



National Center and State Collaborative

An Evaluation of the Precision of NCSC Scores

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Evaluation of the Precision of NCSC Scores

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Executive Summary

This study examines the conditional standard error of measurement (CSEM) of performance level cut scores for the NCSC 2015 assessment. Additionally, item difficulty and discrimination are examined to determine what options may be available to bolster the precision of the scale with future form development.

Results show that the error at the performance level cut scores for all but level 4 was generally relatively low, indicating acceptable precision for classification into performance levels 2 and 3. The error associated with the performance level 4 cut was relatively higher – in some cases as much as 2 or 3 times that of the level 2 or 3 cuts in ELA. This pattern was observed in math, but not to the degree of ELA.

Although the error at the cuts was generally fairly low, the error near the Lowest Obtainable Scale Score (LOSS) and the Highest Obtainable Scale Score (HOSS) was very high for most grade and content tests. This suggests the test functions well for performance level classifications – particularly for performance levels 2 and 3 – but is not very precise for disentangling degrees of performance for very low or very high achieving students.

Encouragingly, most of the items discriminate well across the tiers, especially for tiers 2, 3, and 4. This is a favorable finding, because it suggests that items are available to bolster the information in the higher regions of the scale.

The LOSS scores, however, are mostly associated with students who attempted zero or very few items, as opposed to students who consistently responded to all items but got most of them incorrect. Students who attempted few items are likely students with communication challenges or otherwise were not successful accessing the test content. In these cases, augmenting information in the test scale will do little to help produce measures of student performance. Rather, the focus should be on instructional and administration strategies to better support students in demonstrating what they know and can do.

Purpose

One of the primary purposes of the National Center and State Collaborative (NCSC) alternate assessment is to accurately classify students into one of four performance levels. Performance level classifications are used to inform decisions about instruction and support, and may be used as a component of state accountability systems.

This study examines two aspects of precision. First, conditional standard error of measurement (CSEM) is produced for each performance level cut score to provide information on the precision of scores in the most critical regions of the scale. Second, item difficulty and discrimination are plotted by tier to provide information about the items that may be available to bolster the precision of the scale for future form development.

Method

To evaluate the precision of NCSC scores with respect to performance level classification, the following analyses are produced:

1. Tables that show the conditional standard error of measurement (CSEM) for each of three cut scores distinguishing four performance levels on four forms for each grade and content area test;
2. Graphs that depict the CSEM for each scale score on NCSC by grade, content, and form. Performance levels are color-coded on the graphs to highlight the precision in each region of the scale covering the four respective performance levels.

To evaluate the items in the bank with respect to their potential contributions to precision, scatterplots are produced showing item percent correct (p-value) by discrimination (correlation with total score). Items are coded by tier to better assess the outcomes for each tier group.

Results

Summary of Findings

CSEMs at the cut scores generally ranged between 2 and 7; the majority were less than 6. In every case but one, the highest CSEM for any one test was associated with the cut score for level 4, in contrast to that of levels 2 and 3. The exception was grade five math in which the CSEM at the cut for level 2 on form 3 was slightly higher than the level 4 CSEM (5.92 and 5.88, respectively). It should be noted that the CSEMs for all cuts on grade 5 and 8 math were very close and relatively high compared to other grade content forms.

ELA forms tended to have lower error at the cuts for levels 2 and 3 compared to math but more pronounced error at level 4. Overall, the error among the cuts was more variable for ELA compared to math. In general, the cut scores for all level 2 and 3 cuts were very similar for all grade and content tests. This pattern is observed in the box plots of CSEM (y axis) for each performance level cut score (x axis).

Conditional Standard Error by Performance Level and Subject

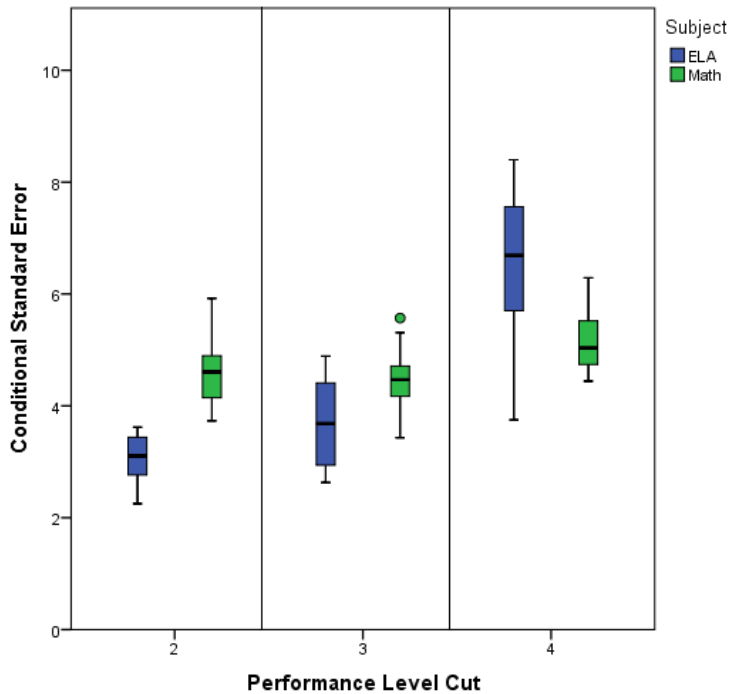


Figure 1. Conditional Standard Error by Performance Level and Subject

There were 12 cut scores with associated CSEMs greater than 7. All of these were level 4 cuts on ELA forms. They are listed below.

- Grade 4 ELA, form 1, Performance level 4 (7.33)
- Grade 4 ELA, form 2, Performance level 4 (8.40)
- Grade 5 ELA, form 1, Performance level 4 (7.41)
- Grade 5 ELA, form 2, Performance level 4 (7.27)
- Grade 5 ELA, form 4, Performance level 4 (7.73)
- Grade 6 ELA, form 1, performance level 4 (7.43)
- Grade 6 ELA, form 2, performance level 4 (8.33)
- Grade 6 ELA, form 3, performance level 4 (7.69)
- Grade 6 ELA, form 4, performance level 4 (7.74)
- Grade 7 ELA, form 2, performance level 4 (8.03)
- Grade 11 ELA, form 1, performance level 4 (7.72)
- Grade 11 ELA, form 2, performance level 4 (7.15)

Inspection of the CSEM plots for each scale score point reveal a common pattern where the error is much more pronounced for extreme scores than scores in the middle of the scale. There were typically 2-4 scores for each grade, content, form associated with the LOSS and typically 1-2

scores at or near the HOSS. All of these most extreme scores were associated with very high CSEM relative to that associated with scores in performance levels 2 and 3 – as much as 7 or 8 times the error. However, it is encouraging that the error associated with classification decisions at levels 2 and 3 is consistently low.

Finally, review of the scatterplots of discrimination and difficulty reveal an expected ordering of the difficulty of items by tier. In particular, tier 1 items separate from the upper tiers. With respect to discrimination, the overwhelming majority of items have positive item total correlations at or above .2. Tier 2 and 3 items, in the mid-range of difficulty tend to discriminate most highly. However, even though the tier 4 items have relatively lower discrimination, these values remain reasonably high – generally above .2. An exception to this trend is grades 3-5 math, where the discrimination of the majority of tier 4 items is below .2

Grade 3 ELA

Conditional Standard Error by Performance Level

Grade 3 ELA Standard Error by Performance Level Cut

Test	Form	PL Cut	Standard Error
Grade 3 ELA	1	2	2.78
		3	2.63
		4	3.75
	2	2	2.97
		3	3.06
		4	4.93
	3	2	2.97
		3	2.90
		4	3.87
	4	2	2.79
		3	2.86
		4	3.80

Table 1. Grade 3 ELA Standard Error by Performance Level Cut

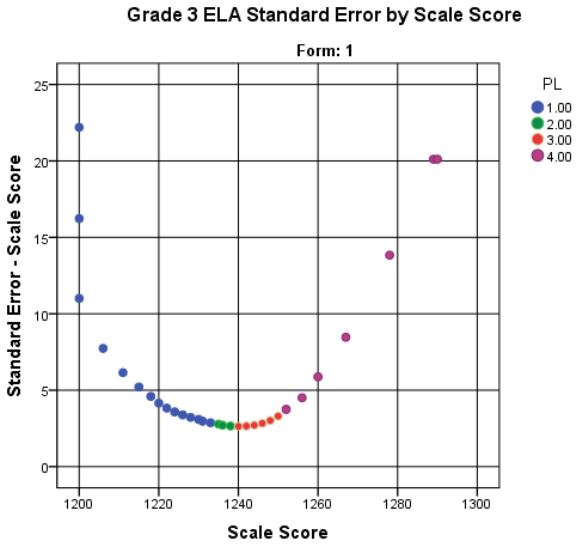


Figure 2. Grade 3 ELA Form 1 Standard Error by Scale Score

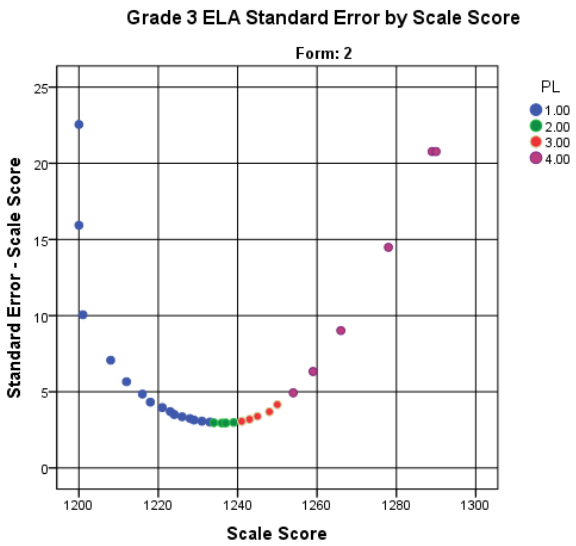


Figure 3. Grade 3 ELA Form 2 Standard Error by Scale Score

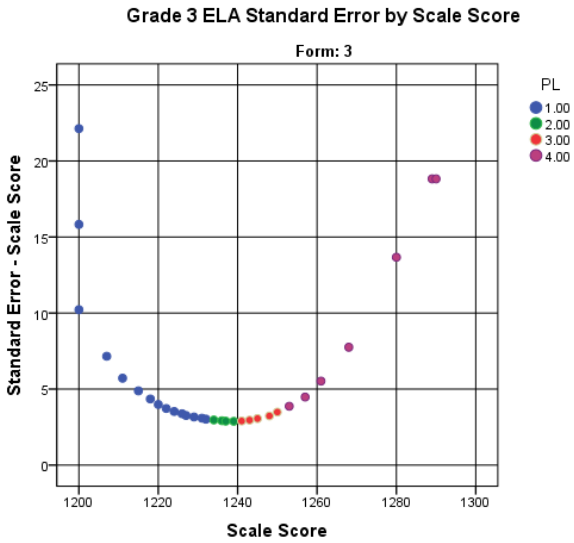


Figure 4. Grade 3 ELA Form 3 Standard Error by Scale Score

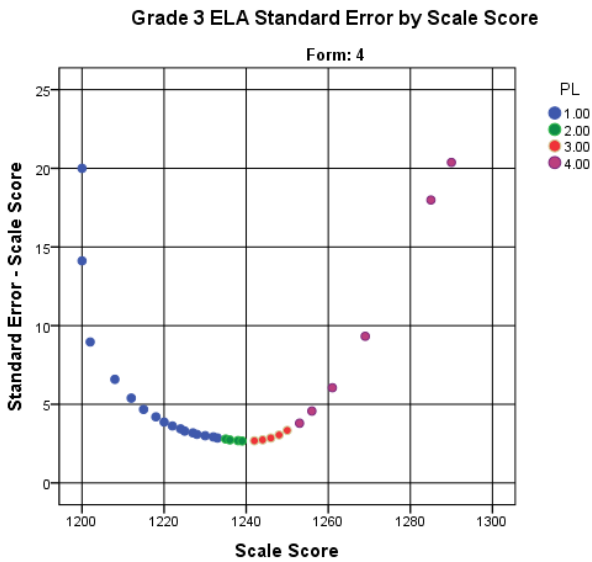


Figure 5. Grade 3 ELA Form 4 Standard Error by Scale Score

Difficulty and Discrimination by Tier

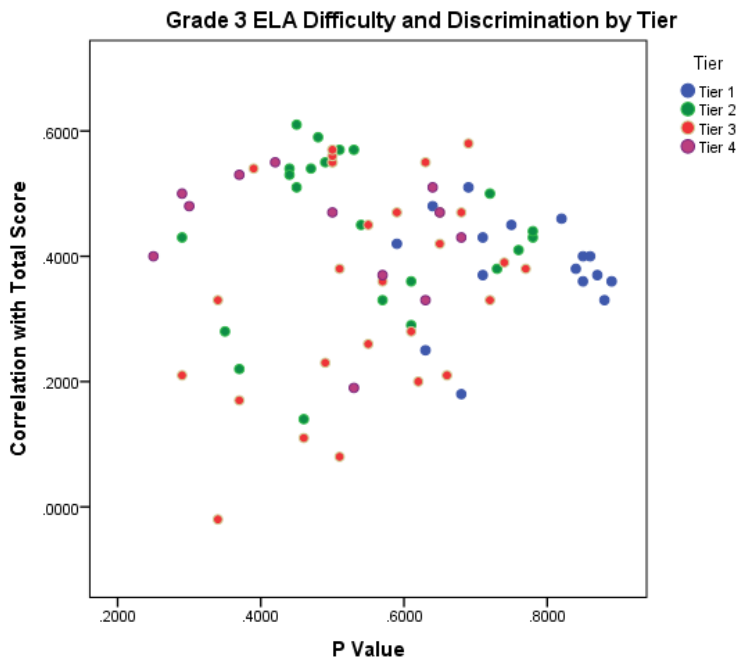


Figure 6. Grade 3 ELA Difficulty and Discrimination by Tier

Grade 4 ELA

Conditional Standard Error by Performance Level

Grade 4 ELA Standard Error by Performance Level Cut

Test	Form	PL Cut	Standard Error
Grade 4 ELA	1	2	2.64
		3	2.78
		4	7.33
	2	2	3.02
		3	3.32
		4	8.4
	3	2	2.75
		3	2.97
		4	5.54
	4	2	2.62
		3	2.76
		4	5.87

Table 2. Grade 4 ELA Standard Error by Performance Level Cut

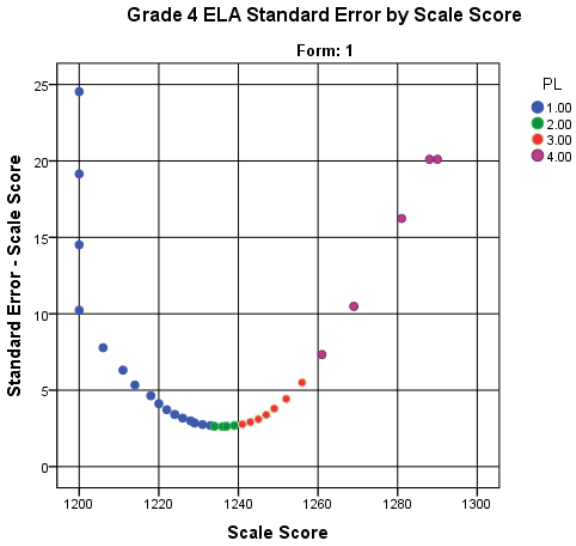


Figure 7. Grade 4 ELA Form 1 Standard Error by Scale Score

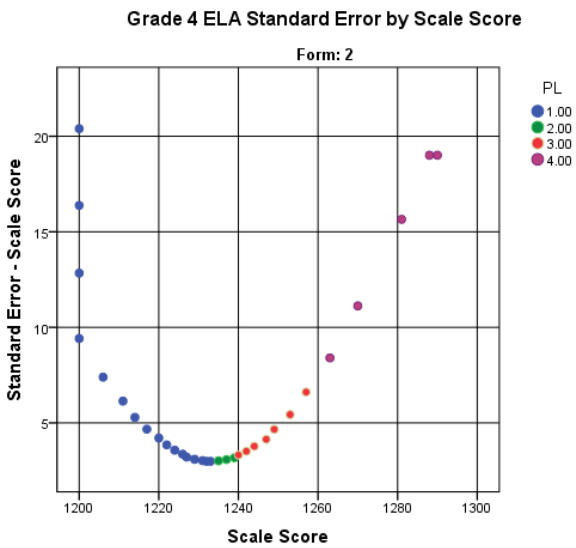


Figure 8. Grade 4 ELA Form 2 Standard Error by Scale Score

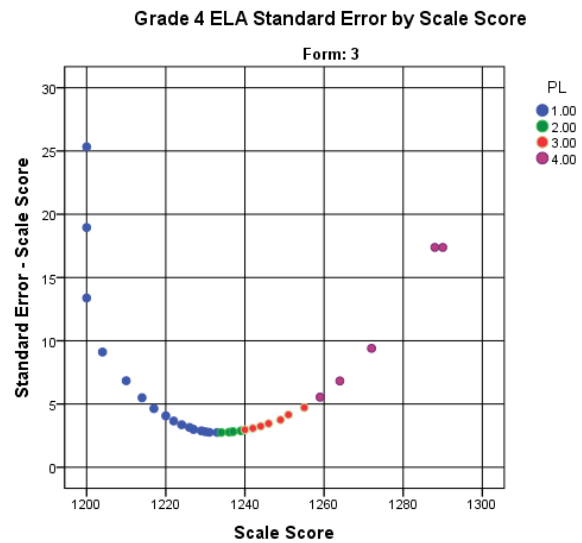


Figure 9. Grade 4 ELA Form 3 Standard Error by Scale Score

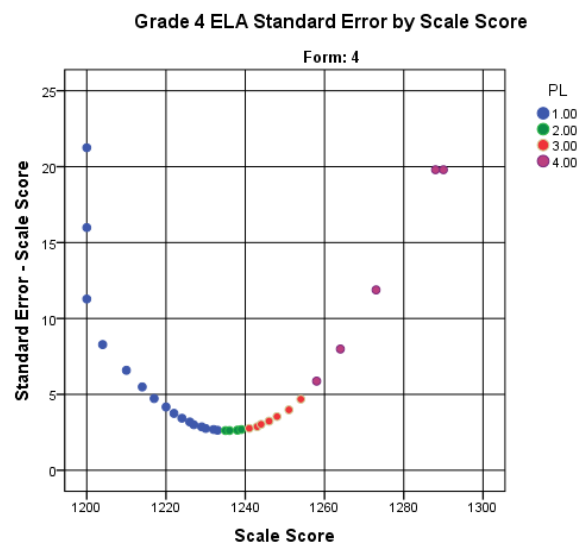


Figure 10. Grade 4 ELA Form 4 Standard Error by Scale Score

Difficulty and Discrimination by Tier

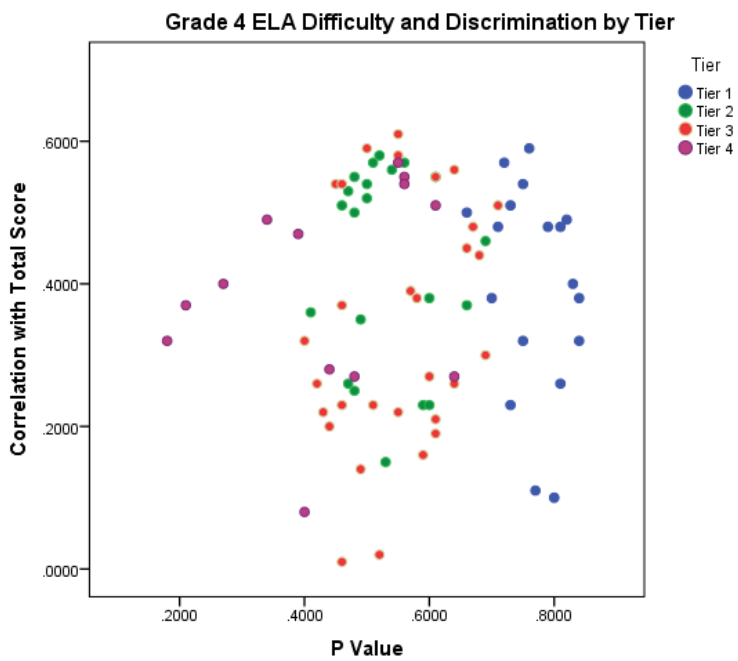


Figure 11. Grade 4 ELA Difficulty and Discrimination by Tier

Grade 5 ELA

Conditional Standard Error by Performance Level

Grade 5 ELA Standard Error by Performance Level Cut

Test	Form	PL Cut	Standard Error
Grade 5 ELA	1	2	3.57
		3	4.12
		4	7.41
	2	2	3.56
		3	4.06
		4	7.27
	3	2	3.44
		3	3.79
		4	6.08
	4	2	3.62
		3	4.30
		4	7.73

Table 3. Grade 5 ELA Standard Error by Performance Level Cut

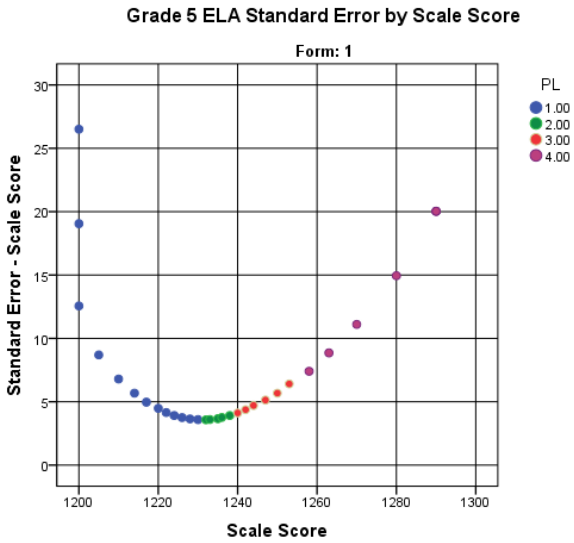


Figure 12. Grade 5 ELA Form 1 Standard Error by Scale Score

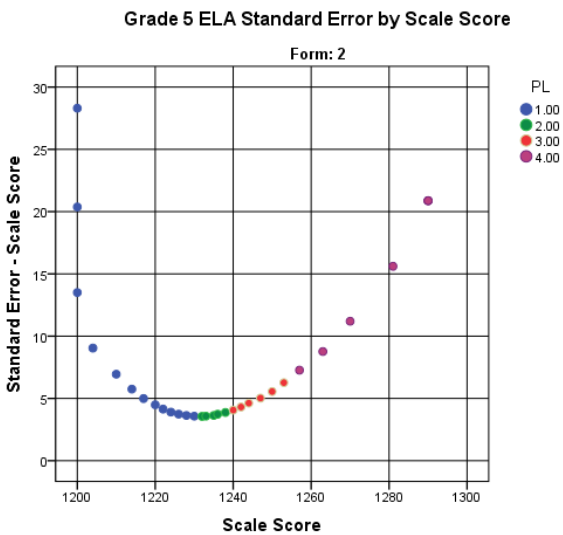


Figure 13. Grade 5 ELA Form 2 Standard Error by Scale Score

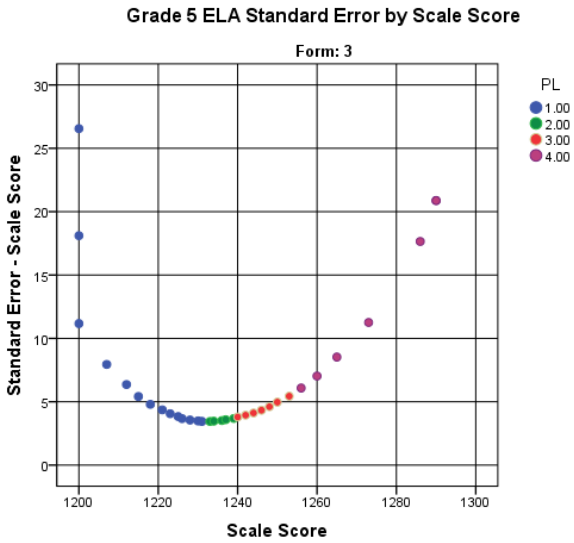


Figure 14. Grade 5 ELA Form 3 Standard Error by Scale Score

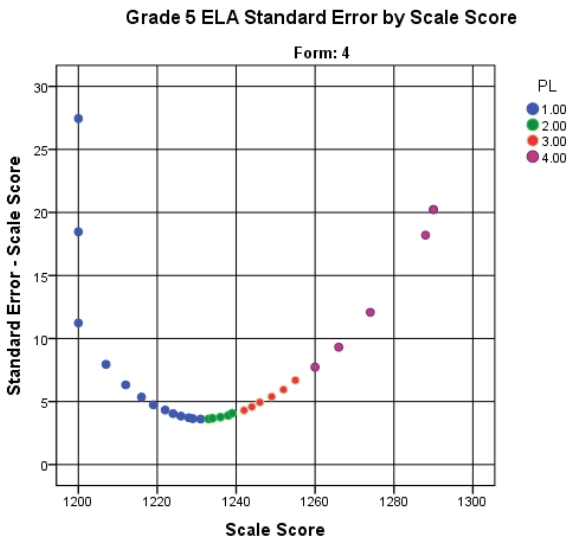


Figure 15. Grade 5 ELA Form 4 Standard Error by Scale Score

Difficulty and Discrimination by Tier

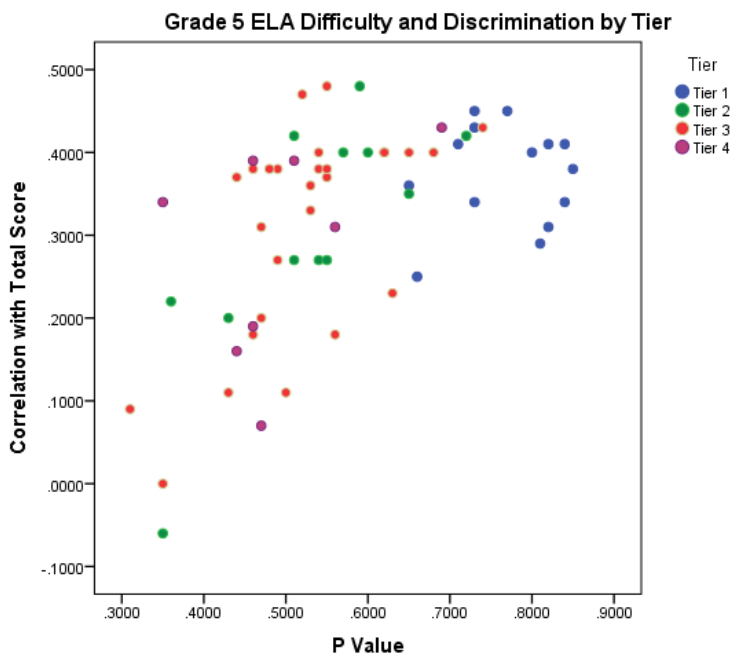


Figure 16. Grade 5 ELA Difficulty and Discrimination by Tier

Grade 6 ELA

Conditional Standard Error by Performance Level

Grade 6 ELA Standard Error by Performance Level Cut

Test	Form	PL Cut	Standard Error
Grade 6 ELA	1	2	3.46
		3	4.58
		4	7.43
	2	2	3.57
		3	4.89
		4	8.33
	3	2	3.31
		3	4.64
		4	7.69
	4	2	3.23
		3	4.78
		4	7.74

Table 4. Grade 6 ELA Standard Error by Performance Level Cut

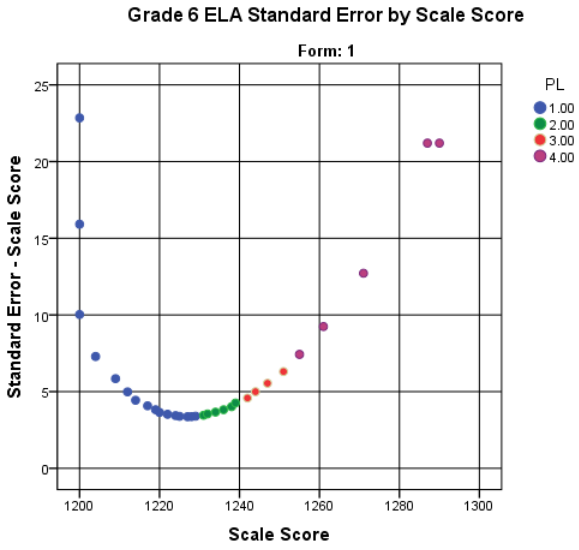


Figure 17. Grade 6 ELA Form 1 Standard Error by Scale Score

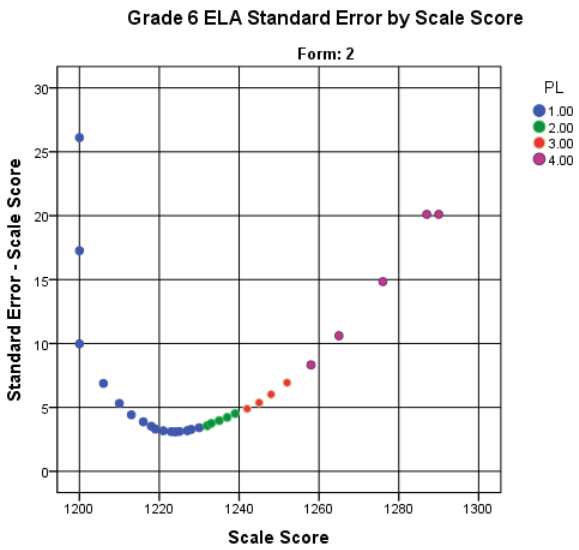


Figure 18. Grade 6 ELA Form 2 Standard Error by Scale Score

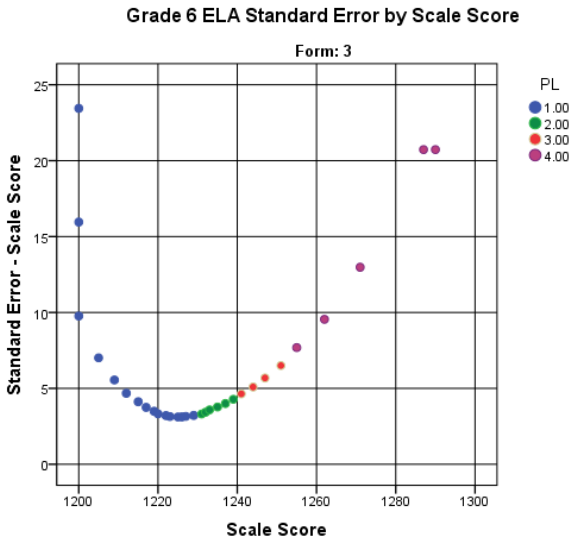


Figure 19. Grade 6 ELA Form 3 Standard Error by Scale Score

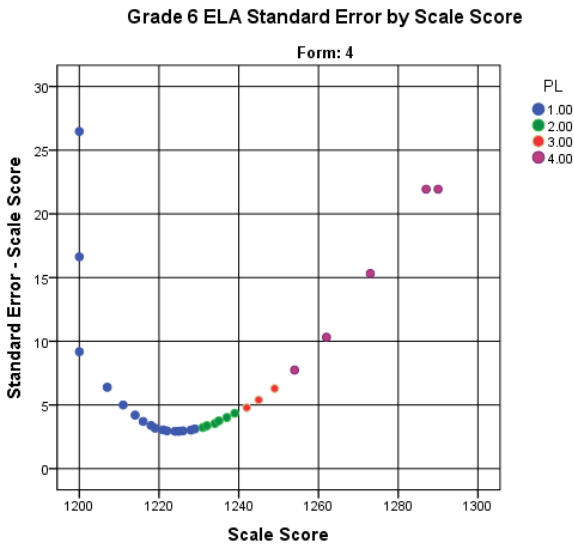


Figure 20. Grade 6 ELA Form 4 Standard Error by Scale Score

Difficulty and Discrimination by Tier

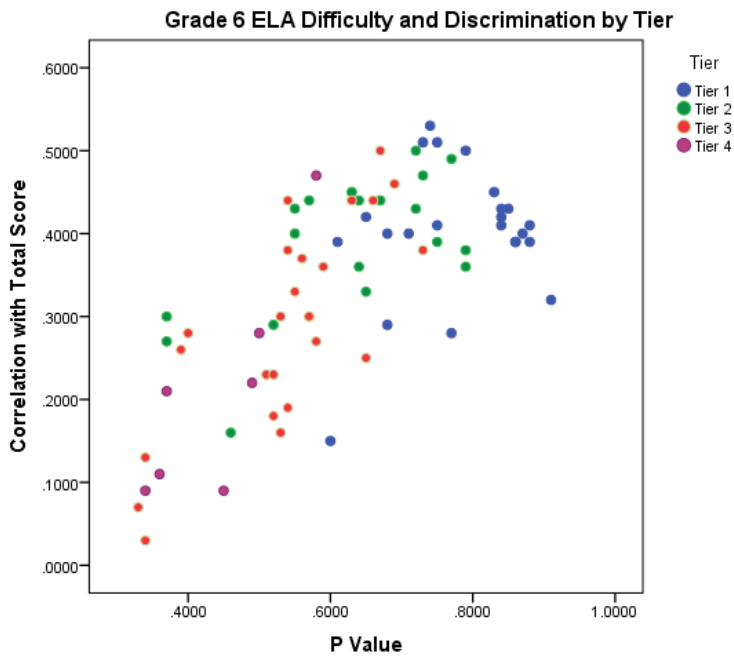


Figure 21. Grade 6 ELA Difficulty and Discrimination by Tier

Grade 7 ELA

Conditional Standard Error by Performance Level

Grade 7 ELA Standard Error by Performance Level Cut

Test	Form	PL Cut	Standard Error
Grade 7 ELA	1	2	3.01
		3	3.61
		4	6.46
	2	2	2.88
		3	3.52
		4	8.03
	3	2	3.25
		3	3.76
		4	6.19
	4	2	3.19
		3	4.29
		4	6.97

Table 5. Grade 7 ELA Standard Error by Performance Level Cut

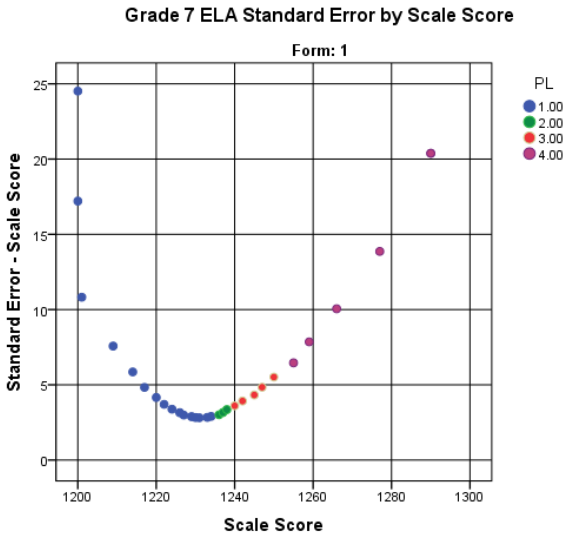


Figure 22. Grade 7 ELA Form 1 Standard Error by Scale Score

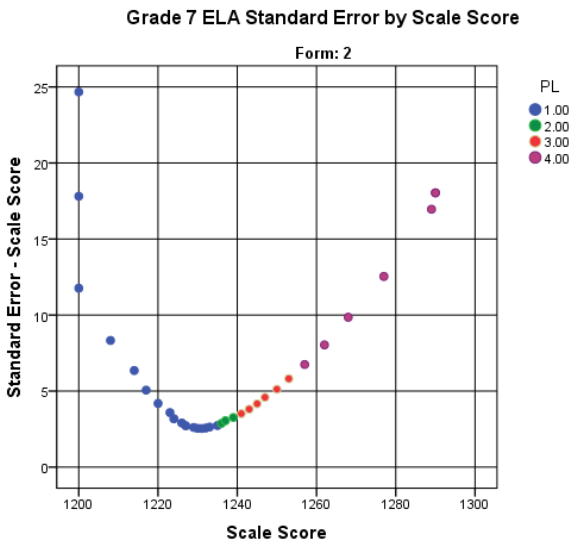


Figure 23. Grade 7 ELA Form 2 Standard Error by Scale Score

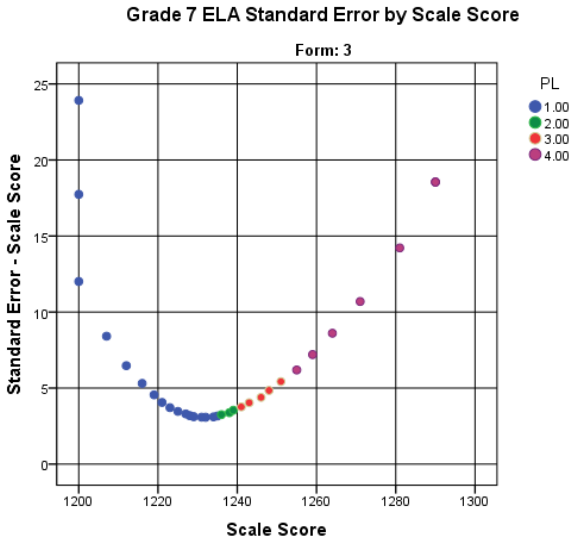


Figure 24. Grade 7 ELA Form 3 Standard Error by Scale Score

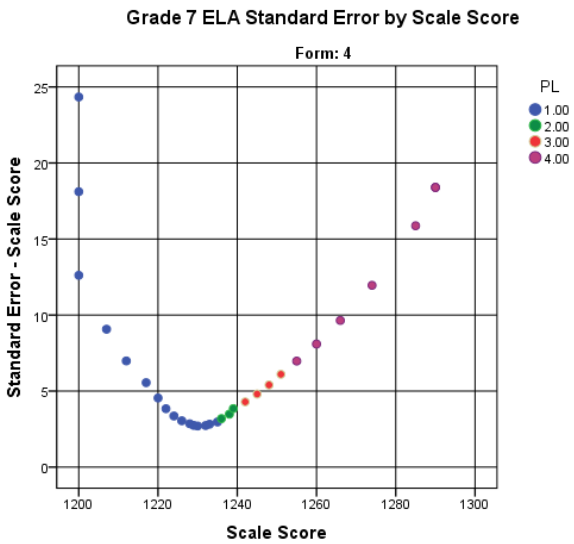


Figure 25. Grade 7 ELA Form 4 Standard Error by Scale Score

Difficulty and Discrimination by Tier

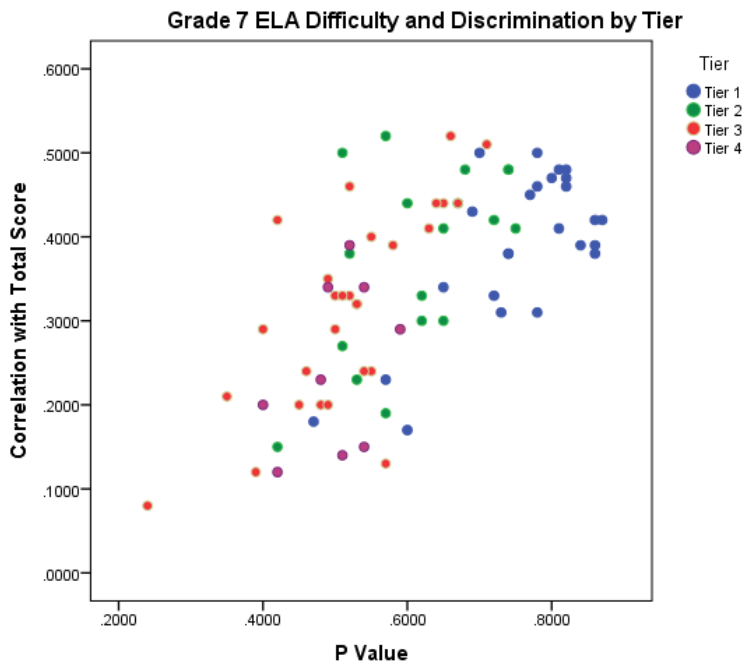


Figure 26. Grade 7 ELA Difficulty and Discrimination by Tier

Grade 8 ELA

Conditional Standard Error by Performance Level

Grade 8 ELA Standard Error by Performance Level Cut

Test	Form	PL Cut	Standard Error
Grade 8 ELA	1	2	3.43
		3	4.69
		4	6.23
	2	2	3.44
		3	4.11
		4	5.62
	3	2	3.62
		3	4.73
		4	5.78
	4	2	3.35
		3	4.52
		4	6.05

Table 6. Grade 8 ELA Standard Error by Performance Level Cut

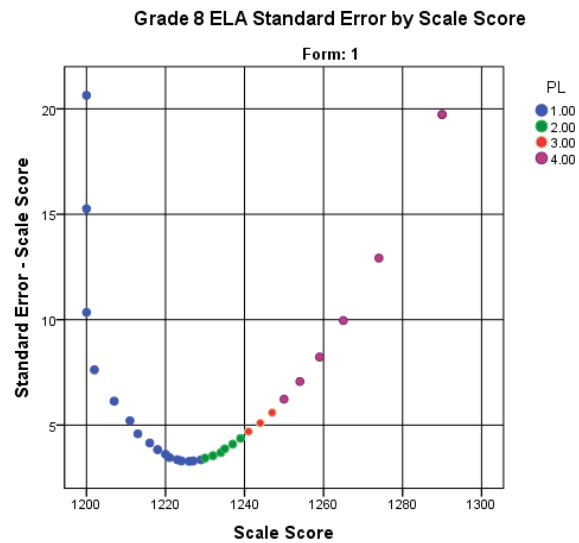


Figure 27. Grade 8 ELA Form 1 Standard Error by Scale Score

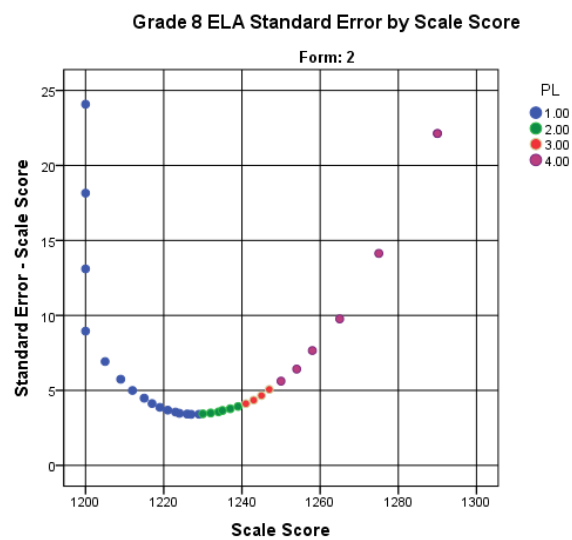


Figure 28. Grade 8 ELA Form 2 Standard Error by Scale Score

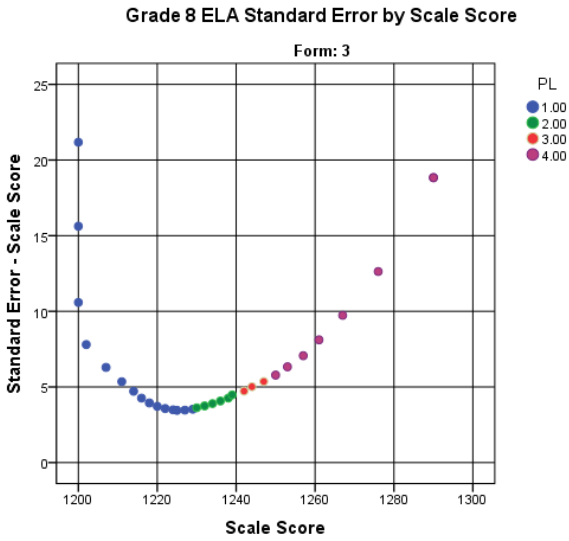


Figure 29. Grade 8 ELA Form 3 Standard Error by Scale Score

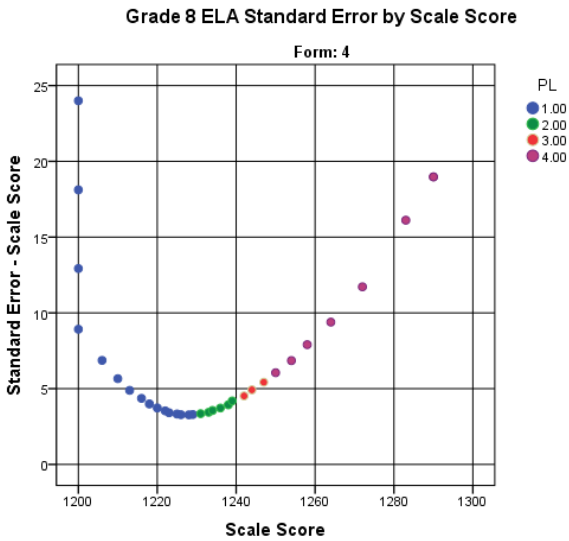


Figure 30. Grade 8 ELA Form 4 Standard Error by Scale Score

Difficulty and Discrimination by Tier

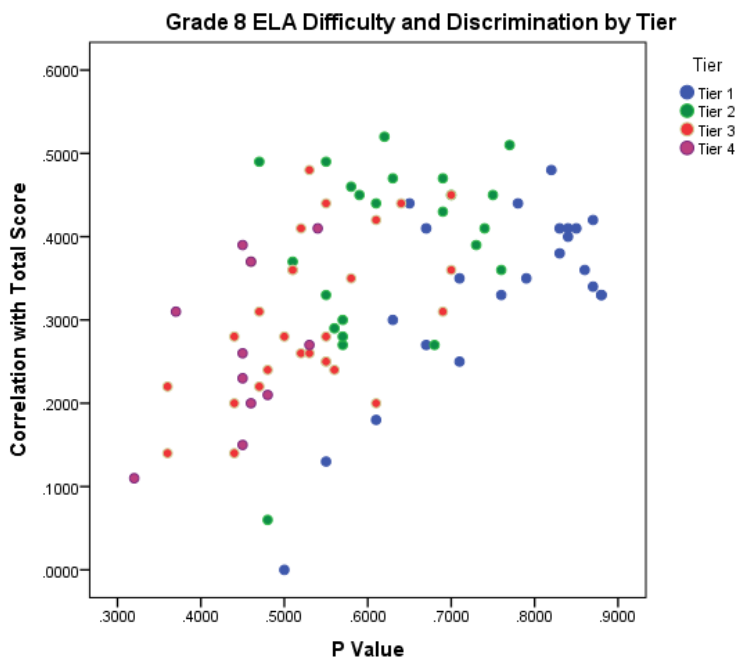


Figure 31. Grade 8 ELA Difficulty and Discrimination by Tier

Grade 11 ELA

Conditional Standard Error by Performance Level

Grade 11 ELA Standard Error by Performance Level Cut

Test	Form	PL Cut	Standard Error
Grade 11 ELA	1	2	2.25
		3	2.91
		4	7.72
	2	2	2.58
		3	2.97
		4	7.15
	3	2	2.60
		3	3.00
		4	6.92
	4	2	2.55
		3	2.88
		4	5.51

Table 7. Grade 11 ELA Standard Error by Performance Level Cut

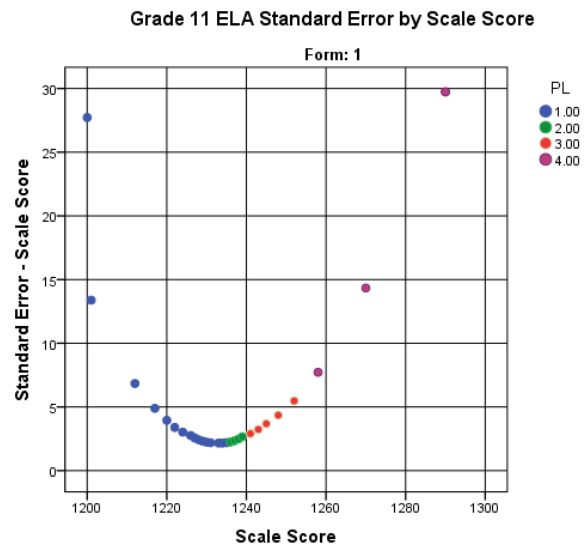


Figure 32. Grade 11 ELA Form 1 Standard Error by Scale Score

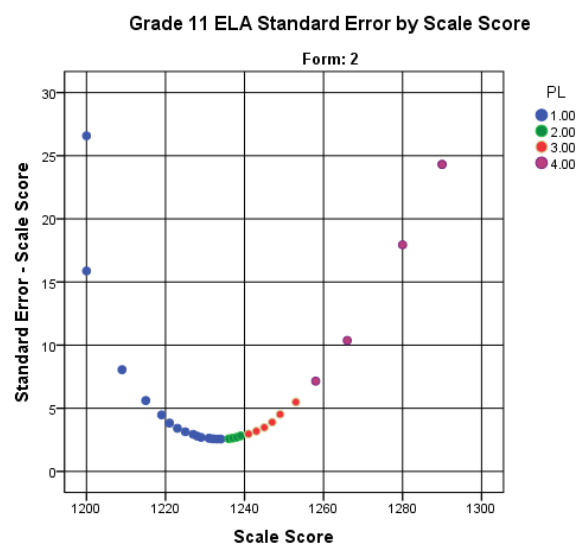


Figure 33. Grade 11 ELA Form 2 Standard Error by Scale Score

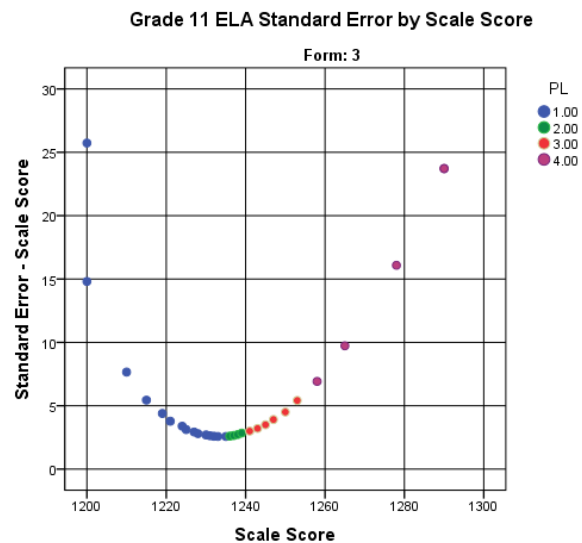


Figure 34. Grade 11 ELA Form 3 Standard Error by Scale Score

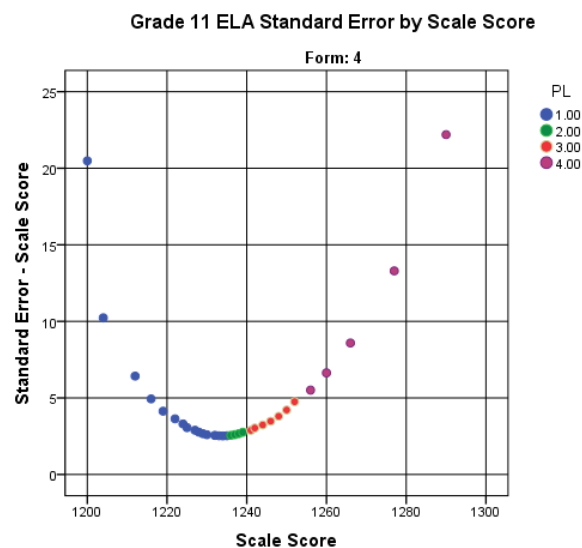


Figure 35. Grade 11 ELA Form 4 Standard Error by Scale Score

Difficulty and Discrimination by Tier

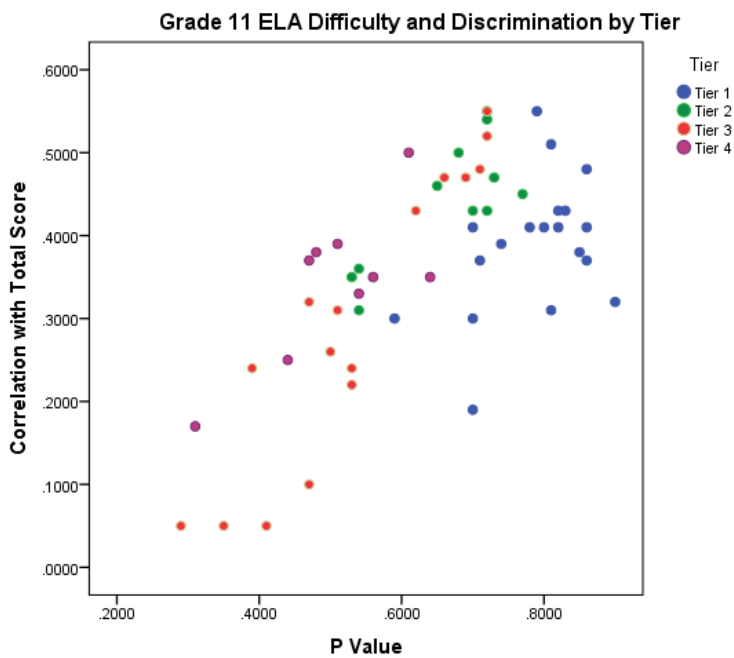


Figure 36. Grade 11 ELA Difficulty and Discrimination by Tier

Grade 3 Math

Conditional Standard Error by Performance Level

Grade 3 Math Standard Error by Performance Level Cut

Test	Form	PL Cut	Standard Error
Grade 3 Math	1	2	4.07
		3	3.89
		4	5.18
	2	2	3.91
		3	3.57
		4	4.66
	3	2	3.95
		3	3.82
		4	4.88
	4	2	3.73
		3	3.43
		4	4.63

Table 8. Grade 3 Math Standard Error by Performance Level Cut

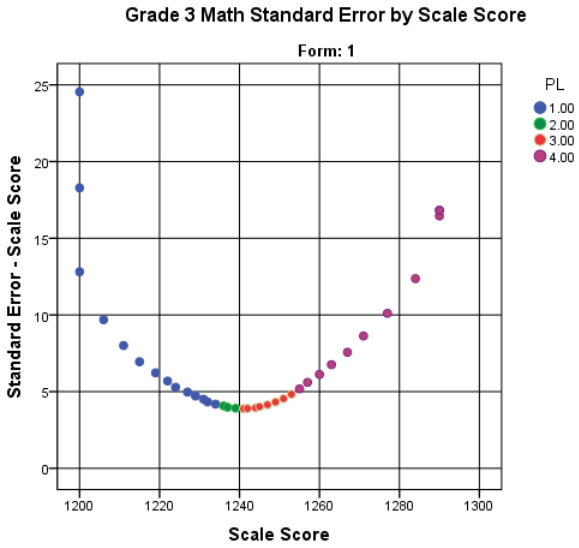


Figure 37. Grade 3 Math Form 1 Standard Error by Scale Score

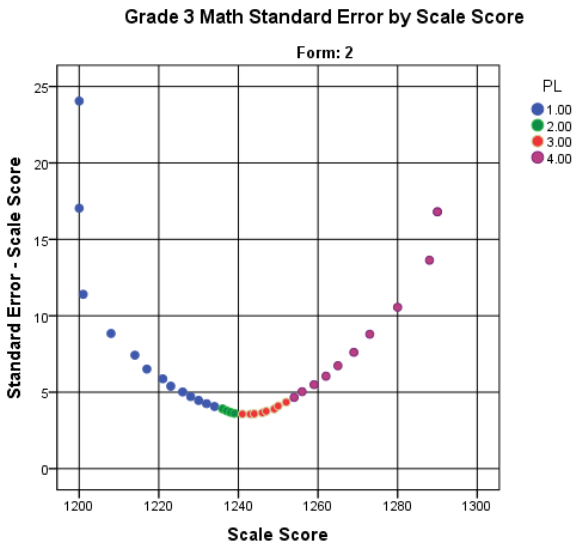


Figure 38. Grade 3 Math Form 2 Standard Error by Scale Score

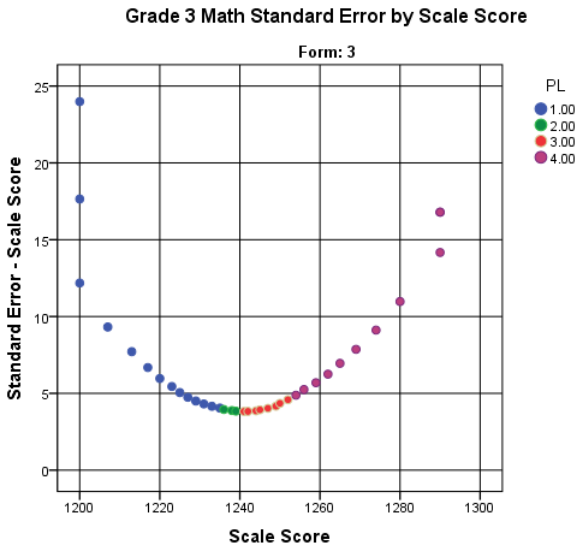


Figure 39. Grade 3 Math Form 3 Standard Error by Scale Score

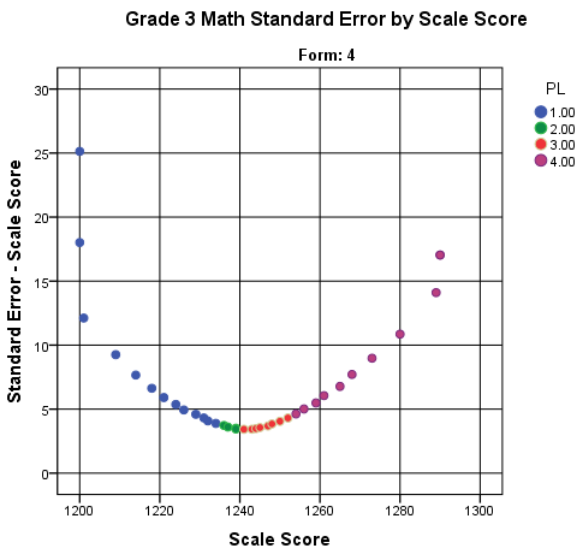


Figure 40. Grade 3 Math Form 4 Standard Error by Scale Score

Difficulty and Discrimination by Tier

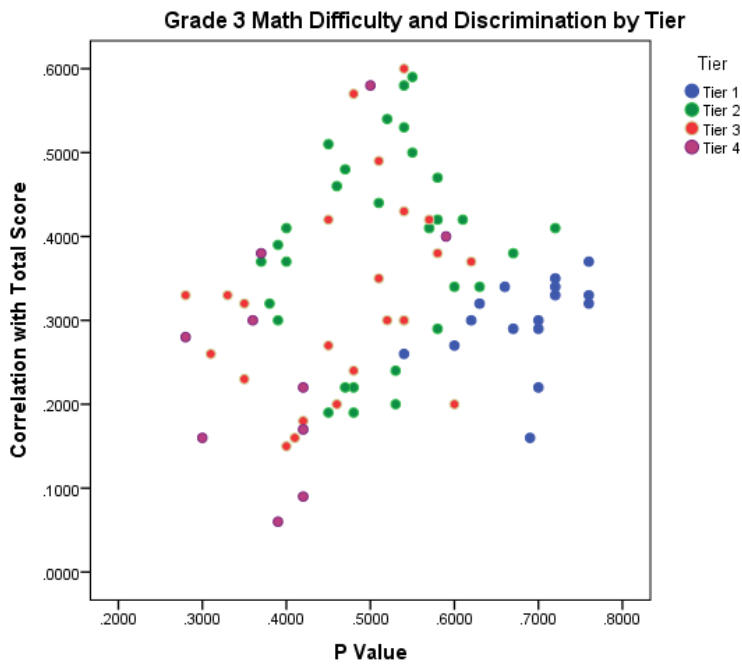


Figure 41. Grade 3 Math Difficulty and Discrimination by Tier

Grade 4 Math

Conditional Standard Error by Performance Level

Grade 4 Math Standard Error by Performance Level Cut

Test	Form	PL Cut	Standard Error
Grade 4 Math	1	2	4.96
		3	4.83
		4	5.60
	2	2	4.77
		3	4.60
		4	5.61
	3	2	4.41
		3	4.31
		4	5.44
	4	2	5.02
		3	5.13
		4	5.91

Table 9. Grade 4 Math Standard Error by Performance Level Cut

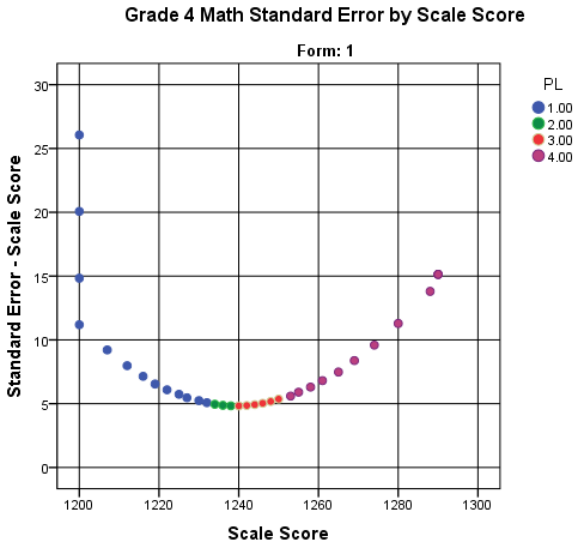


Figure 42. Grade 4 Math Form 1 Standard Error by Scale Score

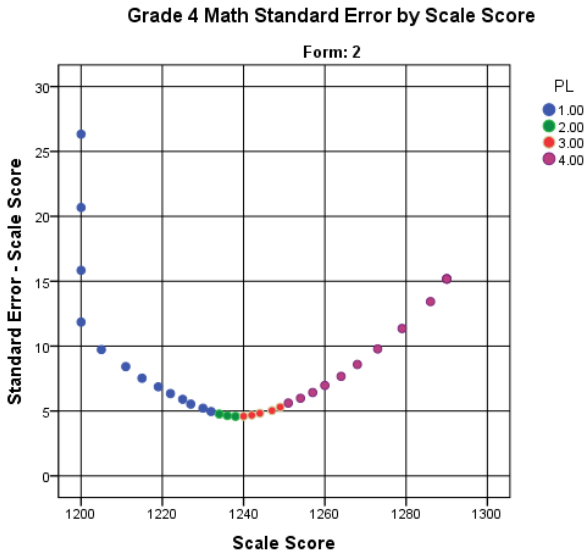


Figure 43. Grade 4 Math Form 2 Standard Error by Scale Score

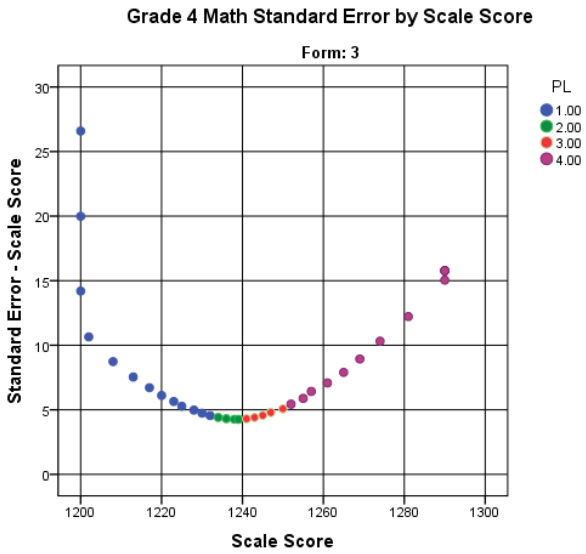


Figure 44. Grade 4 Math Form 3 Standard Error by Scale Score

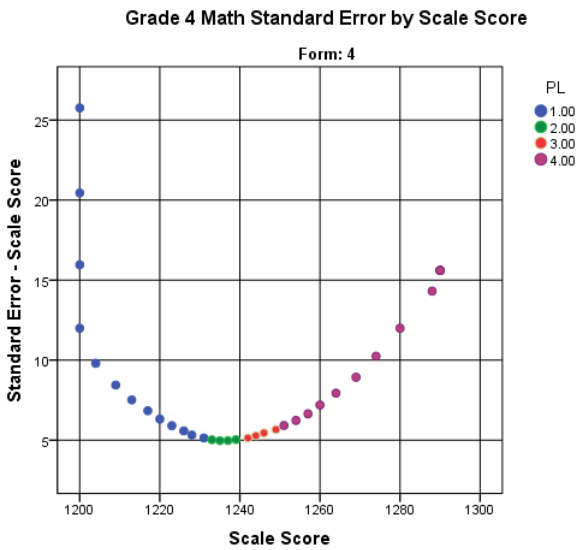


Figure 45. Grade 4 Math Form 4 Standard Error by Scale Score

Difficulty and Discrimination by Tier

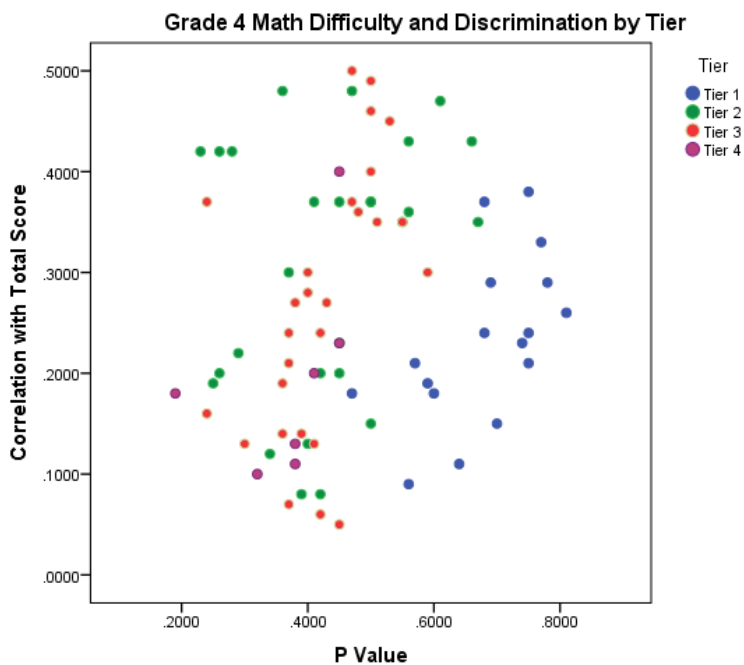


Figure 46. Grade 4 Math Difficulty and Discrimination by Tier

Grade 5 Math

Conditional Standard Error by Performance Level

Grade 5 Math Standard Error by Performance Level Cut

Test	Form	PL Cut	Standard Error
Grade 5 Math	1	2	5.27
		3	5.05
		4	5.73
	2	2	5.76
		3	5.57
		4	6.29
	3	2	5.92
		3	5.31
		4	5.88
	4	2	5.23
		3	5.04
		4	6.02

Table 10. Grade 5 Math Standard Error by Performance Level Cut

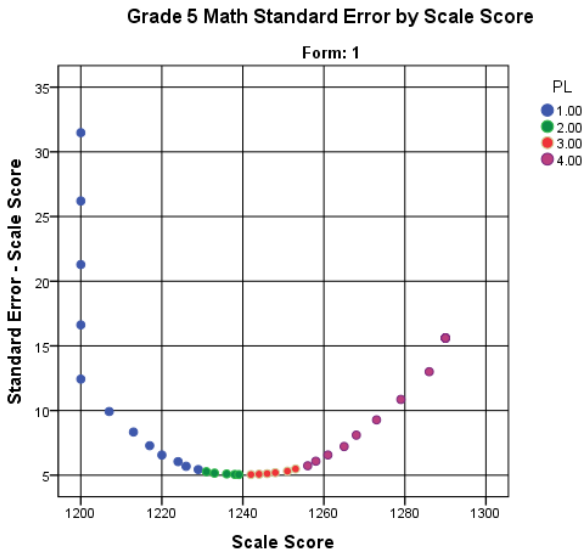


Figure 47. Grade 5 Math Form 1 Standard Error by Scale Score

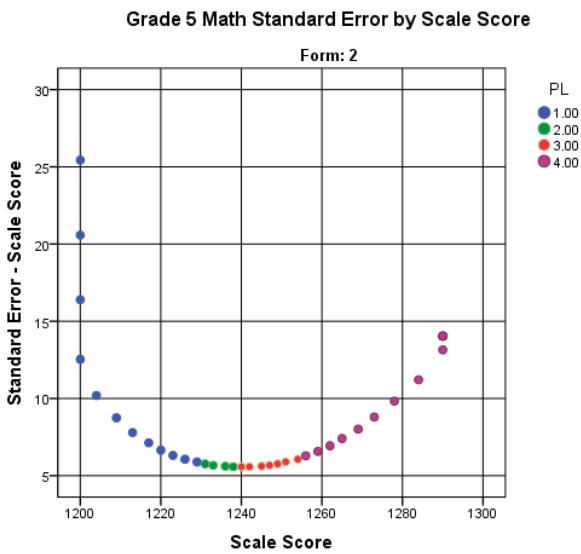


Figure 48. Grade 5 Math Form 2 Standard Error by Scale Score

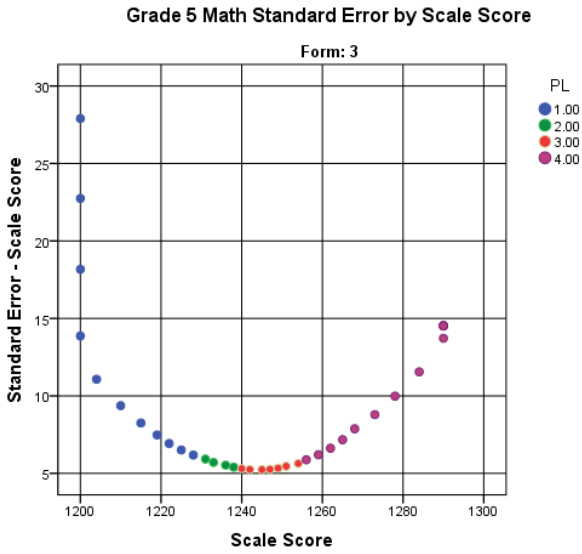


Figure 49. Grade 5 Math Form 3 Standard Error by Scale Score

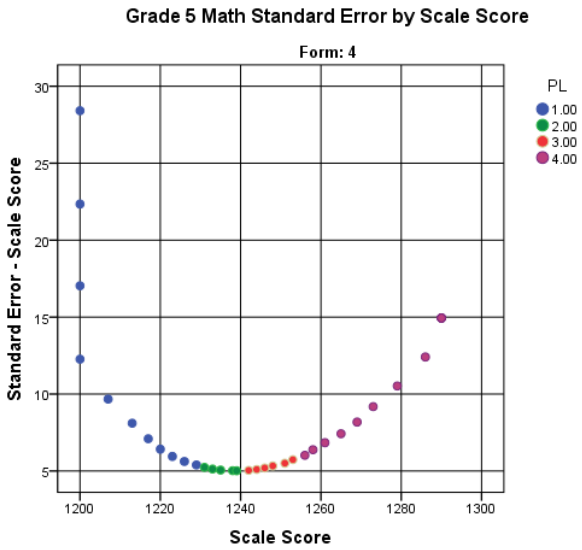


Figure 50. Grade 5 Math Form 4 Standard Error by Scale Score

Difficulty and Discrimination by Tier

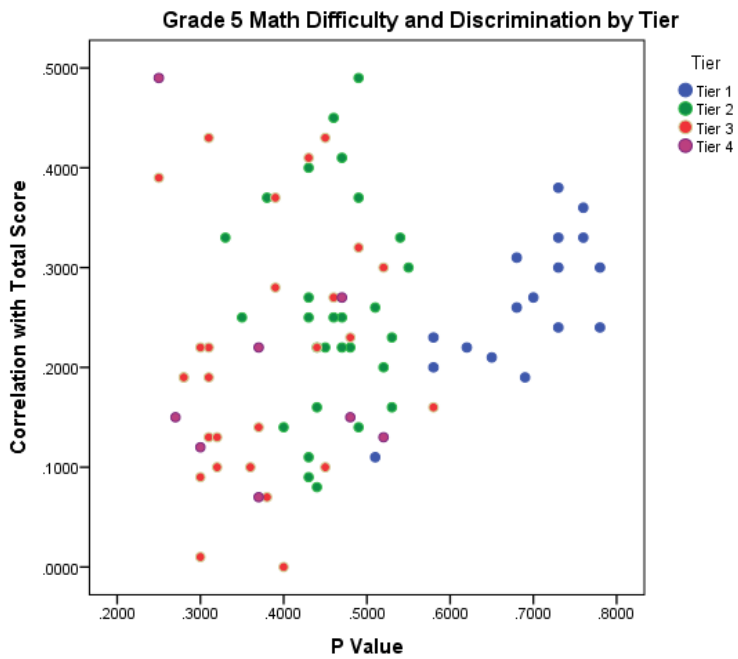


Figure 51. Grade 5 Math Difficulty and Discrimination by Tier

Grade 6 Math

Conditional Standard Error by Performance Level

Grade 6 Math Standard Error by Performance Level Cut

Test	Form	PL Cut	Standard Error
Grade 6 Math	1	2	3.96
		3	4.11
		4	5.00
	2	2	4.30
		3	4.47
		4	5.23
	3	2	3.99
		3	4.01
		4	4.80
	4	2	4.20
		3	4.31
		4	4.82

Table 11. Grade 6 Math Standard Error by Performance Level Cut

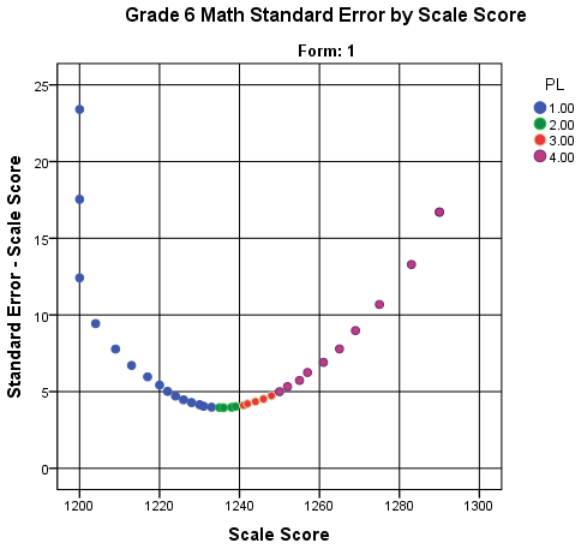


Figure 52. Grade 6 Math Form 1 Standard Error by Scale Score

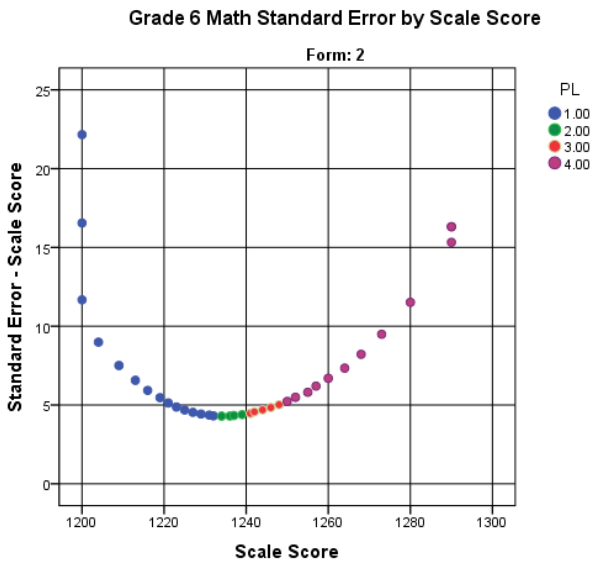


Figure 53. Grade 6 Math Form 2 Standard Error by Scale Score

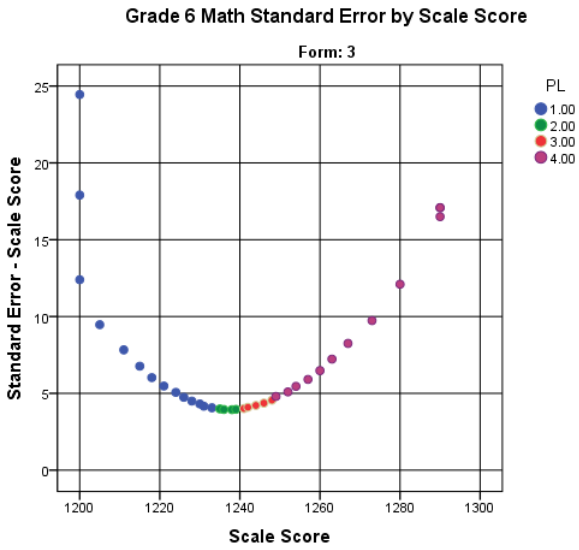


Figure 54. Grade 6 Math Form 3 Standard Error by Scale Score

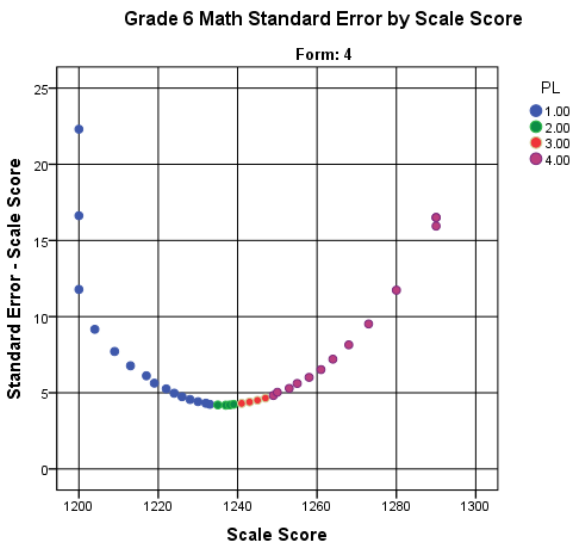


Figure 55. Grade 6 Math Form 4 Standard Error by Scale Score

Difficulty and Discrimination by Tier

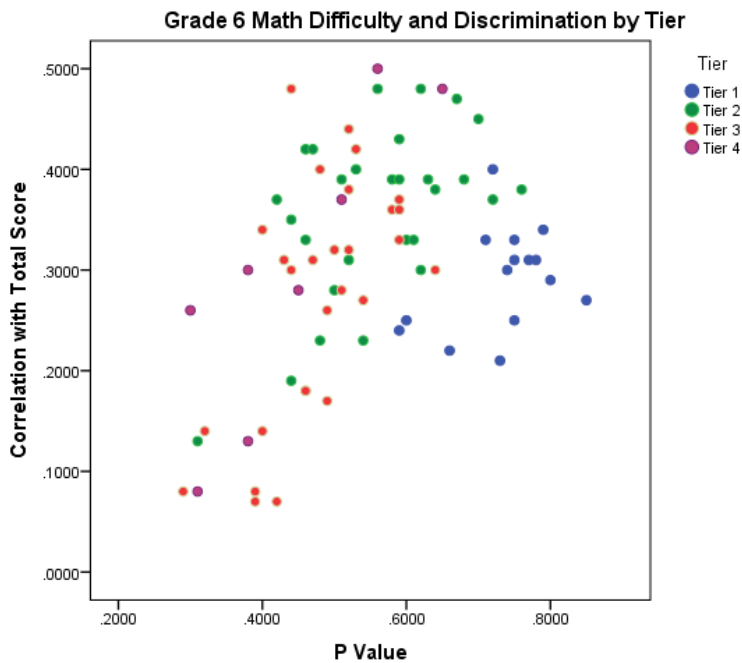


Figure 56. Grade 6 Math Difficulty and Discrimination by Tier

Grade 7 Math

Conditional Standard Error by Performance Level

Grade 7 Math Standard Error by Performance Level Cut

Test	Form	PL Cut	Standard Error
Grade 7 Math	1	2	4.68
		3	4.61
		4	5.42
	2	2	4.09
		3	4.11
		4	5.03
	3	2	4.41
		3	4.26
		4	5.07
	4	2	4.57
		3	4.54
		4	5.38

Table 12. Grade 7 Math Standard Error by Performance Level Cut

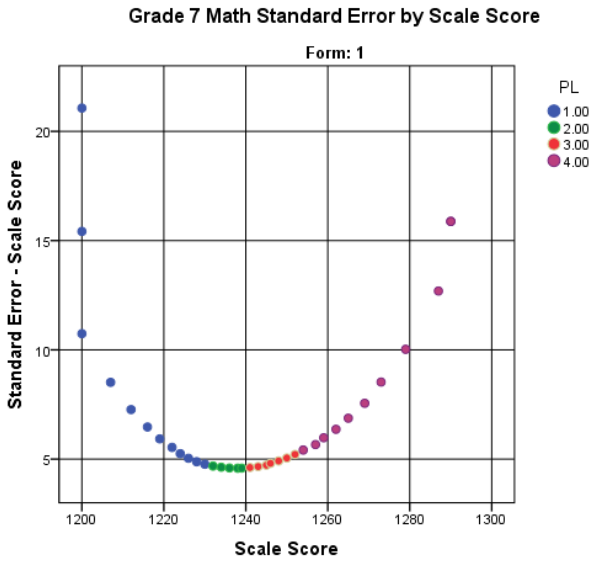


Figure 57. Grade 7 Math Form 1 Standard Error by Scale Score

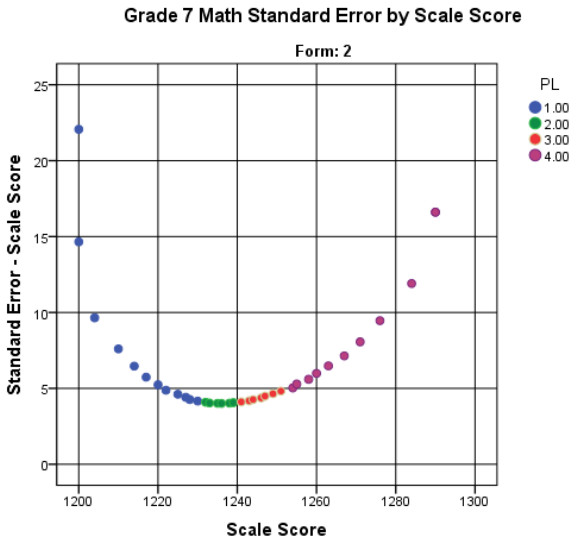


Figure 58. Grade 7 Math Form 2 Standard Error by Scale Score

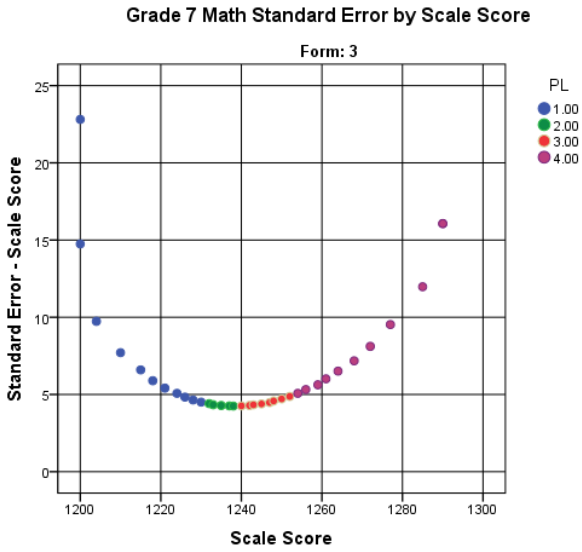


Figure 59. Grade 7 Math Form 3 Standard Error by Scale Score

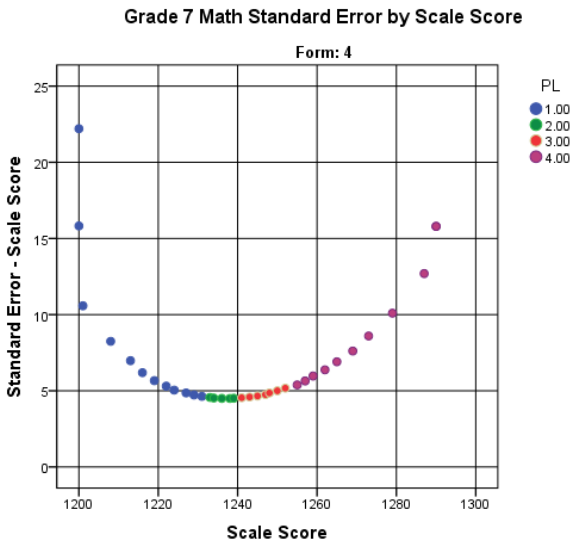


Figure 60. Grade 7 Math Form 4 Standard Error by Scale Score

Difficulty and Discrimination by Tier

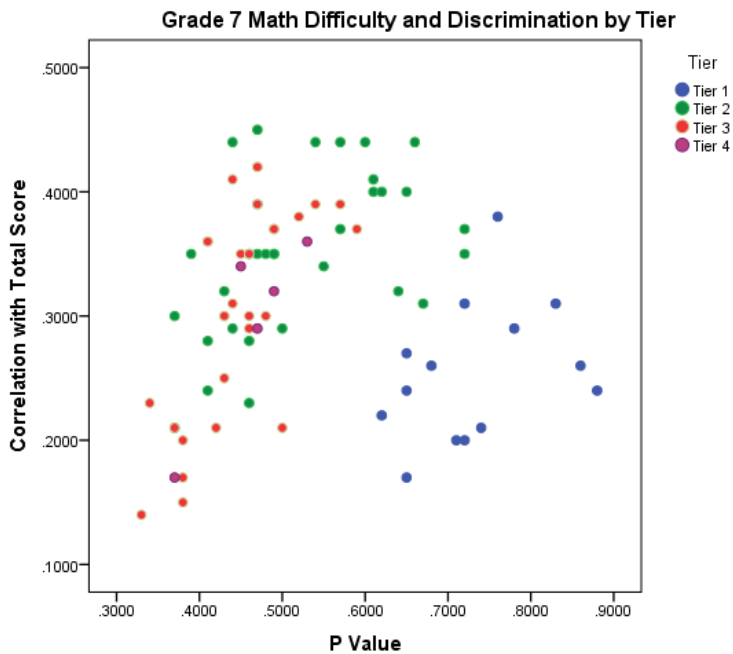


Figure 61. Grade 7 Math Difficulty and Discrimination by Tier

Grade 8 Math

Conditional Standard Error by Performance Level

Grade 8 Math Standard Error by Performance Level Cut

Test	Form	PL Cut	Standard Error
Grade 8 Math	1	2	4.65
		3	4.47
		4	4.79
	2	2	4.23
		3	4.23
		4	4.69
	3	2	4.66
		3	4.51
		4	4.68
	4	2	4.93
		3	4.81
		4	5.04

Table 13. Grade 8 Math Standard Error by Performance Level Cut

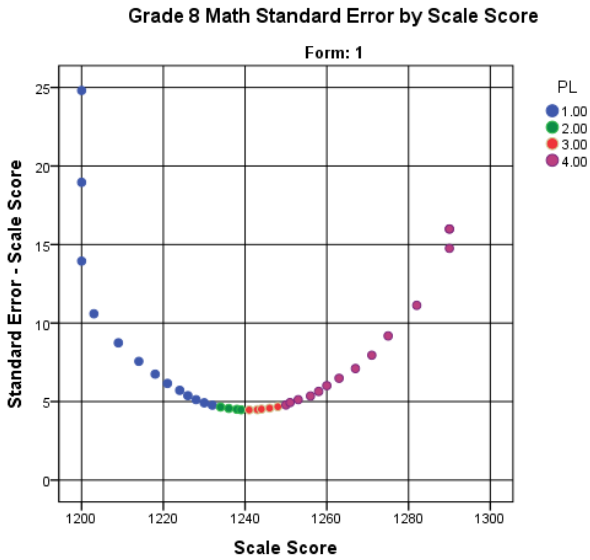


Figure 62. Grade 8 Math Form 1 Standard Error by Scale Score

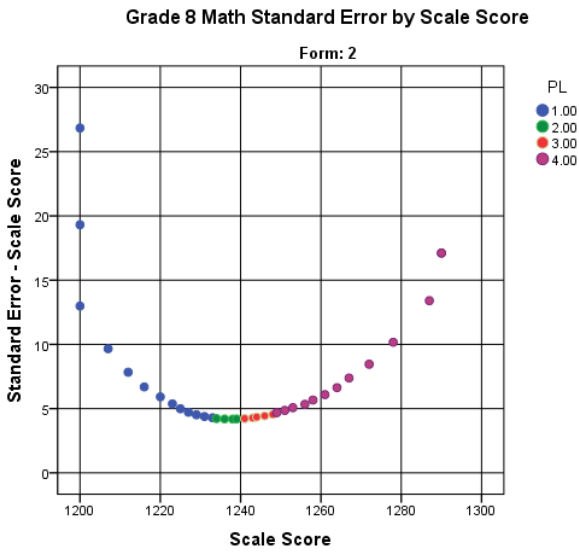


Figure 63. Grade 8 Math Form 2 Standard Error by Scale Score

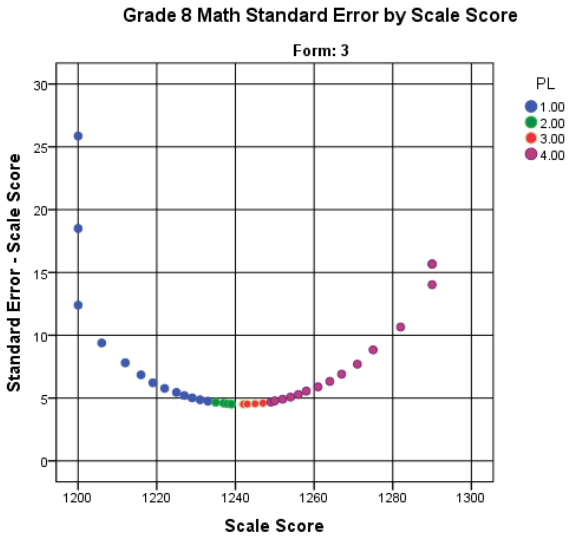


Figure 64. Grade 8 Math Form 3 Standard Error by Scale Score

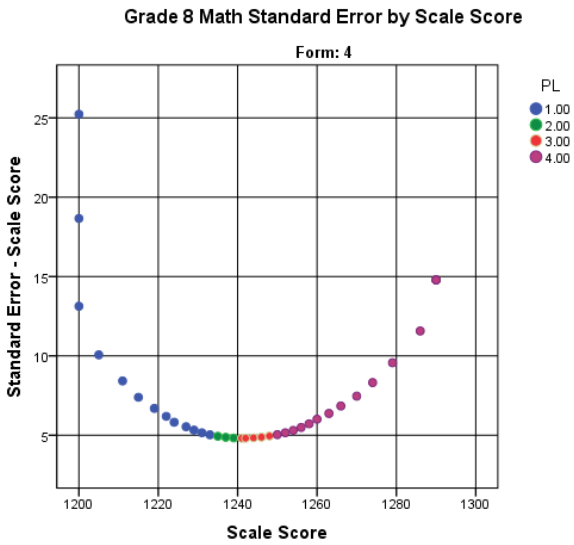


Figure 65. Grade 8 Math Form 4 Standard Error by Scale Score

Difficulty and Discrimination by Tier

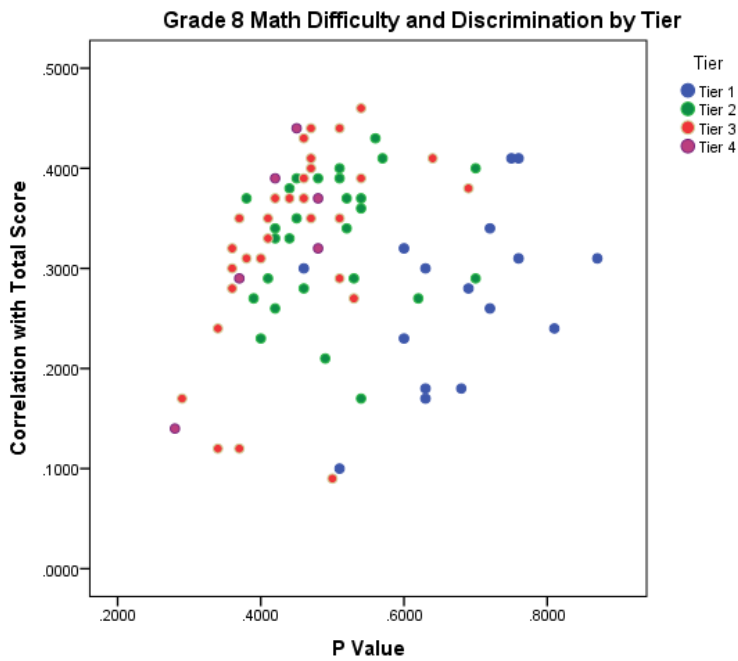


Figure 66. Grade 8 Math Difficulty and Discrimination by Tier

Grade 11 Math

Conditional Standard Error by Performance Level

Grade 11 Math Standard Error by Performance Level Cut

Test	Form	PL Cut	Standard Error
Grade 11 Math	1	2	4.54
		3	4.25
		4	4.44
	2	2	4.64
		3	4.41
		4	4.6
	3	2	4.7
		3	4.56
		4	4.81
	4	2	4.86
		3	4.5
		4	4.59

Table 14 . Grade 11 Math Standard Error by Performance Level Cut

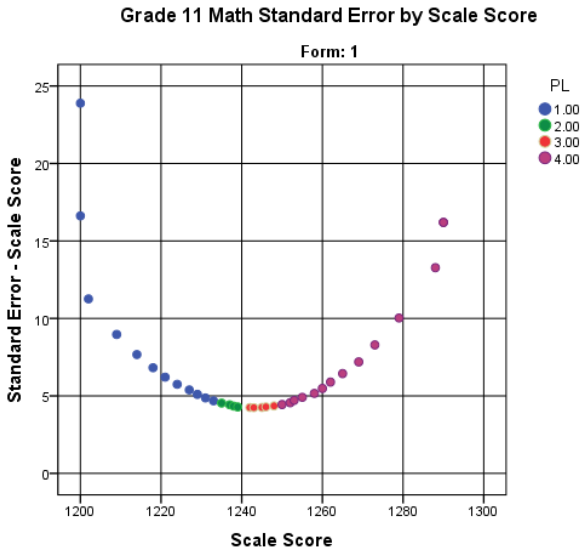


Figure 67. Grade 11 Math Form 1 Standard Error by Scale Score

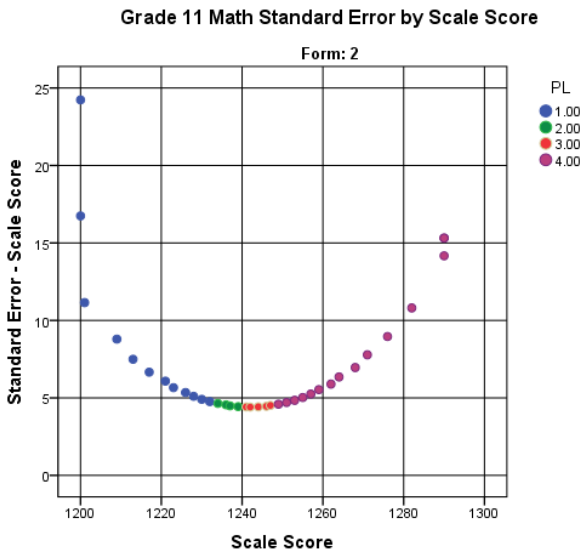


Figure 68. Grade 11 Math Form 2 Standard Error by Scale Score

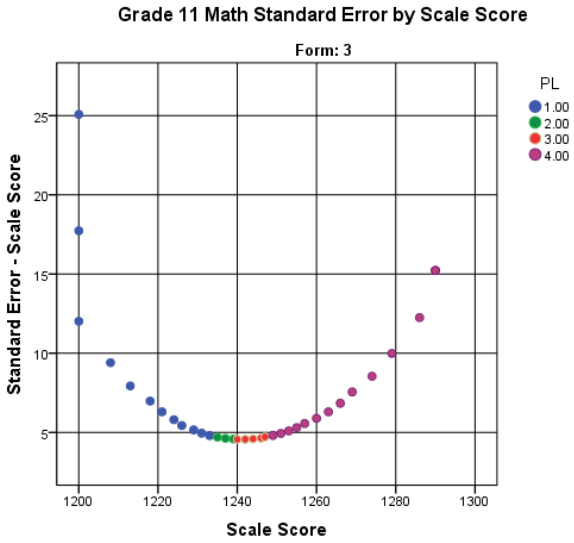


Figure 69. Grade 11 Math Form 3 Standard Error by Scale Score

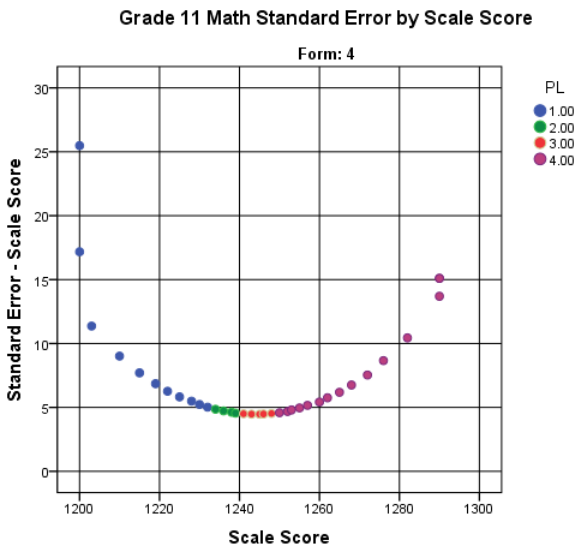


Figure 70. Grade 11 Math Form 4 Standard Error by Scale Score

Difficulty and Discrimination by Tier

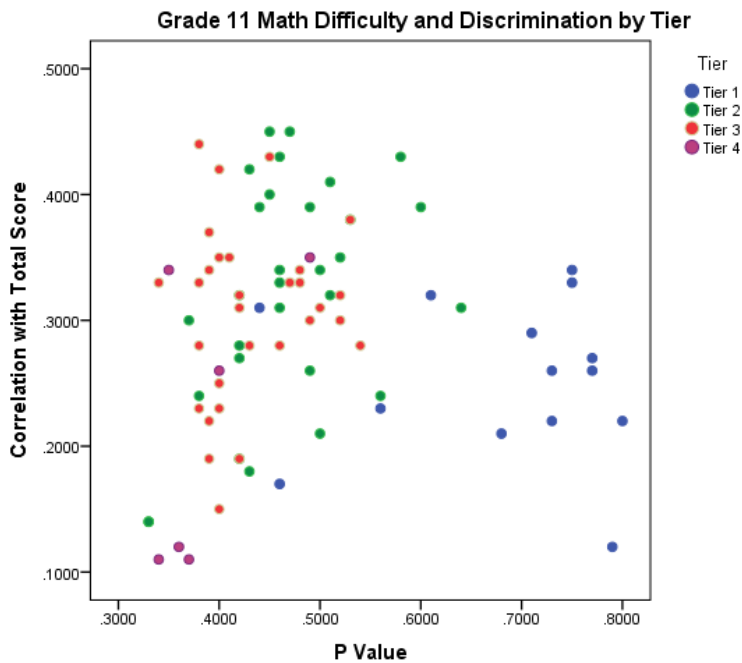


Figure 71. Grade 11 Math Difficulty and Discrimination by Tier

Discussion and Implications

The error at the performance level cut scores for all but level 4 was generally relatively low, indicating acceptable precision for classification into performance levels 2 and 3. The error associated with the performance level 4 cut was relatively higher – in some cases as much as 2 or 3 times that of the level 2 or 3 cuts in ELA. This pattern was observed in math, but not to the degree of ELA.

Although the error at the cuts was generally fairly low, the error near the LOSS and HOSS was very high for most grade and content tests. This suggests the test functions well for performance level classifications – particularly for performance levels 2 and 3 – but is not very precise for disentangling degrees of performance for very low or very high achieving students. This is also not uncommon for fixed form general assessments.

Encouragingly, most of the items discriminate well across the tiers, especially for tiers 2, 3, and 4. This is a favorable finding, because it suggests that items are available to bolster the information in the higher regions of the scale. By assembling future forms with items that are relatively more difficult and more discriminating, the information near the upper region of the scale will improve and error will decrease. Because the information at levels 2 and 3 should not

be decreased, either adding items to the test or pursuing an adaptive approach to testing may be a promising strategy.

Error at the very low end of the scale is likely a different situation. The LOSS scores are mostly associated with students who attempted zero or very few items, as opposed to students who consistently responded to all items but got most of them incorrect. Students who attempted few items are likely students with communication challenges or otherwise were not successful accessing the test content. In these cases, augmenting information in the test scale will do little to help produce measures of student performance. Rather, the focus should be on instructional and administration strategies to better support students in demonstrating what they know and can do.

Appendix A – Index of Tables

Table 1. Grade 3 ELA Standard Error by Performance Level Cut	5
Table 2. Grade 4 ELA Standard Error by Performance Level Cut	8
Table 3. Grade 5 ELA Standard Error by Performance Level Cut	11
Table 4. Grade 6 ELA Standard Error by Performance Level Cut	14
Table 5. Grade 7 ELA Standard Error by Performance Level Cut	17
Table 6. Grade 8 ELA Standard Error by Performance Level Cut	20
Table 7. Grade 11 ELA Standard Error by Performance Level Cut	23
Table 8. Grade 3 Math Standard Error by Performance Level Cut	26
Table 9. Grade 4 Math Standard Error by Performance Level Cut	29
Table 10. Grade 5 Math Standard Error by Performance Level Cut	32
Table 11. Grade 6 Math Standard Error by Performance Level Cut	35
Table 12. Grade 7 Math Standard Error by Performance Level Cut	38
Table 13. Grade 8 Math Standard Error by Performance Level Cut	41
Table 14 . Grade 11 Math Standard Error by Performance Level Cut	44

Appendix B – Index of Figures

Figure 1. Conditional Standard Error by Performance Level and Subject	4
Figure 2. Grade 3 ELA Form 1 Standard Error by Scale Score	6
Figure 3. Grade 3 ELA Form 2 Standard Error by Scale Score	6
Figure 4. Grade 3 ELA Form 3 Standard Error by Scale Score	7
Figure 5. Grade 3 ELA Form 4 Standard Error by Scale Score	7
Figure 6. Grade 3 ELA Difficulty and Discrimination by Tier	8
Figure 7. Grade 4 ELA Form 1 Standard Error by Scale Score	9
Figure 8. Grade 4 ELA Form 2 Standard Error by Scale Score	9
Figure 9. Grade 4 ELA Form 3 Standard Error by Scale Score	10
Figure 10. Grade 4 ELA Form 4 Standard Error by Scale Score	10
Figure 11. Grade 4 ELA Difficulty and Discrimination by Tier	11
Figure 12. Grade 5 ELA Form 1 Standard Error by Scale Score	12
Figure 13. Grade 5 ELA Form 2 Standard Error by Scale Score	12
Figure 14. Grade 5 ELA Form 3 Standard Error by Scale Score	13
Figure 15. Grade 5 ELA Form 4 Standard Error by Scale Score	13
Figure 16. Grade 5 ELA Difficulty and Discrimination by Tier	14
Figure 17. Grade 6 ELA Form 1 Standard Error by Scale Score	15
Figure 18. Grade 6 ELA Form 2 Standard Error by Scale Score	15
Figure 19. Grade 6 ELA Form 3 Standard Error by Scale Score	16
Figure 20. Grade 6 ELA Form 4 Standard Error by Scale Score	16
Figure 21. Grade 6 ELA Difficulty and Discrimination by Tier	17
Figure 22. Grade 7 ELA Form 1 Standard Error by Scale Score	18
Figure 23. Grade 7 ELA Form 2 Standard Error by Scale Score	18
Figure 24. Grade 7 ELA Form 3 Standard Error by Scale Score	19
Figure 25. Grade 7 ELA Form 4 Standard Error by Scale Score	19
Figure 26. Grade 7 ELA Difficulty and Discrimination by Tier	20
Figure 27. Grade 8 ELA Form 1 Standard Error by Scale Score	21
Figure 28. Grade 8 ELA Form 2 Standard Error by Scale Score	21
Figure 29. Grade 8 ELA Form 3 Standard Error by Scale Score	22
Figure 30. Grade 8 ELA Form 4 Standard Error by Scale Score	22
Figure 31. Grade 8 ELA Difficulty and Discrimination by Tier	23
Figure 32. Grade 11 ELA Form 1 Standard Error by Scale Score	24
Figure 33. Grade 11 ELA Form 2 Standard Error by Scale Score	24
Figure 34. Grade 11 ELA Form 3 Standard Error by Scale Score	25
Figure 35. Grade 11 ELA Form 4 Standard Error by Scale Score	25
Figure 36. Grade 11 ELA Difficulty and Discrimination by Tier	26
Figure 37. Grade 3 Math Form 1 Standard Error by Scale Score	27
Figure 38. Grade 3 Math Form 2 Standard Error by Scale Score	27
Figure 39. Grade 3 Math Form 3 Standard Error by Scale Score	28

Figure 40. Grade 3 Math Form 4 Standard Error by Scale Score.....	28
Figure 41. Grade 3 Math Difficulty and Discrimination by Tier.....	29
Figure 42. Grade 4 Math Form 1 Standard Error by Scale Score.....	30
Figure 43. Grade 4 Math Form 2 Standard Error by Scale Score.....	30
Figure 44. Grade 4 Math Form 3 Standard Error by Scale Score.....	31
Figure 45. Grade 4 Math Form 4 Standard Error by Scale Score.....	31
Figure 46. Grade 4 Math Difficulty and Discrimination by Tier.....	32
Figure 47. Grade 5 Math Form 1 Standard Error by Scale Score.....	33
Figure 48. Grade 5 Math Form 2 Standard Error by Scale Score.....	33
Figure 49. Grade 5 Math Form 3 Standard Error by Scale Score.....	34
Figure 50. Grade 5 Math Form 4 Standard Error by Scale Score.....	34
Figure 51. Grade 5 Math Difficulty and Discrimination by Tier.....	35
Figure 52. Grade 6 Math Form 1 Standard Error by Scale Score.....	36
Figure 53. Grade 6 Math Form 2 Standard Error by Scale Score.....	36
Figure 54. Grade 6 Math Form 3 Standard Error by Scale Score.....	37
Figure 55. Grade 6 Math Form 4 Standard Error by Scale Score.....	37
Figure 56. Grade 6 Math Difficulty and Discrimination by Tier.....	38
Figure 57. Grade 7 Math Form 1 Standard Error by Scale Score.....	39
Figure 58. Grade 7 Math Form 2 Standard Error by Scale Score.....	39
Figure 59. Grade 7 Math Form 3 Standard Error by Scale Score.....	40
Figure 60. Grade 7 Math Form 4 Standard Error by Scale Score.....	40
Figure 61. Grade 7 Math Difficulty and Discrimination by Tier.....	41
Figure 62. Grade 8 Math Form 1 Standard Error by Scale Score.....	42
Figure 63. Grade 8 Math Form 2 Standard Error by Scale Score.....	42
Figure 64. Grade 8 Math Form 3 Standard Error by Scale Score.....	43
Figure 65. Grade 8 Math Form 4 Standard Error by Scale Score.....	43
Figure 66. Grade 8 Math Difficulty and Discrimination by Tier.....	44
Figure 67. Grade 11 Math Form 1 Standard Error by Scale Score.....	45
Figure 68. Grade 11 Math Form 2 Standard Error by Scale Score.....	45
Figure 69. Grade 11 Math Form 3 Standard Error by Scale Score.....	46
Figure 70. Grade 11 Math Form 4 Standard Error by Scale Score.....	46
Figure 71. Grade 11 Math Difficulty and Discrimination by Tier.....	47