

Multitudes v3 (2024/25) Prediction Models

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Cautionary Note

This document is a WORK IN PROGRESS and will be updated as new data (e.g., item recalibrations, additional demographic information) 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 model
- recompute scores for remaining tasks with updated 2025 item parameters once available
- try out different definitions of risk (one/both lgs.)
- try different aggregations of tasks (max, mean, etc.) for skill-specific/language-independent predictors
- isolate final model (with pooled predictors)

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1 Step 1 - Building ‘New’ Model Based on 2023/24 Data

- using data collected in the 2023/24 academic year
- using the updated (2025) item parameters
- benefit: sample is representative of CA student population

1.1 Sample

- $N = 2701$
- 28 schools
- 15 districts

Table 1: Demographic Characteristics of the AY 23/24 Sample (N = 2,701) by Grade and Screening Language

Characteristic	English			Spanish		
	K N = 723	G1 N = 546	G2 N = 704	K N = 354	G1 N = 233	G2 N = 254
Gender						
Female	373 (52%)	257 (47%)	356 (51%)	192 (54%)	120 (52%)	141 (56%)
Male	350 (48%)	289 (53%)	346 (49%)	162 (46%)	113 (48%)	113 (44%)
Unknown	0	0	2			
Race						
Asian	86 (13%)	67 (12%)	65 (9.3%)	12 (4.0%)	3 (1.3%)	5 (2.0%)
Black/African American	92 (14%)	54 (9.9%)	98 (14%)	2 (0.7%)	0 (0%)	2 (0.8%)
Not reported	157 (23%)	110 (20%)	142 (20%)	208 (69%)	154 (68%)	149 (60%)
Other	94 (14%)	74 (14%)	85 (12%)	6 (2.0%)	7 (3.1%)	6 (2.4%)
White	245 (36%)	238 (44%)	307 (44%)	75 (25%)	62 (27%)	88 (35%)
Unknown	49	3	7	51	7	4
Ethnicity						
Hispanic/Latin(o/a)	413 (58%)	281 (52%)	383 (55%)	330 (94%)	220 (94%)	237 (93%)
Not Hispanic/Latin(o/a)	299 (42%)	263 (48%)	316 (45%)	22 (6.3%)	13 (5.6%)	17 (6.7%)
Unknown	11	2	5	2	0	0
ELPD						
EL	182 (27%)	94 (17%)	122 (19%)	267 (76%)	178 (77%)	173 (69%)
EO	416 (62%)	393 (73%)	474 (72%)	24 (6.8%)	19 (8.3%)	29 (12%)
EP	51 (7.6%)	51 (9.5%)	61 (9.3%)	42 (12%)	33 (14%)	45 (18%)
TBD	20 (3.0%)	1 (0.2%)	1 (0.2%)	18 (5.1%)	0 (0%)	2 (0.8%)
Unknown	54	7	46	3	3	5
Ever IEP/504	52 (8.6%)	43 (9.0%)	57 (11%)	31 (9.5%)	21 (9.7%)	20 (10%)
Unknown	117	69	204	26	17	60
Home Language						
English	496 (69%)	411 (76%)	472 (72%)	42 (12%)	24 (10%)	34 (14%)
Other	64 (9.0%)	51 (9.4%)	63 (9.6%)	5 (1.4%)	2 (0.9%)	4 (1.6%)
Spanish	154 (22%)	81 (15%)	122 (19%)	299 (86%)	205 (89%)	209 (85%)
Unknown	9	3	47	8	2	7

1.2 Descriptives

1.2.1 Distributions of English Multitudes Tasks

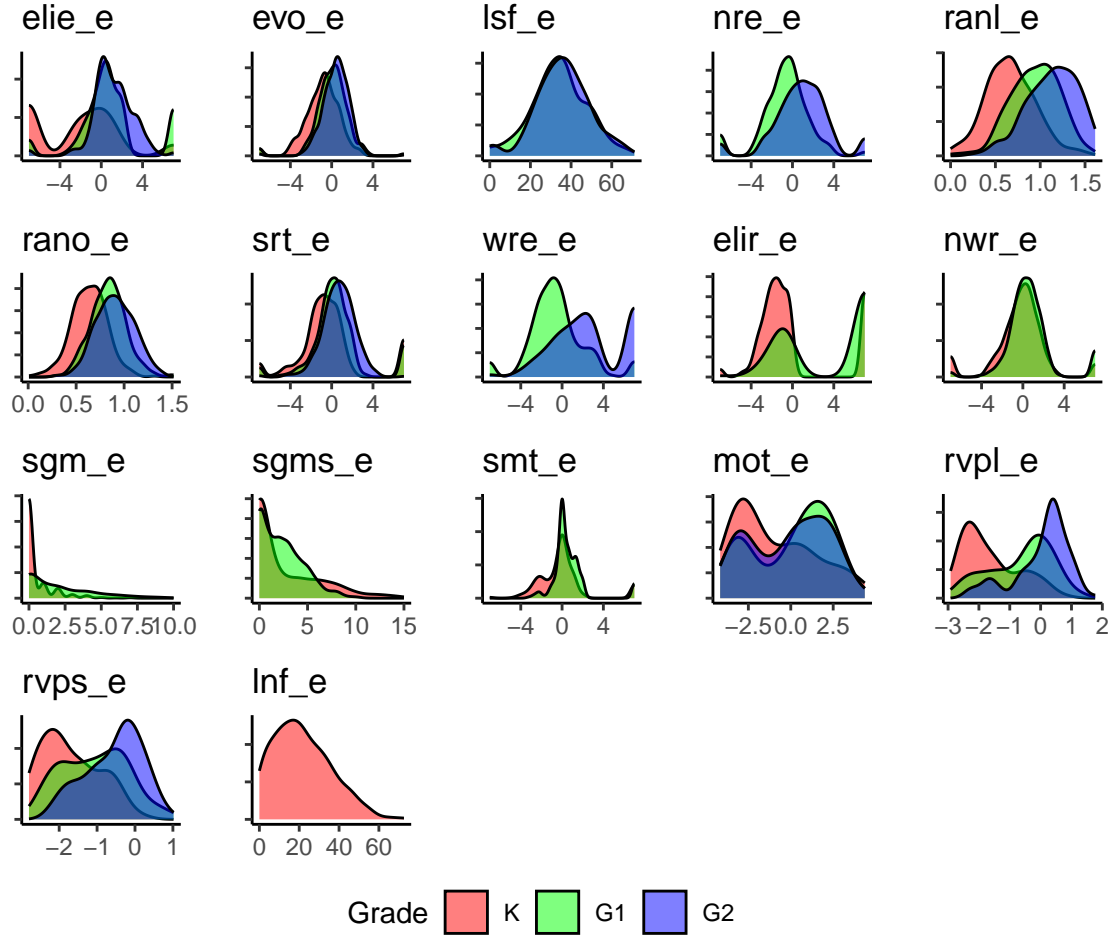


Figure 1: Distributions of English Multitudes Tasks by Grade (Fall 2023)

1.2.2 Distributions of Spanish Multitudes Tasks

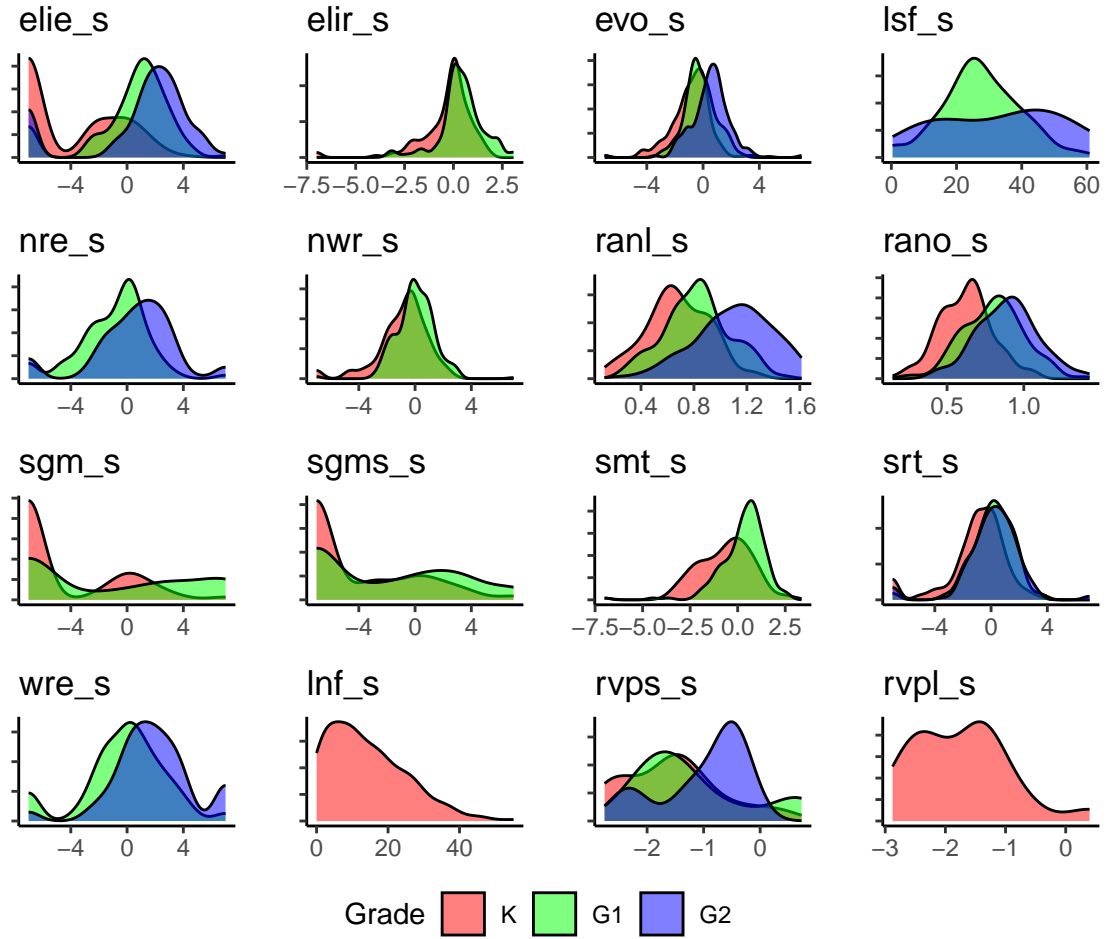


Figure 2: Distributions of Spanish Multitudes Tasks by Grade (Fall 2023)

1.2.3 Distributions of Outcome Measures

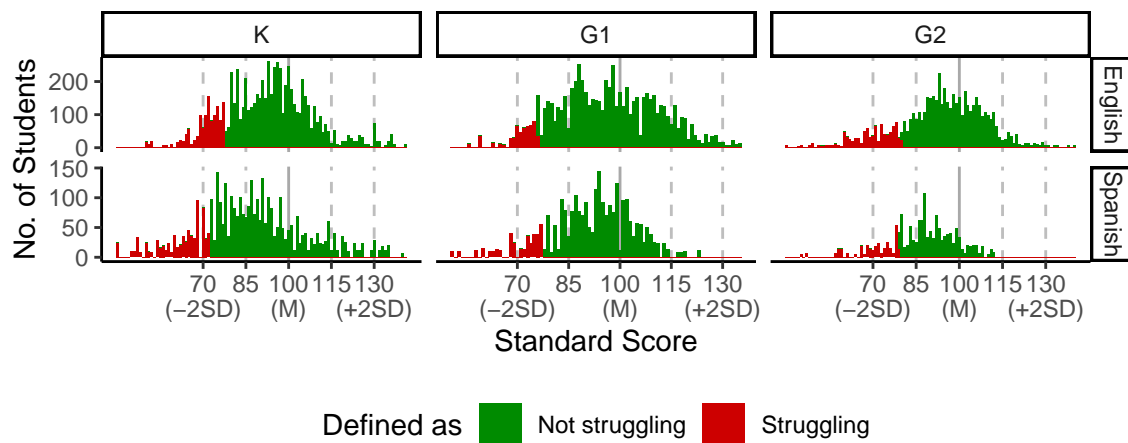


Figure 3: Distribution of Woodcock-Johnson/-Muñoz Basic Reading Skills Cluster (for Kindergarten) Broad Reading Cluster (for Grades 1 and 2) by Grade and Language with Struggling Readers (\leq 20th Percentile) Highlighted (Spring 2024).

Table 2: Comparison of Proportions of Struggling Readers (\leq 20th Percentile) in the Study Sample Based on Overall Multitudes Sample and on Published Woodcock-Johnson/Muñoz Norms (Spring 2024).

Reference	English			Spanish		
	K N = 754	G1 N = 590	G2 N = 780	K N = 375	G1 N = 224	G2 N = 211
Norm-based						
Not struggling	470 (62%)	415 (70%)	541 (69%)	169 (45%)	145 (65%)	106 (50%)
Struggling	284 (38%)	175 (30%)	239 (31%)	206 (55%)	79 (35%)	105 (50%)
Sample-based						
Not struggling	619 (82%)	539 (91%)	635 (81%)	300 (80%)	191 (85%)	162 (77%)
Struggling	135 (18%)	51 (8.6%)	145 (19%)	75 (20%)	33 (15%)	49 (23%)

1.3 Models Evaluations

1.3.1 English-to-English Models

Table 3: Best (Balanced Accuracy) English-to-English Prediction Models Built Using Data from 2023/24 AY.

[illegible]

1.3.2 Spanish-to-Spanish Models

Table 4: Best (Balanced Accuracy) Spanish-to-Spanish Prediction Models Built Using Data from 2023/24 AY.

Grade	Predictors	Method	All				
			n	Acc.	B.Acc.	Sens.	Spec.
K	LNF only	Youden	284	0.7128	0.6949	0.6667	0.7231
K	LNF, RANO, ELIR	SpEqualSe	284	0.7061	0.7052	0.7037	0.7066
K	LNF, RANO, ELIR, EVO	Youden	284	0.7466	0.7012	0.6296	0.7727
K	LNF, RANO, EVO	Youden	284	0.7466	0.7012	0.6296	0.7727
G1	WRE only	Youden	175	0.7611	0.7711	0.7857	0.7566
G1	WRE, RANO, LSF	PrevalenceMatching	175	0.9167	0.8341	0.7143	0.9539
G1	WRE, RANO, LSF, EVO	PrevalenceMatching	175	0.9167	0.8341	0.7143	0.9539
G2	WRE only	Youden	174	0.8736	0.8638	0.8462	0.8815
G2	WRE, RANL	Youden	174	0.8563	0.8709	0.8974	0.8444
G2	WRE, RANL, EVO	Youden	174	0.8621	0.8746	0.8974	0.8519

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

2 Step 2 - Evaluating Model On 24/25 Data

2.1 Sample

- $N = 1390$
- 26 schools
- 12 districts

Table 5: Demographic Characteristics of the AY 24/25 Sample (N = xxxx) by Grade and Screening Language

Characteristic	English			Spanish		
	K N = 438	G1 N = 569	G2 N = 336	K N = 272	G1 N = 305	G2 N = 154
Gender						
Female	180 (47%)	301 (56%)	145 (45%)	98 (44%)	159 (58%)	73 (48%)
Male	202 (53%)	237 (44%)	175 (55%)	125 (56%)	115 (42%)	80 (52%)
Unknown	56	31	16	49	31	1
Race						
Asian	24 (7.7%)	47 (9.3%)	33 (10%)	8 (4.6%)	9 (3.6%)	3 (2.0%)
Black/African American	41 (13%)	65 (13%)	40 (12%)	3 (1.7%)	3 (1.2%)	1 (0.7%)
Not reported	51 (16%)	101 (20%)	41 (13%)	45 (26%)	74 (29%)	44 (30%)
Other	36 (12%)	58 (12%)	35 (11%)	22 (13%)	23 (9.1%)	8 (5.4%)
White	159 (51%)	233 (46%)	179 (55%)	95 (55%)	144 (57%)	93 (62%)
Unknown	127	65	8	99	52	5
Ethnicity						
Hispanic/Latin(o/a)	298 (81%)	433 (78%)	234 (70%)	228 (98%)	295 (98%)	147 (96%)
Not Hispanic/Latin(o/a)	71 (19%)	124 (22%)	98 (30%)	4 (1.7%)	5 (1.7%)	6 (3.9%)
Unknown	69	12	4	40	5	1
ELPD						
EL	215 (59%)	251 (49%)	124 (39%)	211 (89%)	232 (83%)	117 (77%)
EO	123 (34%)	211 (41%)	155 (49%)	0 (0%)	3 (1.1%)	6 (4.0%)
EP	19 (5.2%)	40 (7.8%)	37 (12%)	17 (7.2%)	35 (13%)	27 (18%)
TBD	8 (2.2%)	11 (2.1%)	0 (0%)	8 (3.4%)	8 (2.9%)	1 (0.7%)
Unknown	73	56	20	36	27	3
Ever IEP/504	32 (9.2%)	33 (7.1%)	30 (10.0%)	23 (10%)	12 (4.7%)	5 (3.5%)
Unknown	92	102	35	49	49	13
Home Language						
English	156 (36%)	237 (42%)	170 (51%)	0 (0%)	1 (0.3%)	2 (1.3%)
Other	11 (2.6%)	16 (2.9%)	15 (4.5%)			
Spanish	264 (61%)	306 (55%)	146 (44%)	272 (100%)	304 (100%)	152 (99%)
Unknown	7	10	5			

2.2 English Models