Projections Using Data from Two Years
Updated in March 2011

Background

The Texas Projection Measure (TPM) as implemented in 2009 used students' current-year TAKS measures to make projections. The decision to use only current-year scores to make projections was made to promote transparency in the model, and after analyses indicated that projections with current-year scores mirrored the accuracy of projections made with multiple years of scores. Additionally, the use of only current-year scores maximized the number of students who would receive a TPM. However, projections using current-year scores only do not differentiate two students who scored differently in prior years. Therefore, the purpose of this document is to evaluate the advantages and disadvantages of using two years of scores in making projections. An expanded TPM could include prior-year scores in the projection subject. For example, a grade four student's projection to grade 5 reading would be made from the student's grade 4 reading score, grade 4 mathematics score, grade 3 reading score, and mean campus grade 4 reading score. Analyses evaluated the feasibility of such models for the grades and subjects presented in Table 1. The grades and subjects were chosen based on the availability of student scores from prior years and TAKS results from 2009. Results from only English-version TAKS are presented in this paper. Results from Spanish-version TAKS were similar.

Table 1. TPM Grades and Subjects Evaluated

Grade in 2007	Grade in 2008	Grade in 2009	Language Version	Subjects
3	4	5	English	Reading
				Mathematics
6	7	8	English	Reading
				Mathematics
9	10	11	English	English Language Arts
				Mathematics

Discussion Questions

1. ***Should Texas add prior-year scores in making projections with the TPM?***
2. ***If Texas expands the TPM to include prior-year scores, should Texas provide students with a TPM only if they have all scores or should Texas provide a TPM for students with only current-year scores as well?***

Advantages and Disadvantages of Adding Predictors from the Prior Year

Advantages for adding prior-year scores as additional TPM predictors include:

- increased projection accuracy overall and for limited English proficient (LEP) and special education groups (i.e., those groups with the lowest projection accuracy with the TPM as currently implemented; see the projection accuracy calculated using current-year data only[1])
- improved balance of projection errors, or increased similarity in the numbers of students over- and under-projected by the TPM
- differentiation in the projections for students with different patterns of scores over past years

Disadvantages include:

- potentially fewer students with TPM when only a two-year projection is used
- the inability to use two years of predictors with grade 3 students
- increased model complexity, as the expanded model will have an additional predictor and more equations
- increased difficulty for stakeholders to understand and replicate

Analyses

Analyses were conducted to evaluate changes to projection accuracy for a TPM that includes a student's prior-year score in the projection subject. Three steps were taken in the analyses. First, regression coefficients were generated using the TPM with the three cohorts of students listed in Table 2. Second, the resulting coefficients were then used to project future scores for the cohorts of students who were in grades 4, 7, and 10 in 2008. The third step of the analyses examined the accuracy of the projections, or compared students' projections to 2009 with their observed scores in 2009.

[1] The projection accuracy calculated using current-year data only can be found at: http://www.tea.state.tx.us/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=2147487829&libID=2147487828

Table. 2. Cohorts Used for Development of TPM Equations			
Cohort	**Grade in 2006**	**Grade in 2007**	**Grade in 2008**
1	3	4	5
2	6	7	8
3	9	10	11

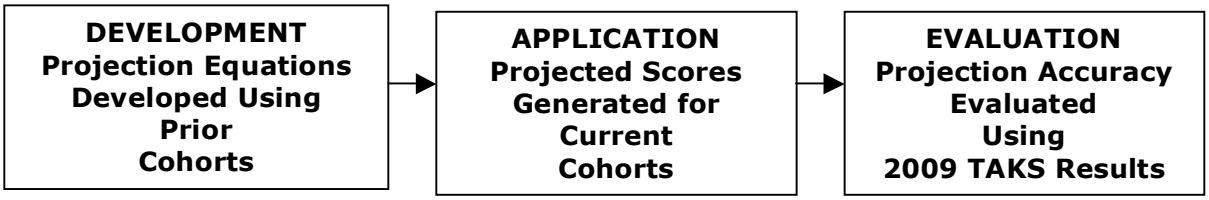

Figure 1. TPM Equation Development, Application, and Evaluation Process

Projection accuracy was evaluated in two ways. Initially the accuracy of the Met Standard and Did Not Meet Standard classifications were analyzed by comparing projected classifications to 2009 results. Then the projected score means were compared to the observed score means from 2009. Projection accuracy was evaluated using two separate models, where the first model included the campus mean and the second model excluded the campus mean. The results of the model that included campus means were very similar to the results of the model that excluded campus means. For simplicity, only the results generated from the model with the campus mean are presented in the following sections. The first section depicts graphs summarizing the comparison of the overall classification accuracy as well as over-projection and under-projection between TPM with 2-years of predictors and the current TPM (i.e., with current-year predictors only). Results compare the mean differences between the projected scores by using two years of predictors and the observed scores. The second section provides a high-level summary of the overall trends, and the third section summarizes the trends by student groups. Detailed results of the classification accuracy and projected score mean analyses are presented in Tables 3–4.

Overall **Results**

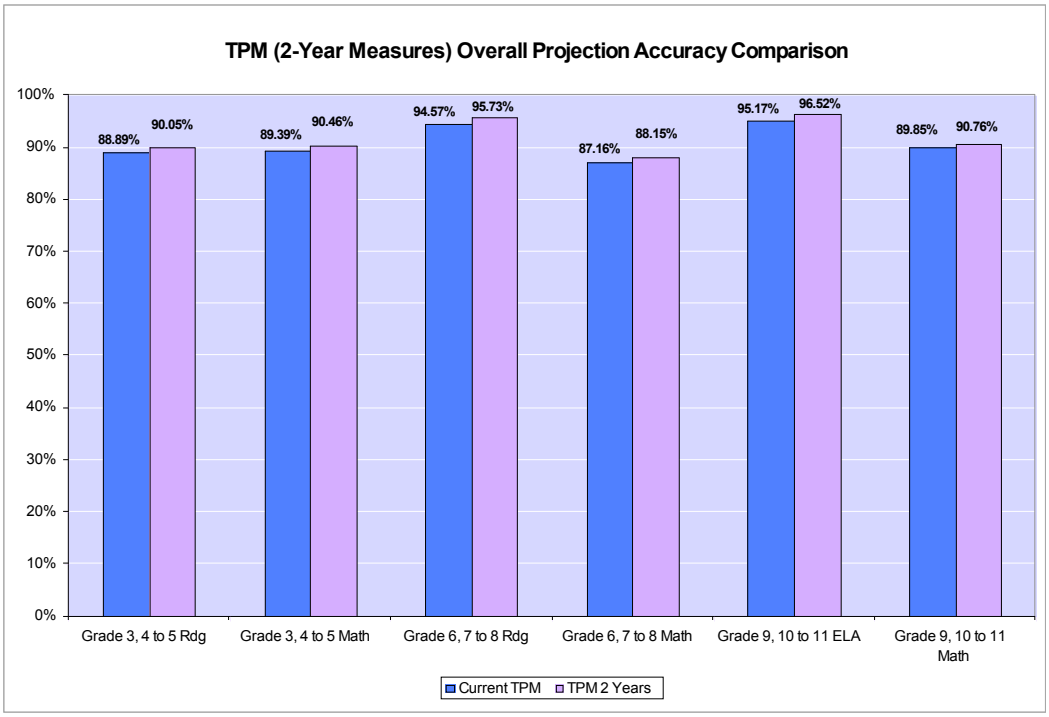

Figure 1 Overall projection accuracy comparison between 1-year measures and 2-year measures

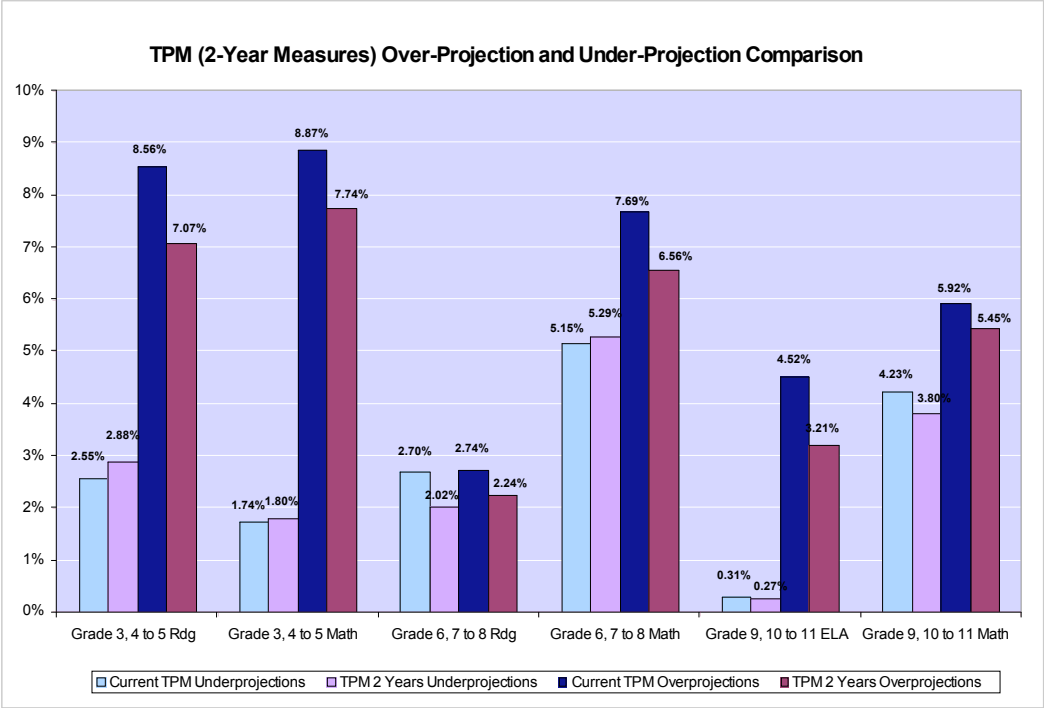

Figure 2 Over-projection and under-projection comparison between 1-year measures and 2-year measures

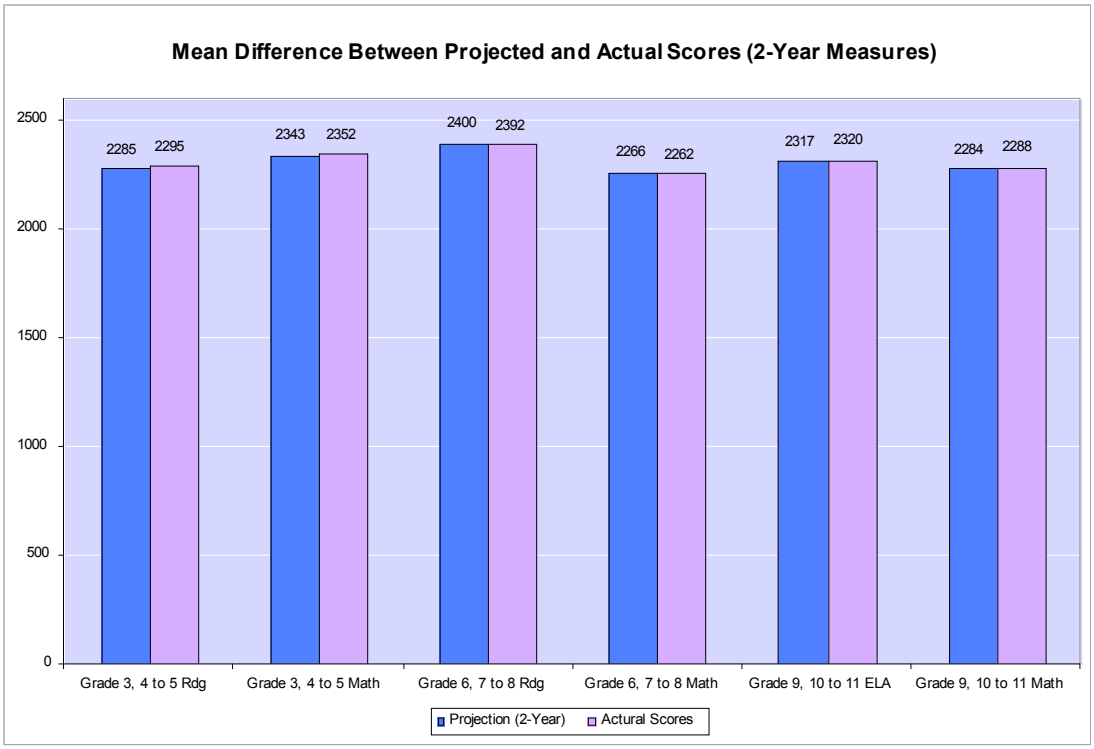

Figure 3 Mean difference between projected scores (2-year measures) and actual scores

Results Summarized Across All Grades and Subjects

Projection Accuracy

- The highest classification accuracy percentages were in grades 9 and 10 to 11 English language arts across all student groups (see Table 3).
- The lowest classification accuracy percentages were in grades 6 and 7 to 8 mathematics across all student groups (see Table 3).
- The overall reading classification accuracy tended to be higher than the mathematics classification accuracy.
- In general, the projection accuracy percentages were lower for special education and limited English proficient student groups than for other student groups (see Table 3).
- In general, the magnitude of the mean differences between projected and observed scores were larger for the limited English proficient student group than for other student groups (see Table 4).
- The classification accuracy percentages resulting from TPM with 2 years of predictors are higher than those resulting from the current TPM for all the grades and the subjects (see Figure 1).

Inaccurate Projections

- The overall percent of inaccurate classifications of the TPM with 2 years of predictors are lower than 12%.
- When projections were inaccurate, over-projections were more common than under-projections
    - students were more likely to be projected to meet the standard without actually meeting it (see Table 3)
- The overall over-projection percentages of the TPM with 2 years of predictors were lower than those from the current TPM. The overall under-projection percentages with 2 years of predictors were lower than those of the current TPM for reading in grade 8 and reading and mathematics in grade 11 (see Figure 2).

Results Summarized By Student Group

All Students

- The classification accuracy percentages for all students across grades and subjects ranged from 88% to 97% with an overall average of 92% (see Table 3).
    - Highest classification accuracy percentage:
        - 96.52% for grades 9 and 10 to 11 English language arts
    - Lowest classification accuracy percentage:
        - 88.15% for grades 6 and 7 to 8 mathematics
- The difference between projected and observed score means ranged from -10.01 for grades 3 and 4 to 5 reading to 7.88 for grades 6 and 7 to 8 reading (see Table 4).

African American

- The classification accuracy percentages for African American students ranged from 83% to 95% with an average of 88% (see Table 3).
    - Highest classification accuracy percentage:
        - 94.52% for grades 9 and 10 to 11 English language arts
    - Lowest classification accuracy percentage:
        - 82.68% for grades 6 and 7 to 8 mathematics
- The difference between projected and observed score means ranged from -8.74 for grades 3 and 4 to 5 reading to 13.06 for grades 6 and 7 to 8 mathematics (see Table 4).

Hispanic

- The classification accuracy percentages for Hispanic students ranged from 85% to 95% with an average of 90% (see Table 3).

    - Highest classification accuracy percentage:
        - 95.15% for grades 9 and 10 to 11 English language arts
    - Lowest classification accuracy percentage:
        - 85.35% for grades 6 and 7 to 8 mathematics
- The difference between projected and observed score means ranged from -10.73 for grades 3 and 4 to 5 math to 7.70 for grades 6 and 7 to 8 reading (see Table 4).

White

- The classification accuracy percentages for white students ranged from 93% to 98% with an average of 95% (see Table 3).
    - Highest classification accuracy percentage:
        - 98.23% for grades 9 and 10 to 11 English language arts
    - Lowest classification accuracy percentage:
        - 92.70% for grades 6 and 7 to 8 mathematics
- The difference between projected and observed score means ranged from -25.06 for grades 3 and 4 to 5 reading to 11.93 for grades 6 and 7 to 8 reading (see Table 4).

Economically Disadvantaged

- The classification accuracy percentages for economically disadvantaged students ranged from 84% to 94% with an average of 88% (see Table 3).
    - Highest classification accuracy percentage:
        - 94.33% for grades 9 and 10 to 11 English language arts
    - Lowest classification accuracy percentage:
        - 84.18% for grades 6 and 7 to 8 mathematics
- The difference between projected and observed score means ranged from -3.43 for grades 9 and 10 to 11 mathematics to 8.62 for grades 6 and 7 to 8 reading (see Table 4).

Special Education

- The classification accuracy percentages for special education students ranged from 81% to 89% with an average of 85% (see Table 3).
    - Highest classification accuracy percentage:
        - 89.47% for grades 6 and 7 to 8 reading.
    - Lowest classification accuracy percentage:
        - 81.19% for grades 6 and 7 to 8 mathematics

- The difference between projected and observed score means ranged from -0.13 for grades 6 and 7 to 8 mathematics to 24.23 for grades 9 and 10 to 11 English language arts (see Table 4).

Limited English Proficient

- The classification accuracy percentages for students with limited English Proficiency ranged from 77% to 87% with an average of 82% (see Table 3).
    - Highest classification accuracy percentage:
        - 86.78% for grades 3 and 4 to 5 mathematics
    - Lowest classification accuracy percentage:
        - 76.77% for grades 6 and 7 to 8 mathematics
- The difference between projected and observed score means ranged from -19.17 for grades 3 and 4 to 5 mathematics to 32.20 for grades 6 and 7 to 8 reading (see Table 4).

Results Summary

The results of the TPM projection accuracy analyses with 2 years of predictors showed similar patterns to the results of the current TPM. For example, the overall reading classification accuracy tended to be higher than the mathematics classification accuracy. The projection accuracy for students in the limited English proficient student group tended to be lower than for students in other student groups. The over-projection tended to be more common than the under-projection. However, the TPM with 2 years of predictors generally resulted in higher projection accuracy and more balanced over- and under-projections than the current TPM.

Discussion Questions

1. ***Should Texas add prior-year scores in making projections with the TPM?***

Advantages for adding the prior-year score as a predictor in the TPM projections include use of a model that makes predictions based on a pattern of scores for a student instead of only current-year scores, improved prediction accuracy overall, and improved accuracy for groups with the lowest projection accuracy under the current TPM. However, adding the additional predictor complicates the model. By expanding the model, more equations will be needed resulting in calculations that are more difficult to understand and replicate. Furthermore, as the number of predictors increases, the ability to

pinpoint areas of improvement and plan interventions based on the TPM for a particular student becomes more complicated.

2. ***If Texas will expand the TPM to include prior-year scores, should Texas provide students with a TPM only if they have all scores or should Texas provide a TPM for students with only current-year scores as well?***

By adding the prior-year predictor into the TPM equation, students will need scores in the current year as well as a score in the projection subject in the prior year. Not all students will have a complete set of scores. For example, in the cohorts studied in this paper, the percentage of students missing the prior-year score ranged from 7.74% (7,713 out of 99,683) for the white group at grade 9 and10 to 11 mathematics to 65.45% (11,696 out of 17,869) for the special education group at grade 6 and 7 to 8 reading. Furthermore, the students missing the prior-year score tended to be in the special education and limited English proficiency groups. One way to maximize the numbers of students with a reported TPM would be to make two sets of equations available for all projections in which a prior-year score would be used, one set based on current and prior-year scores and one based only on current-year scores (like the current TPM). If a student has scores available in the current and prior year, that student's TPM would be based on all scores. If a student is missing prior-year scores, that student's TPM would be based only on current-year scores. By offering two sets of equations, students will obtain a projection with different amounts of data, resulting in projections with slightly different levels of accuracy. In addition, the numbers of students with a reported TPM will be greater than if only students with full data are provided a TPM.

Table 3. English TAKS Classification Accuracy for the TPM (2009) with 2 Years of Predictors								
Grade/Subject	Group	N-count	Total Projection Accuracy		Accurate Classifications		Misclassifications	
			Accurate Projections	Inaccurate Projections	Met Standard	Did Not Meet Standard	Met Standard (Under Projection)	Did Not Meet Standard (Over Projection)
Grade 3, 4 to Grade 5 Reading	All Students	249739 (100.00)	224901 (90.05)	24838 (9.95)	208538 (83.50)	16363 (6.55)	7190 (2.88)	17648 (7.07)
	African American	35312 (100.00)	30344 (85.93)	4968 (14.06)	26190 (74.17)	4154 (11.76)	1972 (5.58)	2996 (8.48)
	Hispanic	107979 (100.00)	94047 (87.10)	13932 (12.90)	84388 (78.15)	9659 (8.95)	3844 (3.56)	10088 (9.34)
	White	96093 (100.00)	90611 (94.29)	5482 (5.70)	88272 (91.86)	2339 (2.43)	1281 (1.33)	4201 (4.37)
	Economically Disadvantaged	130309 (100.00)	111906 (85.88)	18403 (14.12)	98498 (75.59)	13408 (10.29)	5513 (4.23)	12890 (9.89)
	Special Education	9750 (100.00)	8415 (85.73)	1401 (14.27)	7347 (74.85)	1068 (10.88)	239 (2.43)	1162 (11.84)
	Limited English Proficient	27082 (100.00)	22177 (81.89)	4905 (18.11)	17886 (66.04)	4291 (15.84)	1562 (5.77)	3343 (12.34)
Grade 3, 4 to Grade 5 Mathematics	All Students	249230 (100.00)	225451 (90.46)	23779 (9.54)	211429 (84.83)	14022 (5.63)	4486 (1.80)	19293 (7.74)
	African American	35135 (100.00)	29835 (84.92)	5300 (15.08)	25763 (73.33)	4072 (11.59)	1185 (3.37)	4115 (11.71)
	Hispanic	107775 (100.00)	95742 (88.83)	12033 (11.17)	88249 (81.88)	7493 (6.95)	2465 (2.29)	9568 (8.88)
	White	95977 (100.00)	89846 (93.61)	6131 (6.39)	87519 (91.19)	2327 (2.42)	767 (0.80)	5364 (5.59)
	Economically Disadvantaged	129925 (100.00)	113045 (87.01)	16880 (12.99)	102040 (78.54)	11005 (8.47)	3363 (2.59)	13517 (10.40)
	Special Education	9668 (100.00)	8328 (86.14)	1340 (13.86)	7186 (74.33)	1142 (11.81)	310 (3.21)	1030 (10.65)
	Limited English Proficient	27062 (100.00)	23483 (86.78)	3579 (13.23)	20631 (76.24)	2852 (10.54)	946 (3.50)	2633 (9.73)

Table 3. Continued								
Grade/Subject	Group	N-count	Total Projection Accuracy		Accurate Classifications		Misclassifications	
			Accurate Projections	Inaccurate Projections	Met Standard	Did Not Meet Standard	Met Standard (Under Projection)	Did Not Meet Standard (Over Projection)
Grade 6, 7 to Grade 8 Reading	All Students	263258 (100.00)	252023 (95.73)	11235 (4.26)	246020 (93.45)	6003 (2.28)	5326 (2.02)	5909 (2.24)
	African American	34790 (100.00)	32793 (94.26)	1997 (5.74)	31747 (91.25)	1046 (3.01)	1139 (3.27)	858 (2.47)
	Hispanic	119886 (100.00)	112867 (94.15)	7019 (5.85)	108554 (90.55)	4313 (3.60)	3349 (2.79)	3670 (3.06)
	White	98361 (100.00)	96297 (97.91)	2064 (2.10)	95721 (97.32)	576 (0.59)	767 (0.78)	1297 (1.32)
	Economically Disadvantaged	134408 (100.00)	125834 (93.63)	8574 (6.38)	120773 (89.86)	5061 (3.77)	4185 (3.11)	4389 (3.27)
	Special Education	6173 (100.00)	5523 (89.47)	650 (10.53)	5168 (83.72)	355 (5.75)	336 (5.44)	314 (5.09)
	Limited English Proficient	15509 (100.00)	12671 (81.70)	2838 (18.30)	9911 (63.90)	2760 (17.80)	1718 (11.08)	1120 (7.22)
Grade 6, 7 to Grade 8 Mathematics	All Students	262554 (100.00)	231440 (88.15)	31114 (11.85)	204504 (77.89)	26936 (10.26)	13885 (5.29)	17229 (6.56)
	African American	34653 (100.00)	28651 (82.68)	6002 (17.33)	22354 (64.51)	6297 (18.17)	2625 (7.58)	3377 (9.75)
	Hispanic	119512 (100.00)	102003 (85.35)	17509 (14.65)	85800 (71.79)	16203 (13.56)	8273 (6.92)	9236 (7.73)
	White	98184 (100.00)	91024 (92.70)	7160 (7.30)	86838 (88.44)	4186 (4.26)	2813 (2.87)	4347 (4.43)
	Economically Disadvantaged	133909 (100.00)	112734 (84.18)	21175 (15.81)	92335 (68.95)	20399 (15.23)	9843 (7.35)	11332 (8.46)
	Special Education	6023 (100.00)	4890 (81.19)	1133 (18.81)	3595 (59.69)	1295 (21.50)	631 (10.48)	502 (8.33)
	Limited English Proficient	15460 (100.00)	11869 (76.77)	3591 (23.23)	7018 (45.39)	4851 (31.38)	2362 (15.28)	1229 (7.95)

Table 3. Continued								
Grade/Subject	Group	N-count	Total Projection Accuracy		Accurate Classifications		Misclassifications	
			Accurate Projections	Inaccurate Projections	Met Standard	Did Not Meet Standard	Met Standard (Under Projection)	Did Not Meet Standard (Over Projection)
Grade 9, 10 to Grade 11 English Language Arts	All Students	216612 (100.00)	209088 (96.52)	7524 (3.48)	207238 (95.67)	1850 (0.85)	576 (0.27)	6948 (3.21)
	African American	28494 (100.00)	26934 (94.52)	1560 (5.48)	26569 (93.24)	365 (1.28)	102 (0.36)	1458 (5.12)
	Hispanic	86561 (100.00)	82367 (95.15)	4194 (4.85)	81051 (93.63)	1316 (1.52)	378 (0.44)	3816 (4.41)
	White	92304 (100.00)	90664 (98.23)	1640 (1.78)	90529 (98.08)	135 (0.15)	88 (0.10)	1552 (1.68)
	Economically Disadvantaged	87312 (100.00)	82368 (94.33)	4944 (5.66)	80897 (92.65)	1471 (1.68)	393 (0.45)	4551 (5.21)
	Special Education	5370 (100.00)	4472 (83.28)	898 (16.72)	4217 (78.53)	255 (4.75)	57 (1.06)	841 (15.66)
	Limited English Proficient	6999 (100.00)	5493 (78.48)	1506 (21.52)	4492 (64.18)	1001 (14.30)	198 (2.83)	1308 (18.69)
Grade 9, 10 to Grade 11 Mathematics	All Students	215223 (100.00)	195331 (90.76)	19892 (9.25)	176180 (81.86)	19151 (8.90)	8170 (3.80)	11722 (5.45)
	African American	28261 (100.00)	24117 (85.33)	4144 (14.67)	19481 (68.93)	4636 (16.40)	1777 (6.29)	2367 (8.38)
	Hispanic	85770 (100.00)	75571 (88.11)	10199 (11.89)	64818 (75.57)	10753 (12.54)	4615 (5.38)	5584 (6.51)
	White	91970 (100.00)	86717 (94.29)	5253 (5.71)	83165 (90.43)	3552 (3.86)	1656 (1.80)	3597 (3.91)
	Economically Disadvantaged	86487 (100.00)	75247 (87.01)	11240 (13.00)	63211 (73.09)	12036 (13.92)	4961 (5.74)	6279 (7.26)
	Special Education	5098 (100.00)	4208 (82.54)	890 (17.46)	2580 (50.61)	1628 (31.93)	364 (7.14)	526 (10.32)
	Limited English Proficient	6877 (100.00)	5443 (79.15)	1434 (20.85)	2906 (42.26)	2537 (36.89)	936 (13.61)	498 (7.24)

Table 4. English TAKS TPM Mean Differences between Projected and Observed Scores (2 Years of Predictors)							
Grade/Subject	**Group**	**N-count**	**Projection**		**Observed**		**Difference**
			Mean	**SD**	**Mean**	**SD**	
Grade 3, 4 to Grade 5 Reading	All Students	249739 (100.00)	2284.63	143.09	2294.65	206.78	-10.01
	African American	35312 (100.00)	2225.96	136.31	2234.69	195.68	-8.74
	Hispanic	107775 (100.00)	2250.09	134.87	2245.48	193.56	4.60
	White	95977 (100.00)	2336.35	133.78	2361.40	201.98	-25.06
	Economically Disadvantaged	130309 (100.00)	2235.90	132.67	2230.00	189.80	5.90
	Special Education	9816 (100.00)	2226.69	148.71	2221.95	208.42	4.74
	Limited English Proficient	27082 (100.00)	2193.52	124.13	2176.98	175.03	16.55
Grade 3, 4 to Grade 5 Mathematics	All Students	249230 (100.00)	2343.06	171.54	2352.17	239.92	-9.11
	African American	35135 (100.00)	2268.90	164.42	2259.15	233.51	9.74
	Hispanic	107775 (100.00)	2311.21	164.18	2321.94	235.28	-10.73
	White	95977 (100.00)	2394.30	161.92	2403.85	229.40	-9.56
	Economically Disadvantaged	129925 (100.00)	2293.84	163.09	2294.41	234.79	-0.57
	Special Education	9668 (100.00)	2279.17	176.39	2277.47	245.85	1.70
	Limited English Proficient	27062 (100.00)	2262.10	155.62	2281.27	231.89	-19.17

Note. Projected scores were transformed to the horizontal scale to match the scale of the 2009 TAKS observed scores.

Table 4. Continued							
Grade/Subject	Group	N-count	Projection		Observed		Difference
			Mean	SD	Mean	SD	
Grade 6, 7 to Grade 8 Reading	All Students	263258 (100.00)	2399.92	142.97	2392.04	192.28	7.88
	African American	34790 (100.00)	2354.61	130.96	2357.29	186.07	-2.67
	Hispanic	119886 (100.00)	2359.03	134.95	2351.33	191.70	7.70
	White	98361 (100.00)	2456.37	132.37	2444.44	179.90	11.93
	Economically Disadvantaged	134408 (100.00)	2349.27	131.55	2340.65	188.98	8.62
	Special Education	6173 (100.00)	2315.14	133.64	2296.51	187.59	18.62
	Limited English Proficient	15509 (100.00)	2223.54	119.54	2191.35	181.42	32.20
Grade 6, 7 to Grade 8 Mathematics	All Students	262554 (100.00)	2266.31	165.98	2261.56	193.51	4.75
	African American	34653 (100.00)	2198.99	148.03	2185.93	172.19	13.06
	Hispanic	119512 (100.00)	2227.96	154.71	2225.29	182.27	2.67
	White	98184 (100.00)	2322.90	158.60	2316.00	187.92	6.90
	Economically Disadvantaged	133909 (100.00)	2214.94	151.16	2210.03	178.34	4.91
	Special Education	6023 (100.00)	2177.44	149.95	2177.58	171.38	-0.13
	Limited English Proficient	15460 (100.00)	2119.06	133.06	2134.04	162.39	-14.98

Note. Projected scores were transformed to the horizontal scale to match the scale of the 2009 TAKS observed scores.

Table 4. Continued							
Grade/Subject	Group	N-count	Projection		Observed		Difference
			Mean	SD	Mean	SD	
Grade 9, 10 to Grade 11 English Language Arts	All Students	216612 (100.00)	2316.77	101.40	2320.26	144.21	-3.49
	African American	28494 (100.00)	2277.08	90.12	2275.38	128.68	1.70
	Hispanic	86561 (100.00)	2285.56	94.61	2285.92	134.09	-0.36
	White	92304 (100.00)	2351.37	94.46	2358.60	142.55	-7.23
	Economically Disadvantaged	87312 (100.00)	2277.54	92.39	2273.63	130.61	3.91
	Special Education	5370 (100.00)	2219.31	83.55	2195.08	117.69	24.23
	Limited English Proficient	6999 (100.00)	2167.62	75.50	2138.64	103.30	28.98
Grade 9, 10 to Grade 11 Mathematics	All Students	215223 (100.00)	2283.93	166.92	2287.71	189.49	-3.78
	African American	28261 (100.00)	2210.71	141.09	2205.25	163.33	5.46
	Hispanic	85770 (100.00)	2238.60	151.59	2244.38	176.35	-5.78
	White	91970 (100.00)	2335.52	162.26	2339.55	185.37	-4.03
	Economically Disadvantaged	86487 (100.00)	2227.50	148.20	2230.93	173.93	-3.43
	Special Education	5098 (100.00)	2150.51	129.87	2140.32	165.91	10.19
	Limited English Proficient	6877 (100.00)	2115.87	119.46	2128.68	157.02	-12.82