

Appendix 11A

Item Parameters from the PIRLS 2021 Paper Concurrent Calibration

Paper item parameters estimated from the PIRLS 2021 concurrent calibration. Used to estimate student proficiency for paperPIRLS countries and bridge data from digitalPIRLS countries.

Item	RMSD		Slope (a_i)	Location (b_i)	Guessing (c_i)	Step 1 (t_{i1})	Step 2 (t_{i2})	Step 3 (t_{i3})
	2016	2021						
Items Released in 2016								
R11F01M	0.022	–	1.253 (0.078)	-0.602 (0.055)	0.107 (0.014)			
R11F02M	0.015	–	0.704 (0.047)	-0.846 (0.089)	0.209 (0.026)			
R11F03M	0.014	–	1.038 (0.065)	-0.607 (0.077)	0.153 (0.019)			
R11F04M	0.011	–	1.353 (0.050)	-0.756 (0.058)	0.170 (0.018)			
R11F05M	0.020	–	0.951 (0.062)	-0.276 (0.119)	0.185 (0.026)			
R11F06C	0.012	–	0.753 (0.054)	-0.082 (0.081)				
R11F07C	0.023	–	0.459 (0.034)	0.361 (0.078)		-1.110 (0.147)	1.110 (0.147)	
R11F08C	0.032	–	1.029 (0.037)	-0.334 (0.068)				
R11F09C	0.015	–	0.990 (0.059)	-0.604 (0.074)		0.100 (0.039)	-0.100 (0.039)	
R11F10C	0.011	–	0.790 (0.067)	-1.508 (0.170)				
R11F11M	0.011	–	0.631 (0.061)	0.110 (0.108)	0.175 (0.021)			
R11F12C	0.017	–	0.635 (0.030)	0.572 (0.063)		-0.402 (0.095)	0.402 (0.095)	
R11F13M	0.014	–	1.008 (0.064)	-0.317 (0.091)	0.193 (0.034)			
R11L01M	0.026	–	0.612 (0.049)	-1.957 (0.152)	0.177 (0.020)			
R11L02M	0.018	–	0.653 (0.050)	0.496 (0.089)	0.180 (0.026)			
R11L03C	0.018	–	0.638 (0.041)	-0.462 (0.082)				
R11L04C	0.038	–	0.717 (0.038)	0.347 (0.065)		1.957 (0.104)	-1.162 (0.105)	-0.795 (0.062)
R11L05M	0.022	–	1.062 (0.072)	0.463 (0.087)	0.184 (0.019)			
R11L06C	0.015	–	0.622 (0.039)	0.302 (0.092)				
R11L07M	0.021	–	0.702 (0.068)	0.524 (0.095)	0.151 (0.015)			
R11L08C	0.021	–	0.810 (0.040)	0.492 (0.066)		0.856 (0.053)	-0.856 (0.053)	
R11L09M	0.014	–	0.988 (0.063)	-0.920 (0.112)	0.203 (0.026)			
R11L10C	0.024	–	0.685 (0.038)	0.636 (0.081)		0.397 (0.073)	-0.397 (0.073)	
R11L11M	0.018	–	0.901 (0.050)	-0.306 (0.100)	0.181 (0.022)			
R11L12C	0.016	–	0.706 (0.051)	0.405 (0.091)		1.062 (0.090)	-1.062 (0.090)	
R41H01M	0.013	–	0.817 (0.075)	-1.108 (0.329)	0.437 (0.159)			
R41H02M	0.013	–	1.026 (0.046)	-0.748 (0.074)	0.185 (0.033)			

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Item	RMSD		Slope (a _i)	Location (b _i)	Guessing (c _i)	Step 1 (t _{i1})	Step 2 (t _{i2})	Step 3 (t _{i3})
	2016	2021						
R41H03C	0.016	—	1.143 (0.066)	0.194 (0.053)				
R41H04C	0.017	—	0.645 (0.056)	1.626 (0.159)				
R41H05M	0.009	—	0.876 (0.090)	0.131 (0.104)	0.268 (0.028)			
R41H06C	0.012	—	0.687 (0.037)	-0.390 (0.083)		0.095 (0.051)	-0.095 (0.051)	
R41H07M	0.021	—	0.801 (0.055)	0.799 (0.097)	0.122 (0.011)			
R41H08C	0.019	—	0.670 (0.039)	1.472 (0.106)				
R41H09M	0.017	—	0.665 (0.059)	0.175 (0.091)	0.161 (0.027)			
R41H10M	0.018	—	1.218 (0.047)	-0.240 (0.066)	0.217 (0.027)			
R41H11M	0.010	—	1.253 (0.049)	-0.677 (0.089)	0.253 (0.044)			
R41H12M	0.012	—	1.216 (0.051)	-0.102 (0.070)	0.318 (0.022)			
R41H13C	0.018	—	0.510 (0.030)	0.741 (0.076)		0.158 (0.127)	0.166 (0.116)	-0.323 (0.075)
R41H14C	0.029	—	0.879 (0.050)	0.157 (0.071)				
R41H15C	0.020	—	1.205 (0.041)	-0.455 (0.059)				
R41H16C	0.017	—	0.916 (0.048)	0.599 (0.085)				
R41T01M	0.008	—	1.066 (0.044)	-1.087 (0.084)	0.222 (0.030)			
R41T02C	0.018	—	0.688 (0.044)	-0.629 (0.085)		0.386 (0.038)	-0.386 (0.038)	
R41T03C	0.014	—	0.955 (0.033)	0.020 (0.054)		0.081 (0.022)	-0.081 (0.022)	
R41T04C	0.007	—	1.090 (0.045)	-0.124 (0.070)				
R41T05M	0.027	—	0.740 (0.072)	0.351 (0.131)	0.244 (0.050)			
R41T06C	0.014	—	1.332 (0.056)	-0.760 (0.066)				
R41T07C	0.020	—	0.745 (0.032)	0.633 (0.057)		-0.221 (0.045)	0.221 (0.045)	
R41T08C	0.010	—	1.108 (0.039)	-0.110 (0.072)				
R41T09M	0.023	—	1.263 (0.068)	0.420 (0.068)	0.146 (0.018)			
R41T10C	0.010	—	1.227 (0.047)	-0.370 (0.068)				
R41T11C	0.020	—	0.721 (0.033)	0.504 (0.061)		-0.399 (0.068)	0.315 (0.049)	0.084 (0.059)
R41T12M	0.009	—	0.908 (0.054)	-0.361 (0.148)	0.260 (0.083)			
R41T13M	0.011	—	1.084 (0.054)	0.402 (0.069)	0.110 (0.009)			
R41T14C	0.017	—	0.445 (0.032)	0.012 (0.119)				
R41T15M	0.013	—	0.846 (0.049)	0.231 (0.083)	0.199 (0.027)			
R41T16M	0.023	—	1.119 (0.067)	-0.207 (0.069)	0.204 (0.027)			
Items Common in 2016 and 2021								
RP21K01	0.018	0.025	0.464 (0.035)	-0.818 (0.101)		0.240 (0.051)	-0.240 (0.051)	
RP21K02	0.026	0.026	0.765 (0.044)	-0.707 (0.091)				
RP21K03	0.024	0.011	0.875 (0.059)	-0.062 (0.089)	0.153 (0.024)			
RP21K05	0.018	0.026	1.029 (0.049)	0.175 (0.076)				

Paper item parameters estimated from the PIRLS 2021 concurrent calibration. Used to estimate student proficiency for paperPIRLS countries and bridge data from digitalPIRLS countries.

Item	RMSD		Slope (a _i)	Location (b _i)	Guessing (c _i)	Step 1 (t _{i1})	Step 2 (t _{i2})	Step 3 (t _{i3})
	2016	2021						
RP21K06	0.010	0.025	1.378 (0.085)	-0.039 (0.077)	0.261 (0.021)			
RP21K07	0.029	0.033	0.777 (0.043)	0.101 (0.066)		0.229 (0.032)	-0.229 (0.032)	
RP21K08	0.026	0.013	0.955 (0.066)	0.304 (0.076)	0.150 (0.030)			
RP21K09	0.018	0.024	1.232 (0.061)	-0.092 (0.076)	0.198 (0.021)			
RP21K10	0.012	0.019	0.681 (0.035)	0.652 (0.049)		-0.290 (0.089)	0.290 (0.089)	
RP21K11	0.017	0.015	1.006 (0.087)	0.018 (0.074)	0.164 (0.027)			
RP21K12	0.023	0.022	0.585 (0.030)	-0.246 (0.071)		0.861 (0.066)	-0.270 (0.052)	-0.591 (0.046)
RP21Y01	0.020	0.014	1.077 (0.058)	0.156 (0.076)	0.215 (0.024)			
RP21Y02	0.019	0.013	1.563 (0.062)	-0.265 (0.062)	0.235 (0.024)			
RP21Y03	0.039	0.030	0.629 (0.050)	0.481 (0.096)				
RP21Y04	0.021	0.017	1.178 (0.072)	0.021 (0.062)	0.165 (0.021)			
RP21Y05	0.014	0.019	1.582 (0.076)	0.075 (0.075)	0.208 (0.017)			
RP21Y06	0.023	0.016	1.508 (0.063)	0.042 (0.049)	0.183 (0.017)			
RP21Y07	0.030	0.018	0.847 (0.062)	-0.901 (0.074)	0.129 (0.019)			
RP21Y08	0.031	0.012	1.470 (0.051)	-0.177 (0.062)	0.225 (0.029)			
RP21Y09	0.020	0.015	1.006 (0.044)	-0.582 (0.065)		0.221 (0.024)	-0.221 (0.024)	
RP21Y10	0.027	0.024	0.661 (0.031)	0.537 (0.074)				
RP21Y11	0.014	0.022	1.283 (0.071)	-0.024 (0.055)	0.269 (0.019)			
RP21Y12	0.018	0.012	0.696 (0.029)	0.062 (0.058)		-1.142 (0.124)	1.142 (0.124)	
RP21Y13	0.027	0.014	0.757 (0.028)	0.283 (0.059)		0.980 (0.070)	-0.476 (0.081)	-0.504 (0.048)
RP21Y14	0.021	0.020	0.547 (0.027)	0.284 (0.067)		-0.561 (0.095)	0.561 (0.095)	
RP31M01	0.013	0.012	1.417 (0.077)	-0.941 (0.080)	0.167 (0.026)			
RP31M02	0.011	0.008	1.221 (0.055)	-1.072 (0.082)				
RP31M03	0.013	0.014	1.189 (0.057)	-0.146 (0.066)	0.200 (0.031)			
RP31M04	0.021	0.019	0.570 (0.051)	0.247 (0.109)				
RP31M05	0.024	0.029	1.266 (0.109)	0.058 (0.065)	0.384 (0.027)			
RP31M06	0.013	0.027	1.077 (0.071)	0.193 (0.079)	0.252 (0.020)			
RP31M07	0.030	0.010	1.446 (0.080)	-0.372 (0.064)	0.184 (0.019)			
RP31M08	0.021	0.015	1.342 (0.046)	-0.588 (0.063)	0.185 (0.031)			
RP31M09	0.038	0.032	0.678 (0.035)	-0.262 (0.063)		1.434 (0.089)	-1.434 (0.089)	
RP31M10	0.042	0.043	0.564 (0.053)	0.254 (0.132)				
RP31M11	0.033	0.015	0.855 (0.065)	-0.807 (0.120)	0.203 (0.038)			
RP31M12	0.021	0.021	1.136 (0.054)	-0.022 (0.066)	0.125 (0.016)			
RP31M13	0.010	0.014	1.885 (0.058)	-0.784 (0.074)	0.189 (0.020)			
RP31M14	0.024	0.023	1.992 (0.069)	-0.334 (0.060)	0.157 (0.013)			

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	2016	2021						
RP31M15	0.016	0.023	1.233 (0.083)	-0.138 (0.077)	0.193 (0.016)			
RP31M16	0.022	0.035	1.195 (0.046)	-0.066 (0.060)				
RP31M17	0.021	0.020	0.577 (0.030)	-0.157 (0.058)		0.363 (0.058)	0.101 (0.036)	-0.464 (0.043)
RP31W01	0.044	0.044	0.789 (0.038)	-0.547 (0.061)		0.241 (0.038)	-0.241 (0.038)	
RP31W02	0.019	0.032	0.773 (0.032)	0.231 (0.055)		-0.092 (0.038)	0.092 (0.038)	
RP31W03	0.026	0.008	1.309 (0.101)	-0.047 (0.081)	0.151 (0.025)			
RP31W04	0.028	0.018	0.856 (0.050)	-0.719 (0.086)				
RP31W05	0.029	0.007	1.160 (0.069)	0.385 (0.073)	0.243 (0.021)			
RP31W06	0.026	0.009	0.762 (0.041)	-0.998 (0.133)	0.169 (0.027)			
RP31W07	0.017	0.017	0.925 (0.037)	0.487 (0.076)		0.018 (0.031)	0.116 (0.027)	-0.134 (0.029)
RP31W08	0.010	0.016	1.265 (0.060)	-0.214 (0.074)	0.240 (0.026)			
RP31W09	0.025	0.023	0.840 (0.103)	0.381 (0.086)	0.132 (0.023)			
RP31W10	0.014	0.016	1.259 (0.070)	0.285 (0.058)	0.162 (0.015)			
RP31W11	0.014	0.019	1.367 (0.048)	0.452 (0.068)				
RP31W12	0.021	0.013	1.421 (0.062)	0.621 (0.074)	0.196 (0.012)			
RP31W13	0.023	0.016	0.781 (0.035)	0.689 (0.069)				
RP41B01	0.009	0.017	0.747 (0.056)	-2.303 (0.184)				
RP41B02	0.020	0.013	1.078 (0.060)	-1.951 (0.109)	0.157 (0.024)			
RP41B03	0.022	0.019	0.746 (0.064)	-2.343 (0.192)	0.167 (0.030)			
RP41B04	0.020	0.015	0.802 (0.041)	-1.041 (0.082)				
RP41B05	0.020	0.009	0.991 (0.045)	-1.254 (0.065)	0.164 (0.027)			
RP41B06	0.018	0.025	0.546 (0.048)	-1.839 (0.219)	0.174 (0.033)			
RP41B07	0.026	0.019	0.796 (0.051)	-1.050 (0.112)				
RP41B08	0.017	0.009	0.843 (0.051)	-1.409 (0.116)				
RP41B09	0.020	0.010	1.012 (0.045)	-0.948 (0.087)				
RP41B10	0.008	0.019	0.649 (0.043)	-0.432 (0.129)	0.183 (0.029)			
RP41B11	0.020	0.006	1.022 (0.059)	-1.125 (0.123)	0.207 (0.040)			
RP41B12	0.014	0.012	0.845 (0.062)	-1.917 (0.123)	0.182 (0.038)			
RP41B13	0.028	0.040	0.502 (0.033)	-1.130 (0.115)		0.843 (0.069)	-0.843 (0.069)	
RP41B14	0.022	0.025	1.033 (0.055)	-0.689 (0.074)	0.134 (0.017)			
RP41B15	0.028	0.027	0.351 (0.027)	0.310 (0.116)				
RP41B16	0.024	0.026	0.428 (0.025)	-0.190 (0.077)		0.147 (0.052)	-0.147 (0.052)	
RP41B17	0.026	0.019	0.717 (0.036)	-0.432 (0.066)		0.900 (0.061)	-0.900 (0.061)	
RP41E01	0.020	0.016	0.729 (0.068)	-3.153 (0.159)				
RP41E02	0.030	0.019	0.801 (0.057)	-1.701 (0.155)				

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	2016	2021						
RP41E03	0.013	0.031	1.284 (0.061)	-0.691 (0.101)	0.251 (0.036)			
RP41E04	0.008	0.016	1.058 (0.053)	-0.466 (0.086)	0.206 (0.025)			
RP41E05	0.014	0.010	1.266 (0.051)	-1.427 (0.088)	0.178 (0.037)			
RP41E06	0.012	0.026	1.075 (0.071)	-2.186 (0.160)	0.274 (0.068)			
RP41E07	0.027	0.021	0.512 (0.023)	-0.839 (0.091)		0.104 (0.064)	-0.104 (0.064)	
RP41E08	0.021	0.006	0.968 (0.061)	-0.909 (0.123)	0.178 (0.032)			
RP41E09	0.023	0.020	0.530 (0.103)	0.396 (0.301)	0.332 (0.071)			
RP41E10	0.030	0.022	0.828 (0.062)	-3.015 (0.155)				
RP41E11	0.026	0.007	1.363 (0.060)	-0.750 (0.080)	0.235 (0.026)			
RP41E12	0.023	0.012	1.128 (0.057)	-2.377 (0.118)				
RP41E13	0.026	0.017	0.516 (0.037)	-0.292 (0.097)				
RP41E14	0.026	0.026	0.458 (0.027)	0.000 (0.089)		1.032 (0.075)	-1.032 (0.075)	
RP41E15	0.015	0.015	0.770 (0.033)	-2.368 (0.096)				
RP41E16	0.030	0.015	0.782 (0.033)	-0.906 (0.077)				
RP41E17	0.014	0.012	1.117 (0.065)	-0.502 (0.070)	0.146 (0.019)			
RP41I01	0.022	0.010	0.940 (0.050)	-1.355 (0.114)				
RP41I02	0.030	0.016	0.954 (0.072)	0.494 (0.098)	0.149 (0.017)			
RP41I03	0.023	0.023	0.538 (0.022)	0.183 (0.067)		0.413 (0.030)	-0.413 (0.030)	
RP41I04	0.024	0.025	0.702 (0.025)	0.346 (0.063)		0.476 (0.041)	-0.476 (0.041)	
RP41I05	0.030	0.020	1.067 (0.061)	0.041 (0.083)	0.195 (0.035)			
RP41I06	0.032	0.018	1.191 (0.071)	0.451 (0.098)	0.227 (0.027)			
RP41I07	0.016	0.011	0.961 (0.033)	0.424 (0.045)		0.040 (0.034)	-0.040 (0.034)	
RP41I08	0.037	0.011	1.568 (0.072)	-0.574 (0.073)	0.226 (0.035)			
RP41I09	0.034	0.007	1.137 (0.057)	-0.096 (0.068)				
RP41I10	0.013	0.018	0.841 (0.076)	-0.004 (0.110)	0.168 (0.030)			
RP41I11	0.028	0.018	0.864 (0.038)	0.393 (0.058)		0.443 (0.036)	-0.443 (0.036)	
RP41I12	0.019	0.016	1.085 (0.048)	0.190 (0.053)	0.130 (0.017)			
RP41I13	0.019	0.024	0.864 (0.040)	0.177 (0.067)				
RP41I14	0.014	0.011	0.786 (0.049)	0.845 (0.070)				
RP41I15	0.023	0.008	0.858 (0.043)	0.346 (0.059)				
RP41O01	0.015	0.012	0.970 (0.044)	-0.976 (0.095)	0.213 (0.031)			
RP41O02	0.010	0.010	0.931 (0.057)	-0.790 (0.063)				
RP41O03	0.024	0.027	0.908 (0.056)	0.876 (0.089)				
RP41O04	0.020	0.026	0.542 (0.046)	1.154 (0.101)		-0.049 (0.074)	0.049 (0.074)	
RP41O05	0.025	0.030	0.603 (0.032)	0.192 (0.069)		-0.213 (0.074)	0.213 (0.074)	

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	2016	2021						
RP41O06	0.011	0.019	1.404 (0.058)	-0.277 (0.067)	0.262 (0.022)			
RP41O07	0.033	0.032	0.609 (0.032)	-1.073 (0.076)		0.217 (0.039)	-0.217 (0.039)	
RP41O08	0.011	0.027	0.771 (0.049)	-0.106 (0.087)				
RP41O09	0.020	0.041	1.128 (0.045)	-0.149 (0.059)				
RP41O10	0.026	0.017	0.792 (0.032)	0.321 (0.062)		-0.023 (0.040)	0.023 (0.040)	
RP41O11	0.026	0.014	1.356 (0.057)	0.118 (0.059)	0.259 (0.026)			
RP41O12	0.030	0.012	1.320 (0.061)	-0.308 (0.054)	0.137 (0.018)			
RP41O13	0.020	0.020	0.536 (0.040)	0.347 (0.064)		-1.189 (0.225)	0.920 (0.161)	0.269 (0.097)
Items Introduced in 2021								
* RP31P01	—	0.010	0.835 (0.116)	-0.780 (0.211)	0.226 (0.051)			
* RP31P02	—	0.005	1.029 (0.051)	-1.517 (0.182)	0.195 (0.015)			
* RP31P03	—	0.020	0.788 (0.074)	-0.925 (0.127)		0.507 (0.079)	-0.507 (0.079)	
* RP31P04	—	0.009	0.955 (0.042)	-2.082 (0.177)				
* RP31P05	—	0.019	1.228 (0.068)	-1.215 (0.159)	0.193 (0.026)			
* RP31P06	—	0.019	0.651 (0.098)	-2.502 (0.307)				
* RP31P07	—	0.029	0.733 (0.070)	-0.703 (0.097)				
* RP31P08	—	0.020	1.064 (0.099)	-1.378 (0.211)	0.196 (0.028)			
* RP31P09	—	0.020	1.236 (0.061)	-1.420 (0.121)	0.216 (0.024)			
* RP31P10	—	0.010	1.101 (0.042)	-1.432 (0.114)	0.192 (0.015)			
* RP31P11	—	0.019	0.749 (0.065)	-1.064 (0.135)		-0.263 (0.143)	0.263 (0.143)	
* RP31P12	—	0.030	0.566 (0.114)	-0.466 (0.247)				
* RP31P13	—	0.016	1.116 (0.053)	-1.106 (0.111)				
* RP31P14	—	0.011	1.023 (0.047)	-0.674 (0.080)				
* RP31U01	—	0.008	0.741 (0.061)	-2.466 (0.183)				
* RP31U02	—	0.011	0.912 (0.063)	-2.296 (0.129)	0.248 (0.016)			
* RP31U03	—	0.008	0.973 (0.060)	-1.510 (0.120)	0.195 (0.019)			
* RP31U04	—	0.020	0.622 (0.100)	-1.504 (0.297)				
* RP31U05	—	0.020	0.935 (0.068)	-1.467 (0.141)	0.199 (0.031)			
* RP31U06	—	0.016	1.043 (0.068)	-1.446 (0.121)	0.181 (0.020)			
* RP31U07	—	0.014	1.060 (0.070)	-0.438 (0.092)	0.172 (0.019)			
* RP31U08	—	0.013	0.986 (0.097)	-0.608 (0.132)	0.183 (0.019)			
* RP31U09	—	0.009	1.074 (0.045)	-1.491 (0.082)	0.214 (0.023)			
* RP31U10	—	0.020	0.724 (0.090)	-0.554 (0.163)				
* RP31U11	—	0.020	0.722 (0.051)	-1.521 (0.081)		0.204 (0.120)	-0.204 (0.120)	
* RP31U12	—	0.019	1.070 (0.063)	-1.421 (0.132)				

Paper item parameters estimated from the PIRLS 2021 concurrent calibration. Used to estimate student proficiency for paperPIRLS countries and bridge data from digitalPIRLS countries.

Item	RMSD		Slope (a_i)	Location (b_i)	Guessing (c_i)	Step 1 (t_{i1})	Step 2 (t_{i2})	Step 3 (t_{i3})
	2016	2021						
* RP31U13	—	0.022	1.172 (0.043)	-1.588 (0.071)	0.169 (0.013)			
* RP31U14	—	0.043	0.522 (0.097)	0.265 (0.180)				
* RP41H01	—	0.010	0.890 (0.043)	-2.422 (0.149)				
* RP41H02	—	0.017	1.082 (0.048)	-1.507 (0.085)	0.195 (0.017)			
* RP41H03	—	0.020	0.671 (0.087)	-0.183 (0.174)	0.185 (0.023)			
* RP41H04	—	0.023	0.747 (0.084)	-1.852 (0.155)	0.212 (0.018)			
* RP41H05	—	0.023	1.007 (0.090)	-2.191 (0.288)	0.260 (0.023)			
* RP41H06	—	0.017	0.887 (0.116)	-2.103 (0.243)				
* RP41H07	—	0.014	1.141 (0.052)	-0.997 (0.093)	0.197 (0.022)			
* RP41H08	—	0.010	1.051 (0.062)	-0.849 (0.123)	0.163 (0.014)			
* RP41H09	—	0.020	1.048 (0.055)	-1.478 (0.100)	0.199 (0.020)			
* RP41H10	—	0.008	0.967 (0.063)	-0.912 (0.091)	0.203 (0.027)			
* RP41H11	—	0.010	0.694 (0.072)	-1.649 (0.194)				
* RP41H12	—	0.022	0.971 (0.063)	-1.079 (0.102)				
* RP41H13	—	0.008	1.133 (0.052)	-1.195 (0.094)	0.175 (0.025)			
* RP41H14	—	0.030	0.866 (0.143)	-1.768 (0.135)				
* RP41H15	—	0.012	0.922 (0.056)	-0.540 (0.131)	0.170 (0.021)			
* RP41H16	—	0.010	1.092 (0.046)	-0.888 (0.106)	0.187 (0.018)			
* RP41M01	—	0.021	0.636 (0.152)	-2.525 (0.542)	0.289 (0.040)			
* RP41M02	—	0.014	1.088 (0.051)	-0.250 (0.133)	0.170 (0.025)			
* RP41M03	—	0.019	0.670 (0.057)	-2.136 (0.172)				
* RP41M04	—	0.014	0.858 (0.109)	-1.086 (0.104)				
* RP41M05	—	0.014	0.821 (0.068)	-2.242 (0.190)	0.225 (0.019)			
* RP41M06	—	0.009	0.938 (0.153)	-1.901 (0.596)				
* RP41M07	—	0.007	0.958 (0.064)	-1.133 (0.141)	0.228 (0.027)			
* RP41M08	—	0.023	1.067 (0.066)	-2.160 (0.173)				
* RP41M09	—	0.007	0.963 (0.060)	-1.323 (0.099)	0.208 (0.034)			
* RP41M10	—	0.009	0.712 (0.103)	-1.789 (0.253)		0.183 (0.085)	-0.183 (0.085)	
* RP41M11	—	0.009	1.080 (0.054)	-0.524 (0.105)	0.180 (0.035)			
* RP41M12	—	0.018	0.804 (0.182)	-1.782 (0.298)				
* RP41M13	—	0.024	1.047 (0.082)	-2.184 (0.207)	0.203 (0.034)			
* RP41M14	—	0.019	0.647 (0.039)	-0.641 (0.124)		0.667 (0.146)	0.067 (0.083)	-0.735 (0.094)
* RP41M15	—	0.010	1.034 (0.082)	-0.831 (0.128)	0.208 (0.031)			
* RP41M16	—	0.009	0.893 (0.093)	-1.542 (0.181)				
* RP41M17	—	0.013	1.132 (0.096)	-0.491 (0.121)				

Paper item parameters estimated from the PIRLS 2021 concurrent calibration. Used to estimate student proficiency for paperPIRLS countries and bridge data from digitalPIRLS countries.

Item	RMSD		Slope (a_i)	Location (b_i)	Guessing (c_i)	Step 1 (t_{i1})	Step 2 (t_{i2})	Step 3 (t_{i3})
	2016	2021						
* RP41M18	—	0.023	1.137 (0.117)	-0.789 (0.114)	0.148 (0.019)			
RP51C01	—	0.022	0.460 (0.106)	0.480 (0.135)		0.096 (0.088)	-0.096 (0.088)	
RP51C02	—	0.011	0.980 (0.058)	-0.786 (0.089)	0.167 (0.021)			
RP51C03	—	0.015	0.954 (0.055)	0.538 (0.106)				
RP51C04	—	0.009	0.978 (0.062)	-1.158 (0.123)	0.199 (0.027)			
RP51C05	—	0.021	0.983 (0.047)	-0.655 (0.062)		0.372 (0.046)	-0.372 (0.046)	
RP51C06	—	0.023	0.595 (0.064)	0.409 (0.141)		-0.065 (0.161)	0.065 (0.161)	
RP51C07	—	0.011	0.696 (0.088)	-0.474 (0.145)				
RP51C08	—	0.013	0.877 (0.061)	-0.235 (0.106)	0.177 (0.026)			
RP51C09	—	0.023	1.232 (0.062)	-1.018 (0.097)	0.162 (0.016)			
RP51C10	—	0.021	0.837 (0.050)	-0.225 (0.073)		0.659 (0.077)	-0.659 (0.077)	
RP51C11	—	0.018	0.943 (0.063)	-0.285 (0.097)	0.158 (0.016)			
RP51C12	—	0.014	1.186 (0.056)	-0.651 (0.075)	0.190 (0.024)			
RP51C13	—	0.025	0.867 (0.053)	-0.011 (0.089)		0.361 (0.056)	-0.361 (0.056)	
RP51C14	—	0.027	0.934 (0.067)	0.852 (0.080)		0.176 (0.072)	-0.176 (0.072)	
RP51C15	—	0.020	0.742 (0.096)	1.213 (0.154)				
RP51D01	—	0.006	0.934 (0.078)	-1.040 (0.109)				
RP51D02	—	0.022	0.751 (0.080)	0.105 (0.123)	0.194 (0.031)			
RP51D03	—	0.013	0.884 (0.057)	-0.182 (0.105)				
RP51D04	—	0.012	1.050 (0.103)	-0.343 (0.131)	0.150 (0.016)			
RP51D05	—	0.019	0.871 (0.062)	-0.351 (0.107)	0.177 (0.018)			
RP51D06	—	0.031	0.700 (0.050)	-0.098 (0.083)		0.636 (0.066)	-0.636 (0.066)	
RP51D07	—	0.010	1.003 (0.081)	0.368 (0.089)				
RP51D08	—	0.015	0.943 (0.133)	-0.303 (0.132)	0.153 (0.018)			
RP51D09	—	0.014	0.844 (0.078)	0.092 (0.164)	0.150 (0.014)			
RP51D10	—	0.019	0.518 (0.050)	0.495 (0.110)		-2.261 (0.332)	2.261 (0.332)	
RP51D11	—	0.024	0.606 (0.052)	0.148 (0.122)		0.542 (0.080)	-0.542 (0.080)	
RP51D12	—	0.019	0.708 (0.059)	-0.082 (0.102)		0.603 (0.089)	0.270 (0.072)	-0.873 (0.096)
RP51D13	—	0.019	0.743 (0.074)	-0.308 (0.146)				
RP51D14	—	0.019	1.024 (0.082)	0.057 (0.130)	0.173 (0.023)			
RP51D15	—	0.035	0.769 (0.061)	0.988 (0.166)		0.170 (0.168)	-0.170 (0.168)	
RP51D16	—	0.025	0.859 (0.085)	0.423 (0.158)				
RP51N01	—	0.018	0.949 (0.076)	-0.956 (0.121)				
RP51N02	—	0.026	0.669 (0.054)	0.088 (0.098)		0.164 (0.057)	-0.164 (0.057)	
RP51N03	—	0.028	0.962 (0.126)	0.796 (0.199)	0.112 (0.009)			

Paper item parameters estimated from the PIRLS 2021 concurrent calibration. Used to estimate student proficiency for paperPIRLS countries and bridge data from digitalPIRLS countries.

Item	RMSD		Slope (a_i)	Location (b_i)	Guessing (c_i)	Step 1 (t_{i1})	Step 2 (t_{i2})	Step 3 (t_{i3})
	2016	2021						
RP51N04	—	0.024	0.716 (0.074)	-0.366 (0.119)				
RP51N05	—	0.033	0.765 (0.077)	0.619 (0.116)				
RP51N06	—	0.016	0.770 (0.046)	0.085 (0.063)		0.034 (0.061)	-0.034 (0.061)	
RP51N07	—	0.020	0.609 (0.062)	-0.504 (0.131)	0.206 (0.023)			
RP51N08	—	0.013	0.907 (0.109)	0.018 (0.144)	0.179 (0.027)			
RP51N09	—	0.022	0.827 (0.134)	0.684 (0.204)		0.054 (0.142)	-0.054 (0.142)	
RP51N10	—	0.014	1.179 (0.082)	0.607 (0.096)				
RP51N11	—	0.015	1.001 (0.088)	0.348 (0.124)				
RP51N12	—	0.022	0.734 (0.054)	0.588 (0.090)				
RP51N13	—	0.017	0.957 (0.046)	-0.094 (0.061)		0.247 (0.031)	-0.247 (0.031)	
RP51N14	—	0.019	0.911 (0.101)	0.953 (0.134)				
RP51N15	—	0.026	0.768 (0.087)	1.567 (0.174)				
RP51R01	—	0.018	0.759 (0.070)	-1.256 (0.111)	0.170 (0.022)			
RP51R02	—	0.017	0.947 (0.127)	-1.649 (0.342)				
RP51R03	—	0.012	0.763 (0.053)	-3.372 (0.259)				
RP51R04	—	0.021	0.693 (0.055)	-0.395 (0.145)				
RP51R05	—	0.012	0.619 (0.056)	-0.916 (0.128)		-0.303 (0.162)	0.303 (0.162)	
RP51R06	—	0.010	1.038 (0.064)	-1.291 (0.138)	0.234 (0.043)			
RP51R07	—	0.014	0.775 (0.053)	-1.443 (0.159)				
RP51R08	—	0.017	0.783 (0.120)	-0.869 (0.306)	0.308 (0.057)			
RP51R09	—	0.010	1.062 (0.064)	-0.387 (0.110)	0.194 (0.035)			
RP51R10	—	0.018	0.919 (0.075)	-0.168 (0.133)	0.127 (0.016)			
RP51R11	—	0.009	0.786 (0.106)	-0.836 (0.177)	0.214 (0.021)			
RP51R13	—	0.024	0.473 (0.087)	-0.366 (0.252)				
RP51R14	—	0.017	0.690 (0.096)	-1.441 (0.129)	0.210 (0.029)			
RP51R15	—	0.019	1.132 (0.069)	-0.843 (0.107)				
RP51R16	—	0.038	0.646 (0.100)	-0.418 (0.242)				
RP51R17	—	0.018	0.718 (0.085)	-0.549 (0.122)		0.606 (0.062)	-0.606 (0.062)	
RP51T01	—	0.019	0.900 (0.091)	-2.144 (0.202)				
RP51T02	—	0.024	0.766 (0.059)	0.515 (0.117)	0.175 (0.024)			
RP51T03	—	0.015	0.743 (0.079)	-0.946 (0.148)	0.197 (0.018)			
RP51T04	—	0.025	0.733 (0.056)	-0.420 (0.193)				
RP51T05	—	0.015	0.559 (0.084)	-0.160 (0.113)		-0.122 (0.092)	0.122 (0.092)	
RP51T06	—	0.017	1.219 (0.062)	-0.718 (0.073)	0.169 (0.016)			
RP51T07	—	0.014	1.183 (0.050)	-0.558 (0.071)	0.167 (0.026)			

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Item	RMSD		Slope (a _i)	Location (b _i)	Guessing (c _i)	Step 1 (t _{i1})	Step 2 (t _{i2})	Step 3 (t _{i3})
	2016	2021						
RP51T08	–	0.012	1.067 (0.051)	-1.234 (0.099)	0.196 (0.019)			
RP51T09	–	0.026	0.777 (0.063)	-0.384 (0.134)	0.198 (0.020)			
RP51T10	–	0.020	0.991 (0.057)	-0.260 (0.077)				
RP51T11	–	0.023	0.761 (0.065)	-0.718 (0.065)		-0.699 (0.124)	0.699 (0.124)	
RP51T12	–	0.034	0.789 (0.116)	-0.461 (0.151)				
RP51T13	–	0.032	0.814 (0.059)	0.488 (0.085)		0.731 (0.113)	-0.731 (0.113)	
RP51T14	–	0.014	1.014 (0.047)	0.001 (0.057)				
RP51T15	–	0.031	0.747 (0.052)	0.218 (0.078)		0.692 (0.093)	-0.692 (0.093)	
RP51T16	–	0.021	0.798 (0.067)	0.360 (0.086)		0.411 (0.087)	-0.411 (0.087)	
RP51Z01	–	0.019	0.383 (0.132)	-0.911 (0.387)		0.478 (0.153)	-0.478 (0.153)	
RP51Z02	–	0.011	0.676 (0.100)	-1.293 (0.190)				
RP51Z03	–	0.022	1.163 (0.088)	-0.289 (0.119)	0.123 (0.022)			
RP51Z04	–	0.009	1.082 (0.078)	-0.743 (0.087)	0.224 (0.037)			
RP51Z05	–	0.022	0.814 (0.133)	0.005 (0.139)				
RP51Z06	–	0.009	0.748 (0.085)	-1.596 (0.171)		0.087 (0.100)	-0.087 (0.100)	
RP51Z07	–	0.015	1.135 (0.046)	-1.398 (0.089)				
RP51Z08	–	0.017	1.212 (0.097)	-0.716 (0.166)	0.147 (0.017)			
RP51Z09	–	0.027	0.828 (0.130)	0.120 (0.161)				
RP51Z10	–	0.009	1.059 (0.046)	-0.876 (0.071)				
RP51Z11	–	0.015	0.879 (0.084)	-1.213 (0.142)				
RP51Z12	–	0.013	0.837 (0.076)	-0.689 (0.108)		0.078 (0.096)	-0.078 (0.096)	
RP51Z13	–	0.025	1.208 (0.088)	-1.035 (0.185)	0.152 (0.014)			
RP51Z14	–	0.024	0.435 (0.038)	-0.946 (0.133)		-0.425 (0.154)	-0.054 (0.127)	0.479 (0.160)
RP51Z15	–	0.021	0.856 (0.067)	-0.324 (0.083)				
Non-Response Indicators								
RPCRINF	0.032	0.015	1.579 (0.203)	0.510 (0.083)	0.519 (0.037)			
RPCRLIT	0.028	0.017	1.418 (0.146)	0.208 (0.101)	0.527 (0.041)			
RPMCINF	0.007	0.011	1.381 (0.162)	0.393 (0.084)	0.802 (0.011)			
RPMCLIT	0.018	0.012	1.263 (0.130)	-0.058 (0.118)	0.807 (0.014)			
RPCRRSI	0.026	0.019	1.739 (0.207)	0.136 (0.099)	0.574 (0.041)			
RPCRIIE	0.035	0.014	1.495 (0.162)	0.490 (0.074)	0.445 (0.036)			
RPMCRSI	0.022	0.013	1.443 (0.163)	0.192 (0.092)	0.766 (0.014)			
RPMCIIE	0.004	0.011	1.465 (0.163)	0.153 (0.093)	0.782 (0.013)			

() Standard errors appear in parentheses.

* Items from passages developed for PIRLS Literacy in 2011 or 2016, but treated as new in 2021.