0.9231	0.7744	0.062	0.269
G1	WRE, RANO, LSF, EVO	274	0.7734	0.8446	0.9231	0.766	0.047	0.266	38	0.6316	NA	NA	0.6316	0.000	0.368	208	0.7981	0.8564	0.9231	0.7897	0.062	0.255
G2	WRE only	613	0.8744	0.9083	0.957	0.8596	0.152	0.264	100	0.79	0.8419	0.9655	0.7183	0.290	0.480	433	0.8799	0.9162	0.9661	0.8663	0.136	0.247
G2	WRE, RANL	309	0.8997	0.9417	1	0.8835	0.139	0.240	45	0.8444	0.9	1	0.8	0.222	0.378	241	0.9046	0.9452	1	0.8905	0.129	0.224
G2	WRE, RANL, EVO	309	0.8867	0.8952	0.907	0.8835	0.139	0.226	45	0.7778	0.8214	0.9	0.7429	0.222	0.400	241	0.9087	0.9339	0.9677	0.9	0.129	0.212

Note. green: $\geq .8$; black: $\geq .7$; yellow: $\geq .6$; red otherwise

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2.4 LOGO Cross-validated Models (2023/24 and 2024/25 Combined)

Table 4: English-to-English Prediction Models Using Data from Both 2023/24 and 2024/25 AYs.

Grade	Predictors	All							EL							EO						
		n	Acc.	B.Acc.	Sens.	Spec.	Prev.	P.Prev.	n	Acc.	B.Acc.	Sens.	Spec.	Prev.	P.Prev.	n	Acc.	B.Acc.	Sens.	Spec.	Prev.	P.Prev.
K	LNF only	692	0.7727	0.7347	0.6777	0.7917	0.167	0.286	225	0.6856	0.7163	0.7797	0.6529	0.258	0.458	353	0.8169	0.7138	0.5714	0.8562	0.138	0.203
K	LNF, RANO, ELIR	565	0.7839	0.6934	0.5714	0.8154	0.129	0.234	137	0.6738	0.6709	0.6667	0.6752	0.170	0.383	334	0.8095	0.6815	0.5122	0.8508	0.122	0.194
K	LNF, RANO, ELIR, EVO	545	0.7591	0.6957	0.6111	0.7802	0.125	0.269	120	0.6048	0.6589	0.7368	0.581	0.153	0.468	334	0.7946	0.6835	0.5366	0.8305	0.122	0.214
K	LNF, RANO, EVO	549	0.7676	0.7111	0.6351	0.787	0.127	0.267	124	0.6484	0.694	0.7619	0.6262	0.164	0.438	334	0.7976	0.6957	0.561	0.8305	0.122	0.217
G1	WRE only	860	0.8581	0.8328	0.7895	0.876	0.207	0.262	228	0.7884	0.788	0.7865	0.7895	0.369	0.423	546	0.8723	0.8332	0.7778	0.8887	0.148	0.210
G1	WRE, EVO	776	0.8044	0.8091	0.8162	0.8021	0.166	0.301	161	0.7425	0.7752	0.8478	0.7025	0.275	0.449	546	0.8102	0.807	0.8025	0.8116	0.148	0.279
G1	WRE, RANO	614	0.7915	0.8	0.814	0.786	0.196	0.332	151	0.7516	0.7706	0.8269	0.7143	0.331	0.465	403	0.7951	0.7895	0.7812	0.7977	0.158	0.294
G1	WRE, RANO, EVO	577	0.8111	0.8032	0.7909	0.8155	0.179	0.293	122	0.7874	0.8102	0.8649	0.7556	0.291	0.425	403	0.8074	0.7841	0.75	0.8182	0.158	0.272
G1	WRE, RANO, LSF	597	0.8247	0.8071	0.7787	0.8356	0.191	0.282	142	0.7703	0.7634	0.7447	0.7822	0.318	0.385	398	0.8325	0.8054	0.7656	0.8452	0.160	0.252
G1	WRE, RANO, LSF, EVO	568	0.8562	0.8192	0.7615	0.877	0.180	0.238	119	0.8145	0.8037	0.7778	0.8295	0.290	0.347	398	0.8625	0.8106	0.7344	0.8869	0.160	0.212
G2	WRE only	861	0.863	0.8929	0.9425	0.8433	0.199	0.313	177	0.8056	0.853	0.9825	0.7236	0.317	0.500	568	0.8697	0.8946	0.9346	0.8547	0.188	0.294
G2	WRE, RANL	532	0.886	0.8989	0.9211	0.8767	0.210	0.290	102	0.8558	0.8689	0.9	0.8378	0.288	0.375	374	0.8877	0.9052	0.9351	0.8754	0.206	0.291
G2	WRE, RANL, EVO	515	0.8935	0.9053	0.9252	0.8854	0.203	0.280	89	0.9	0.9186	0.9583	0.8788	0.267	0.344	374	0.8904	0.9069	0.9351	0.8788	0.206	0.289

Note. green: $\geq .8$; black: $\geq .7$; yellow: $\geq .6$; red otherwise

3 SPANISH MODELS

3.1 Sample

Table 5: Demographic Characteristics of the Sample for the Spanish Prediction Model (N = 979) by Grade

Characteristic	K N = 407	G1 N = 308	G2 N = 257
Gender			
Female	181 (49%)	153 (53%)	140 (55%)
Male	189 (51%)	136 (47%)	116 (45%)
Unknown	37	19	1
Race			
Asian	11 (3.4%)	7 (2.6%)	6 (2.4%)
Black/African American	2 (0.6%)	0 (0%)	1 (0.4%)
Not reported	191 (60%)	134 (49%)	119 (48%)
Other	22 (6.9%)	20 (7.3%)	7 (2.8%)
White	93 (29%)	113 (41%)	116 (47%)
Unknown	88	34	8
Ethnicity			
Hispanic/Latin(o/a)	373 (96%)	295 (96%)	242 (95%)
Not Hispanic/Latin(o/a)	17 (4.4%)	11 (3.6%)	14 (5.5%)
Unknown	17	2	1
ELPD			
EL	321 (83%)	236 (80%)	186 (74%)
EO	15 (3.9%)	13 (4.4%)	26 (10%)
EP	48 (12%)	46 (16%)	38 (15%)
TBD	5 (1.3%)	1 (0.3%)	1 (0.4%)
Unknown	18	12	6
Ever IEP/504	31 (9.0%)	22 (8.8%)	13 (6.0%)
Unknown	61	58	39
Home Language			
English	33 (8.2%)	18 (5.9%)	29 (12%)
Other	4 (1.0%)	1 (0.3%)	2 (0.8%)
Spanish	365 (91%)	287 (94%)	219 (88%)
Unknown	5	2	7

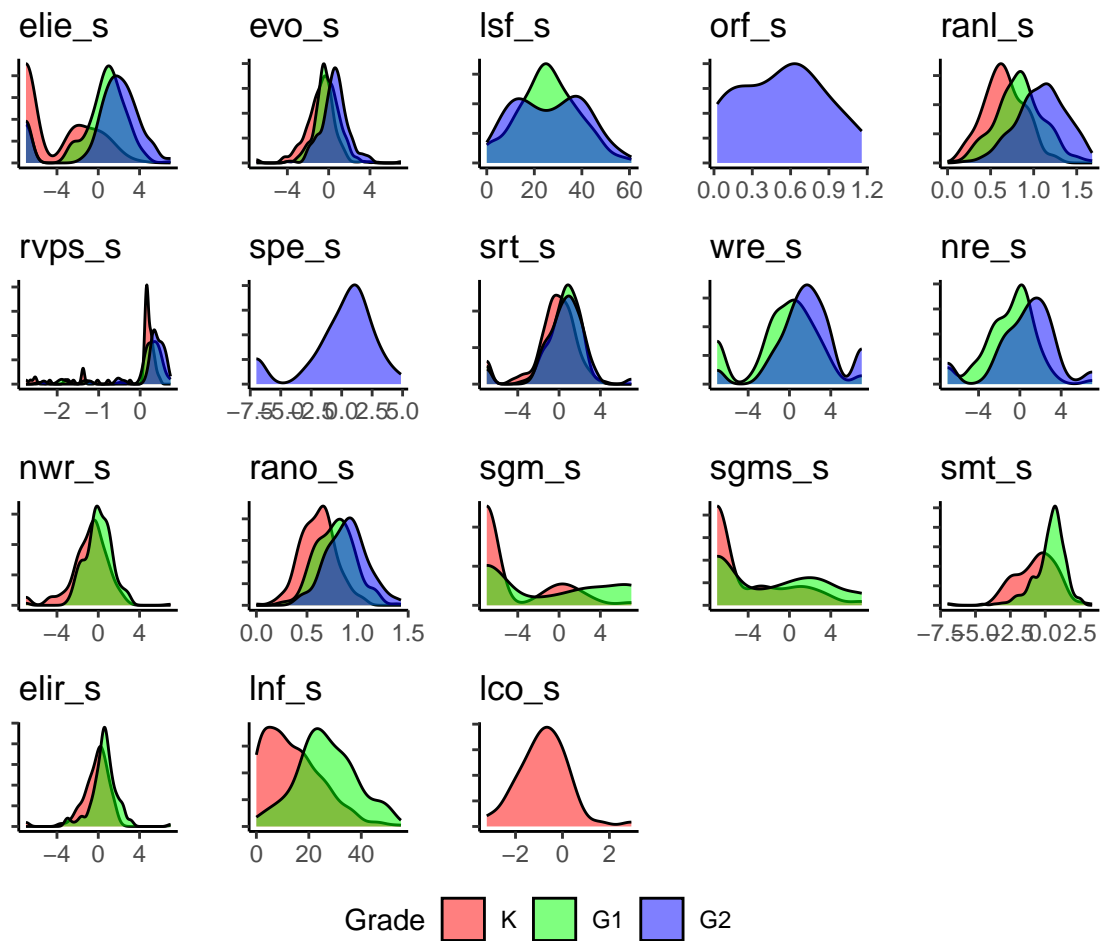


Figure 3: Distributions of Spanish Multitudes Tasks by Grade (Fall '23 & Fall '24 Combined)

3.2 Descriptives

3.2.1 Distributions of Spanish Multitudes Tasks

3.2.2 Distributions of Spanish Outcome Measures

Table 6: Comparison of Proportions of Struggling Readers (\leq 20th Percentile) in the Study Sample Based on Overall Multitudes Sample and on Norms (Spring 2024).

Reference	K N = 407	G1 N = 308	G2 N = 257
Norm-based			
Not struggling	191 (47%)	178 (58%)	138 (54%)
Struggling	216 (53%)	130 (42%)	119 (46%)
Sample-based			
Not struggling	328 (81%)	234 (76%)	194 (75%)
Struggling	79 (19%)	74 (24%)	63 (25%)

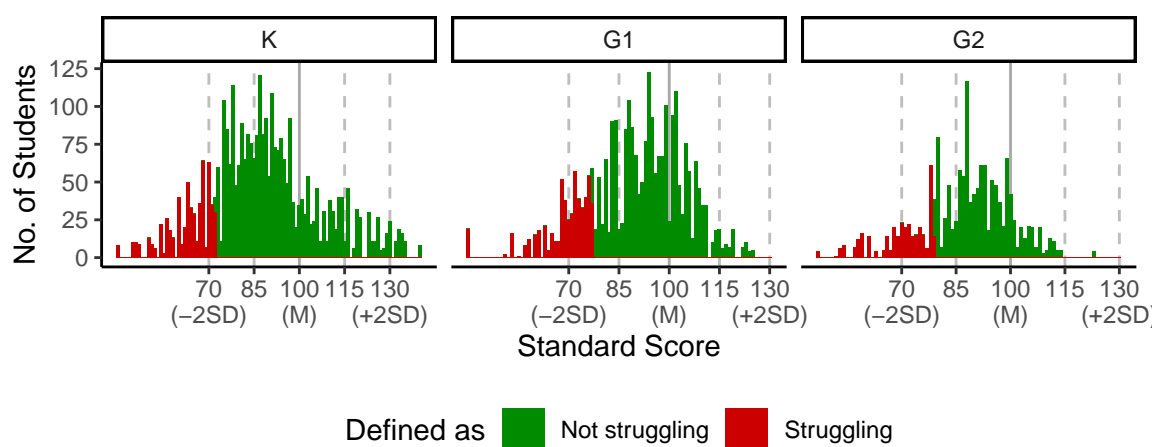


Figure 4: Distribution of Woodcock-Muñoz Basic Reading Skills Cluster (for Kindergarten) Broad Reading Cluster (for Grades 1 and 2) by Grade and Language with Struggling Readers (\leq 20th Percentile) Highlighted (Spring '24 and Spring '25 Combined).

3.3 LOGO Cross-validated Models

Table 7: Spanish-to-Spanish Prediction Models Using Data from Both 2023/24 and 2024/25 AYs.

Grade	Predictors	All						
		n	Acc.	B.Acc.	Sens.	Spec.	Prev.	P.Prev.
K	LNF only	294	0.619	0.6768	0.7609	0.5927	0.156	0.463
K	LNF, RANO, ELIR	204	0.6078	0.6226	0.6429	0.6023	0.137	0.431
K	LNF, RANO, ELIR, EVO	204	0.6667	0.5966	0.5	0.6932	0.137	0.333
K	LNF, RANO, EVO	243	0.6872	0.628	0.5484	0.7075	0.128	0.325
G1	WRE only	209	0.7943	0.8356	0.9048	0.7665	0.201	0.368
G1	WRE, RANO, LSF	129	0.8527	0.8452	0.8333	0.8571	0.186	0.271
G1	WRE, RANO, LSF, EVO	128	0.8516	0.8285	0.7917	0.8654	0.188	0.258
G2	WRE only	194	0.8608	0.8538	0.8409	0.8667	0.227	0.294
G2	WRE, RANL	147	0.8367	0.8355	0.8333	0.8376	0.204	0.299
G2	WRE, RANL, EVO	147	0.8503	0.844	0.8333	0.8547	0.204	0.286

Note. green: $\geq .8$; black: $\geq .7$; yellow: $\geq .6$; red otherwise