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Idaho Percentile Results for the SBAC English Language Arts and Mathematics Tests, 2015-2017, Grades 3-8 and 10

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ABSTRACT

Idaho uses the English Language Arts and Mathematics tests from the Smarter Balanced Assessment Consortium (SBAC) for the Idaho Standard Achievement Tests. ISAT results have been reported almost exclusively as "percent proficient or above" statistics (i.e., the percentage of Idaho students who performed at the "A" level). This paper illustrates how a traditional normative statistic using scale scores -- percentiles -- can provide informative descriptions of student achievement trends. The 10th, 25th, 50th, 75th and 90th percentiles for the ISAT 2015, 2016, and 2017 English Language Arts and Mathematics tests for grades 3-8 and 10 were examined. These five percentiles provided an across-the-board look at student achievement (i.e., High, High Average, Average for Grade Level, Low Average, and Low performing students) and at how achievement has changed over time and graphically via boxplots and line graphs. Between 2016 and 2017, Idaho lost 26 percentile points statewide in English language arts but gained three in mathematics. Statewide from 2016 to 2017, the English language arts percentiles of Idaho's High and High Average performing students increased while the percentiles of Idaho's Average, Low Average, and Low performing students decreased. The mathematics percentiles of Idaho's High, High Average, and Average performing students increased while the percentiles of Idaho's Low Average and Low performing students decreased. These achievement trends in terms of percentiles could become an informative element of Idaho's comprehensive accountability system. (Contains 7 references, 2 tables, and 16 figures.)

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Idaho Percentile Results for ISAT (SBAC) English Language Arts and Mathematics Tests, 2015-2017, Grades 3-8 & 10

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Learning Point Associates (2009) has suggested three measures of school performance that can provide valuable support for program evaluation and accountability systems. The three measures are averages, percentiles, and effect sizes. This paper considers what we might learn about the statewide performance of Idaho students from their percentile results on the 2015, 2016 and 2017 ISAT (SBAC) tests of English language arts and mathematics.

Average scores are amenable to traditional statistical analysis, but they hide a lot of performance information in a single measure of central tendency. Percentiles are much less amenable to statistical analysis, but they provide performance information across the distribution of scale scores. They enable us to look at the change in five performance levels from year to year, and five overall trends. The five percentiles (i.e., scale scores) are:

90th percentile: High Score, above 90% of the scale scores on the test
75th percentile: High Average Score, above 75% of the scale scores
50th percentile: Average Score for Grade Level, above 50% of the scale scores
25th percentile: Low Average Score, above 25% of the scale scores
10th percentile: Low Score, above 10% of the scale scores

The 75th and 25th percentiles define the middle half of students who took the test, and that the 50th percentile is the middle half of students and the middle of all students.

DATA COLLECTION

The ISAT by SBAC measured student performance in English language arts and mathematics in grades 3 through 8 and 10, and reported out the results as four-digit scale scores. Thus, the first task was to identify 210 percentiles (i.e., the five percentiles x the seven grades tested x the two subjects tested x the three ISAT administrations).

The State of Idaho (i.e., the State Department of Education or the State Board of Education) does not report out ISAT percentile results. The percentiles were collected from three ISAT scale score to percentile rank conversion tables that are available on the web (Stoneberg, 2015; Stoneberg, 2016a; Stoneberg, 2017). These conversion tables were prepared using Microsoft Excel to process ISAT 2015, 2016 and 2017 summary statistics provided by the Idaho State Department of Education.

The 140 ISAT percentiles (i.e., scale scores) required to conduct the analyses reported in this paper are listed in Table 1.

Table 1. Idaho scale scores at the 10th, 25th, 50th, 75th and 90th percentiles for the ISAT/SBAC English language arts and mathematics tests from 2015, 2016, and 2017 in grades 3-8 & 10.

| ISAT English Language Arts, Percentiles 2015 to 2017, Grades 3-8 and 10 | | | | | | | | | | | | | | | | | | | | | |
|---|---------|------|------|---------|------|------|---------|------|------|---------|------|------|---------|------|------|---------|------|------|----------|------|------|
| | Grade 3 | | | Grade 4 | | | Grade 5 | | | Grade 6 | | | Grade 7 | | | Grade 8 | | | Grade 10 | | |
| | 2015 | 2016 | 2017 | 2015 | 2016 | 2017 | 2015 | 2016 | 2017 | 2015 | 2016 | 2017 | 2015 | 2016 | 2017 | 2015 | 2016 | 2017 | 2015 | 2016 | 2017 |
| 10th | 2324 | 2323 | 2315 | 2352 | 2356 | 2350 | 2393 | 2392 | 2386 | 2416 | 2386 | 2413 | 2433 | 2436 | 2433 | 2452 | 2452 | 2449 | 2469 | 2470 | 2458 |
| 25th | 2372 | 2373 | 2368 | 2404 | 2409 | 2404 | 2445 | 2446 | 2442 | 2467 | 2455 | 2467 | 2487 | 2491 | 2489 | 2506 | 2506 | 2505 | 2530 | 2531 | 2522 |
| 50th | 2426 | 2428 | 2421 | 2461 | 2468 | 2463 | 2502 | 2506 | 2504 | 2524 | 2527 | 2526 | 2548 | 2552 | 2551 | 2566 | 2566 | 2567 | 2598 | 2599 | 2592 |
| 75th | 2479 | 2483 | 2475 | 2519 | 2527 | 2523 | 2560 | 2566 | 2567 | 2581 | 2573 | 2586 | 2608 | 2614 | 2614 | 2626 | 2626 | 2630 | 2666 | 2667 | 2663 |
| 90th | 2528 | 2533 | 2524 | 2570 | 2580 | 2577 | 2611 | 2620 | 2623 | 2632 | 2618 | 2640 | 2662 | 2669 | 2670 | 2685 | 2680 | 2686 | 2727 | 2728 | 2727 |

| ISAT Mathematics, Percentiles 2015 to 2017, Grades 3-8 and 10 | | | | | | | | | | | | | | | | | | | | | |
|---|---------|------|------|---------|------|------|---------|------|------|---------|------|------|---------|------|------|---------|------|------|----------|------|------|
| | Grade 3 | | | Grade 4 | | | Grade 5 | | | Grade 6 | | | Grade 7 | | | Grade 8 | | | Grade 10 | | |
| | 2015 | 2016 | 2017 | 2015 | 2016 | 2017 | 2015 | 2016 | 2017 | 2015 | 2016 | 2017 | 2015 | 2016 | 2017 | 2015 | 2016 | 2017 | 2015 | 2016 | 2017 |
| 10th | 2337 | 2339 | 2319 | 2375 | 2378 | 2374 | 2395 | 2395 | 2392 | 2397 | 2402 | 2405 | 2409 | 2416 | 2416 | 2412 | 2414 | 2409 | 2415 | 2416 | 2411 |
| 25th | 2382 | 2385 | 2368 | 2421 | 2425 | 2419 | 2445 | 2446 | 2445 | 2453 | 2459 | 2462 | 2468 | 2476 | 2476 | 2476 | 2479 | 2476 | 2482 | 2483 | 2481 |
| 50th | 2432 | 2436 | 2433 | 2471 | 2478 | 2475 | 2500 | 2503 | 2504 | 2516 | 2522 | 2532 | 2533 | 2542 | 2542 | 2547 | 2552 | 2551 | 2555 | 2558 | 2559 |
| 75th | 2482 | 2487 | 2486 | 2522 | 2526 | 2529 | 2555 | 2559 | 2564 | 2579 | 2585 | 2600 | 2598 | 2608 | 2608 | 2617 | 2624 | 2627 | 2629 | 2632 | 2638 |
| 90th | 2527 | 2533 | 2534 | 2567 | 2578 | 2577 | 2605 | 2610 | 2612 | 2636 | 2641 | 2660 | 2657 | 2667 | 2667 | 2681 | 2690 | 2694 | 2695 | 2706 | 2708 |

RESULTS: GRADE LEVEL BY PERCENTILE TABLES

One way to look at Idaho's percentile results is to identify the point differences between the 2016 and 2017 assessments for each grade-level and each percentile and prepare a seven-grade by five-percentile table (with summary point counts for each grade-levels and each percentile completing an 8 by 6 table).

The 2016 to 2017 point differences for the ISAT English language arts mathematics tests are in Table 2. The author suggests only a few narratives related for Table 2. The intent is that the reader will take the opportunity to review the data and to write personal narratives for findings of specific interest to the reader. The reader may also want to mine the information in the three-year boxplots and line graphs in Appendix A for further personal narratives.

Table 2. Summary changes by grade level and percentile from 2016 to 2017 on the ISAT/SBAC English language arts and mathematics tests.

Idaho Percentile Changes, 2016 to 2017, Grades 3-8 and 10

ISAT/SBAC English Language Arts

| Grade > | 3 | 4 | 5 | 6 | 7 | 8 | 10 | Total |
|--------------|------------|------------|-----------|-----------|-----------|----------|------------|------------|
| 90th | -9 | -3 | 3 | 22 | 1 | 6 | -1 | 19 |
| 75th | -8 | -4 | 1 | 13 | 0 | 4 | -4 | 2 |
| 50th | -7 | -5 | -2 | -1 | -1 | 1 | -7 | -22 |
| 25th | -5 | -5 | -4 | 12 | -2 | -1 | -9 | -14 |
| 10th | -8 | -6 | -6 | 27 | -3 | -3 | -12 | -11 |
| Total | -37 | -23 | -8 | 73 | -5 | 7 | -33 | -26 |

ISAT/SBAC Mathematics

| Grade > | 3 | 4 | 5 | 6 | 7 | 8 | 10 | Total |
|--------------|------------|------------|----------|-----------|----------|-----------|----------|----------|
| 90th | 1 | -1 | 2 | 19 | 0 | 4 | 2 | 27 |
| 75th | -1 | 3 | 5 | 15 | 0 | 3 | 6 | 31 |
| 50th | -3 | -3 | 1 | 10 | 0 | -1 | 1 | 5 |
| 25th | -17 | -6 | -1 | 3 | 0 | -3 | -2 | -26 |
| 10th | -20 | -4 | -3 | 3 | 0 | -5 | -5 | -34 |
| Total | -40 | -11 | 4 | 50 | 0 | -2 | 2 | 3 |

Percentile changes in ISAT English language arts, 2016-2017

- 1) Of the 35 grade-percentile changes on the 2017 English Language Arts test, 11 were positive, one was zero, and 23 were negative.
- 2) Sixth graders had five of the eight "grade-level" gains in 2017.
- 3) Sixth graders with a total of 83 points across the five percentiles (i.e., levels of performance) had the most improved performance on the English Language Arts test in 2017.
- 4) The overall statewide results for ISAT English Language Arts: Idaho scored 26 points lower in 2017 than in 2016.

Percentile changes ISAT Mathematics, 2016-2017

- 1) Of the 35 grade-percentile changes on the 2017 ISAT Mathematics test, 15 were positive, five were the zero, and 15 were negative.
- 2) Sixth graders with a total gain of 50 points across the five percentiles had the most improved statewide performance in Mathematics in 2017.
- 3) Seventh grade had the same percentiles in 2017 as in 2016 in Mathematics.
- 4) The overall statewide results for ISAT English Language Arts: Idaho scored 3 points higher in 2017 than in 2016.

RESULTS: 2016-2017 CHANGE BY GRADE AND BY PERCENTILE

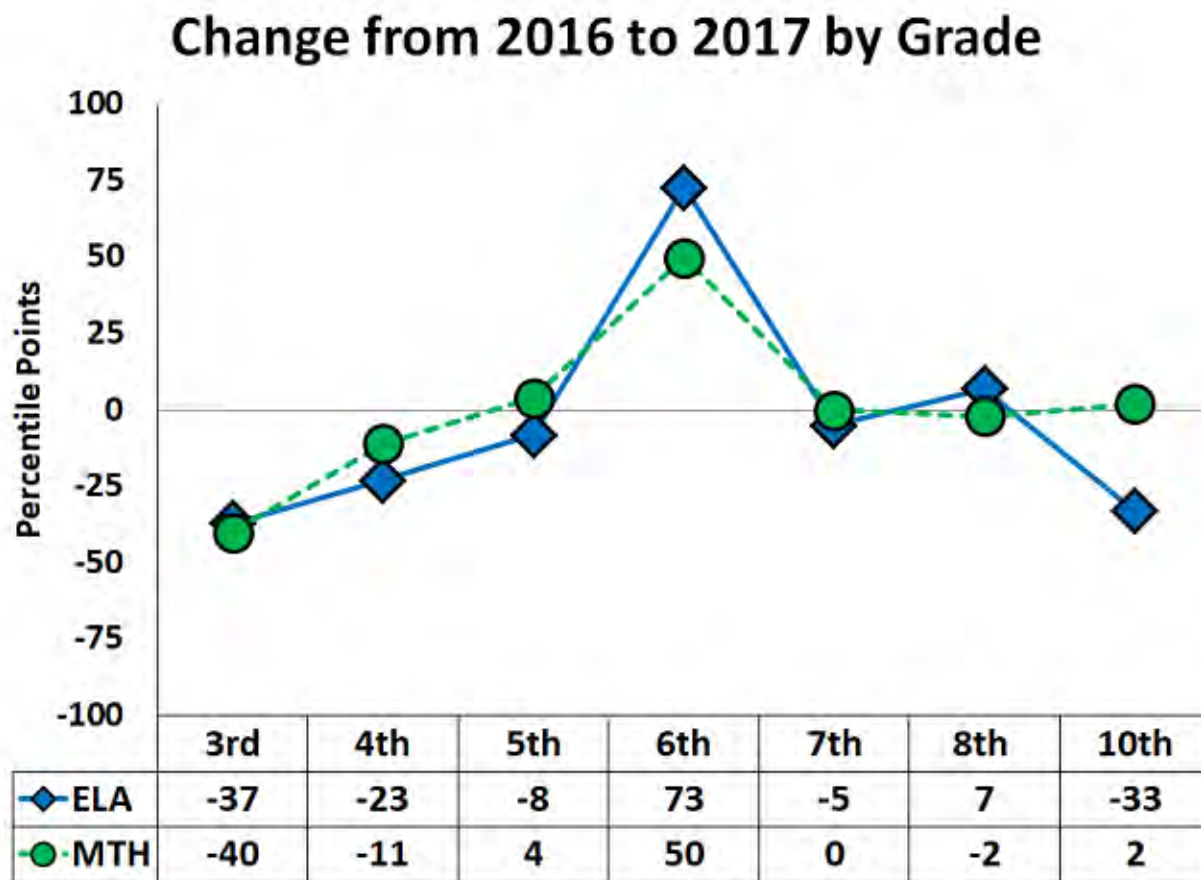


Figure 1. Total change in percentile points from 2016 to 2017 across the High (90th), High Average (75th), Average (50th), Low Average (25th) and Low (10th) percentiles for grades 3, 4, 5, 6, 7, 8 and 10, for ISAT English language arts and mathematics.

English language arts, 2016-2017

Statewide from 2016 to 2017, Idaho students in two grades (6th and 8th) gained points in English language arts, while students in five grades (3rd, 4th, 5th, 7th, and 10th) lost points.

Mathematics, 2016- 2017

Statewide from 2016 to 2017, Idaho students in three grades (5th, 6th and 10th) gained points in mathematics, students in three grades (3rd, 4th, and 8th) lost points, and 7th grade students maintained their status quo.

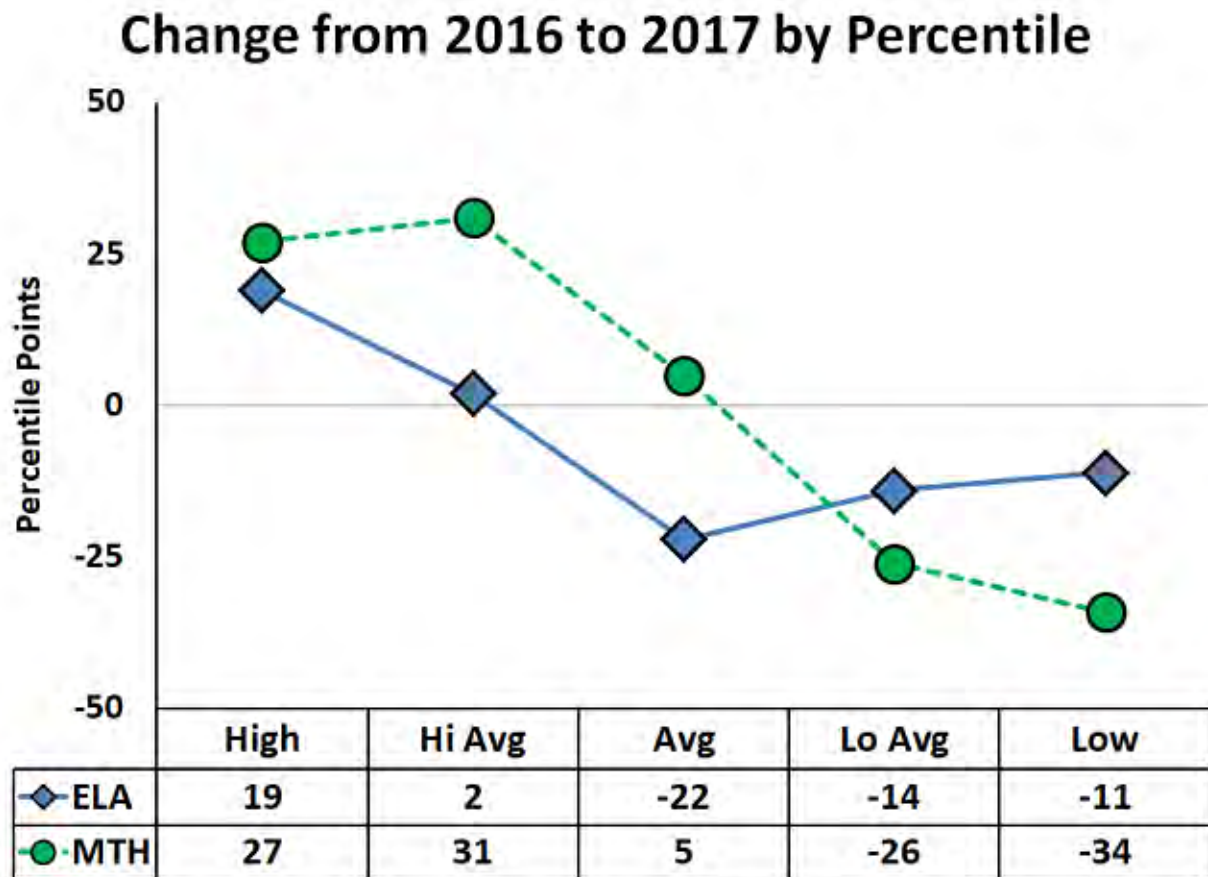


Figure 2. Total change from 2016 to 2017 across grades 3, 4, 5, 6, 7, 8 and 10 for the High (90th), High Average (75th), Average (50th), Low Average (25th) and Low (10th) percentiles, for English language arts and mathematics.

English Language Arts, 2016-2017

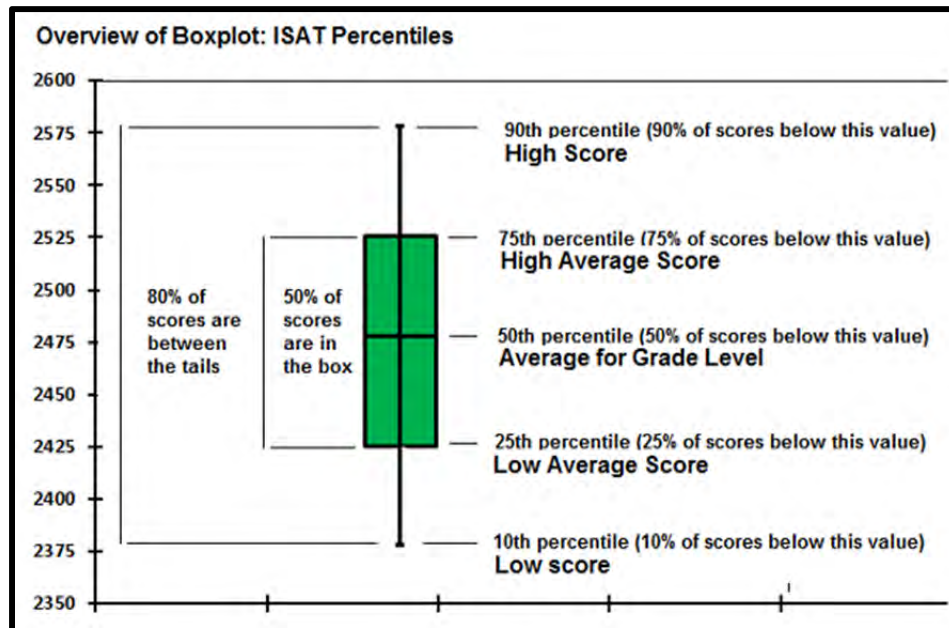
Statewide from 2016 to 2017, the English language arts percentiles of Idaho’s High and High Average performing students increased while the percentiles of Idaho’s Average, Low Average, and Low performing students decreased.

Mathematics, 2016-2017

Statewide from 2016 to 2017, the mathematics percentiles of Idaho’s High, High Average, and Average performing students increased while the percentiles of Idaho’s Low Average and Low performing students decreased.

RESULTS: BOXPLOTS AND LINE GRAPHS

Performance trends being with the third data point and are refined with each additional data point. The author selected two kinds of graphs for displaying trends at the 10th, 25th, 50th, 75th and 90th percentiles over time for each grade-subject: boxplots and line charts. Line charts are often used to report student test results and are generally understood by administrators, teachers and parents. Boxplots, however, are not commonly used to report student test results so a brief overview is in order.



The boxplot permits the reader to follow the academic progress of the middle half of students (i.e., from high average and average for grade level to low average) without losing track of the high and low students. While it does not provide the reader with exact scores for the five percentiles, the boxplot does illustrate a trend. The reader, however, will find exact scale scores for the high, high average, average, low average, and low percentiles displayed in the line graphs.

The full-page figure for each grade-subject (e.g., third grade English Language Arts, etc.) in Appendix A displays both the boxplot and line graph for the statewide ISAT 2015, 2016, and 2017 High, High Average, Average, Low Average and Low percentiles.

- 1) **English language arts.** Boxplot and line graph displays for grades 3-8 and 10 percentile results are in Figures A1 through A7 in Appendix A.
- 2) **Mathematics.** Boxplot and line graph displays for grades 3-8 and 10 percentile results are in Figures A8 through A14 in Appendix A.

DISCUSSION

Percent Proficient vs. Scale Scores. Each year Idaho spends a considerable sum to administer and score the Idaho Standards Achievement Tests. A search for ISAT results on the State Department of Education and the State Board of Education website yielded limited information about the test itself or the administrative logistics that school districts must follow, but there were little to no ISAT English Language Arts and Mathematics test results other than “percent below basic, basic, proficient, advanced” posted. See, for example, <http://www.sde.idaho.gov/communications/files/frequently-requested-data/2016-2017-Assessment-Results.xlsx>

The percent above cut-score metric such as those reported by ISAT and NAEP are problematic, especially when looking at achievement trends. The National Academies of Sciences, Engineering, and Medicine (2017) conducted a congressionally mandated evaluation of the NAEP achievement levels – Basic, Proficient and Advanced (i.e., NAEP’s percent above cut-score metric) – to determine whether the achievement levels are *reasonable, reliable, valid, and informative to the public*, and to recommend ways that the use of achievement levels can be improved. The National Academies report notes:

One of the most common and unwarranted inferences using achievement level percentages involves assessing the amount of progress students have made over time, particularly by population groups. For instance, news reports often focus not only on how students are doing at a particular time, but the extent to which the percentage of students scoring Proficient or above has (or has not) improved over successive NAEP years. **When these comparisons are based on the scale scores, they provide useful information. When they are based on the “percentage Proficient or above” metric and used to compare progress across groups, they can be misleading.** A report by Holland on this issue focused on misinterpretations associated with using the “percent above a cut score” metric. Although this metric is widely used for NAEP [and ISAT], **there are serious limitations to the inferences that the percent above cut score metric can support, particularly when evaluating trends over time, gaps among groups, or trends in gaps....** [Emphasis added.] (p. 208).

The percentile results reported in this paper were based on ISAT 2015 through 2017 scale scores. Percentiles provide useful trend information that is preferred over percent above cut-score trend information.

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APPENDIX A

ISAT English Language Arts 2015, 2016, and 2017

Grade-level boxplot and line graphs for statewide scale scores at the 10th, 25th, 50th, 75th, and 90th percentiles

Grade 3, Page 11
Grade 4, Page 12
Grade 5, Page 13
Grade 6, Page 14
Grade 7, Page 15
Grade 8, Page 16
Grade 10, Page 17

ISAT Mathematics 2015, 2016, and 2017

Grade-level boxplot and line graphs for statewide scale scores at the 10th, 25th, 50th, 75th, and 90th percentiles

Grade 3, Page 18
Grade 4, Page 19
Grade 5, Page 20
Grade 6, Page 21
Grade 7, Page 22
Grade 8, Page 23
Grade 10, Page 24



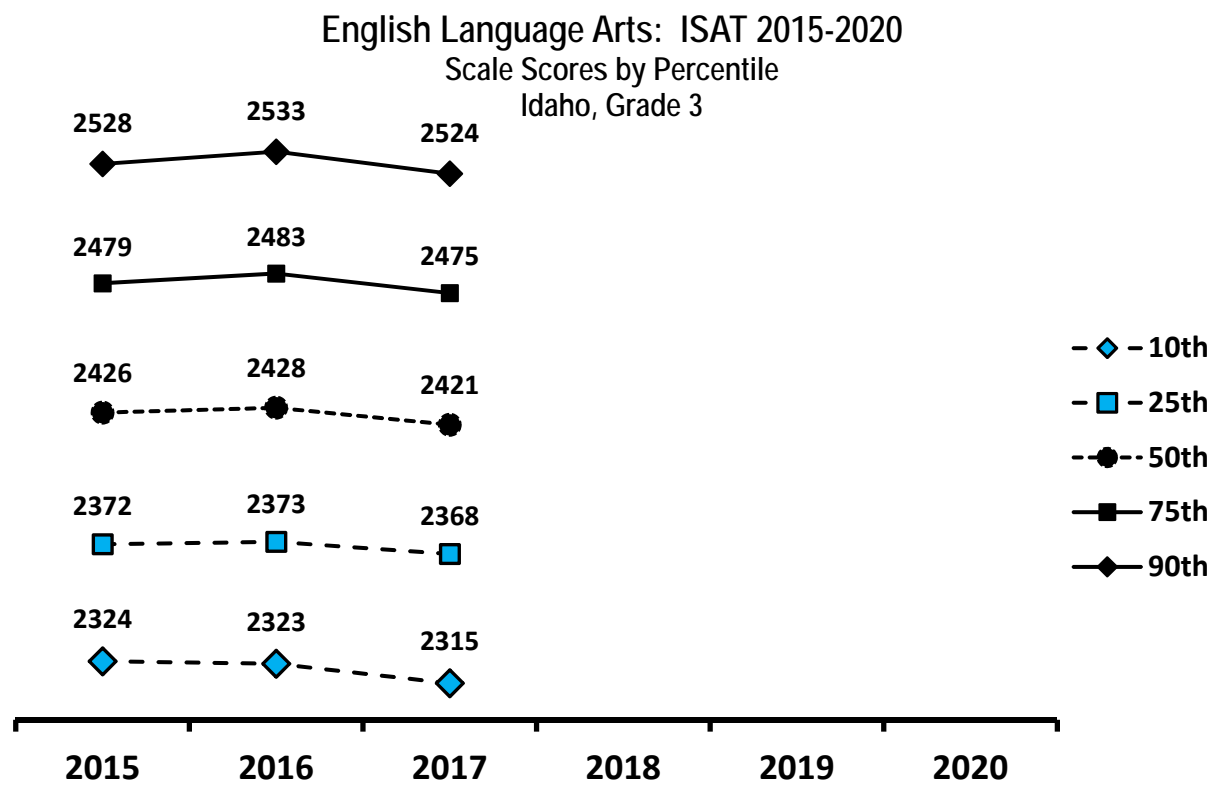
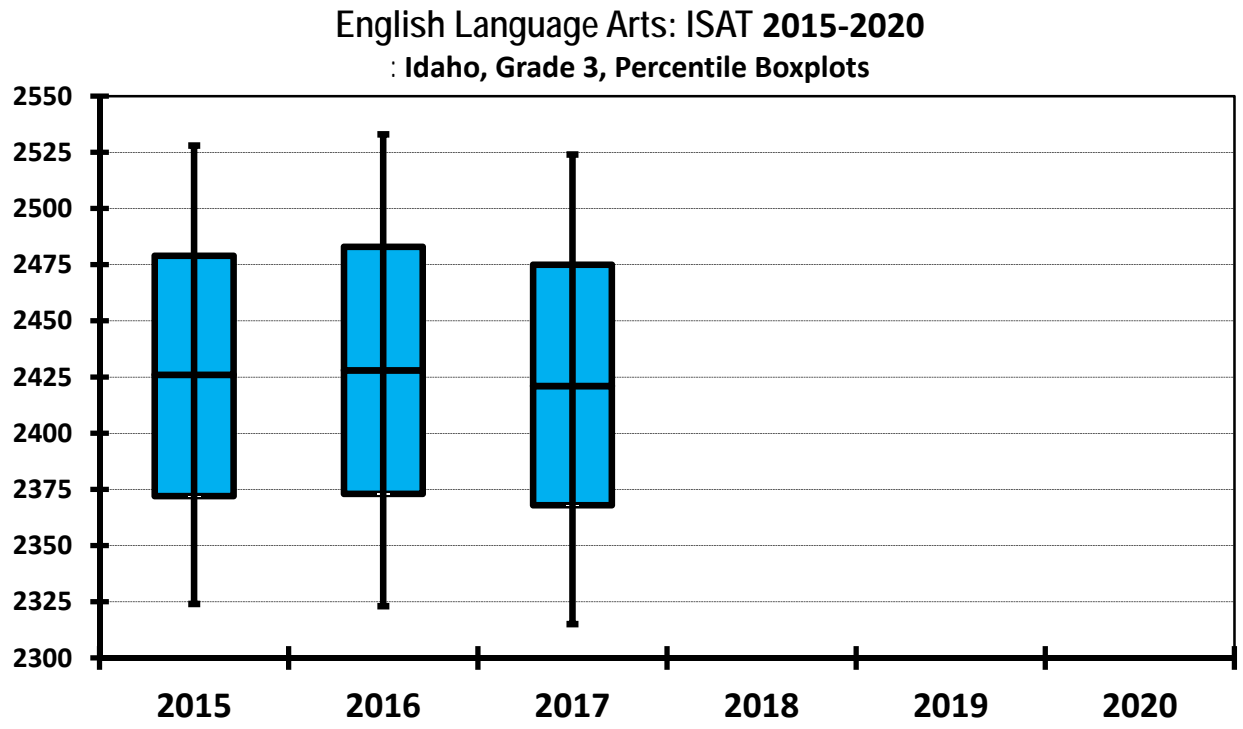


Figure A1. ISAT English Language Arts Test, Grade 3, 2015 to 2017. Idaho statewide scale scores for the 10th, 25th, 50th, 75th, and 90th percentiles presented in boxplot and line graph formats.

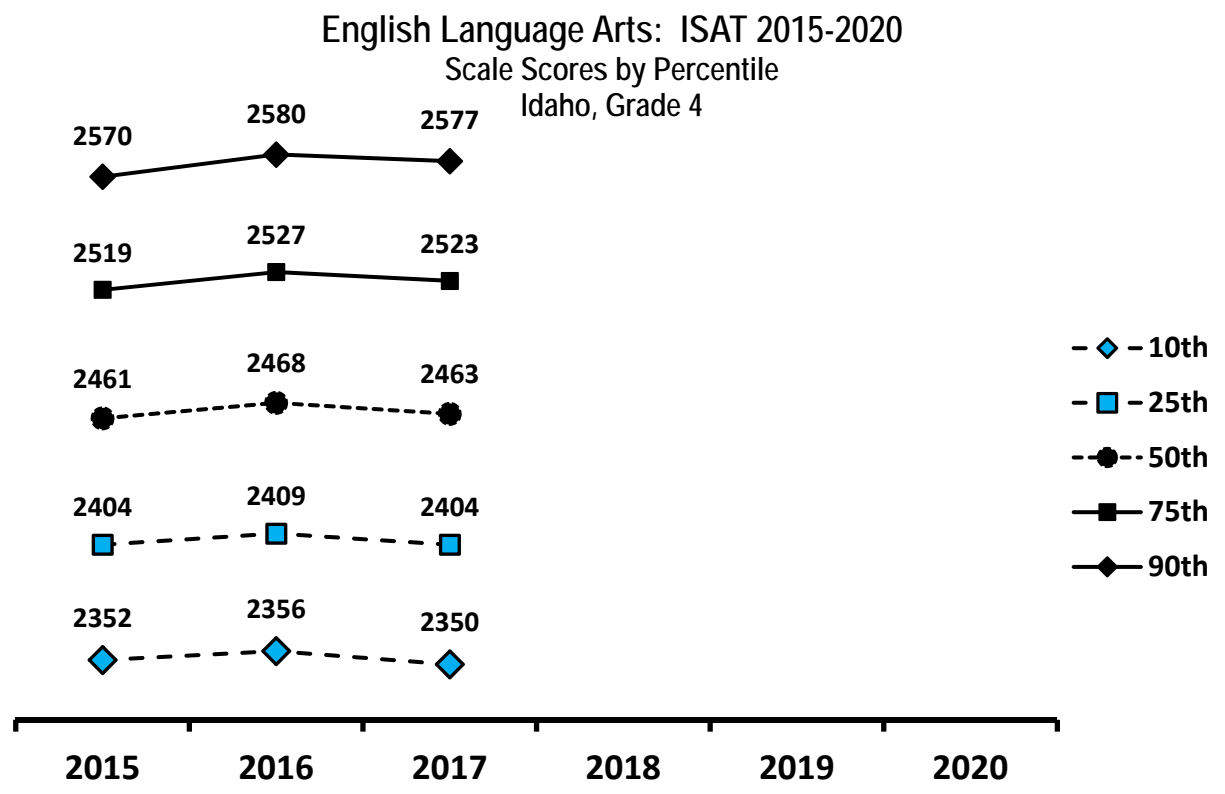
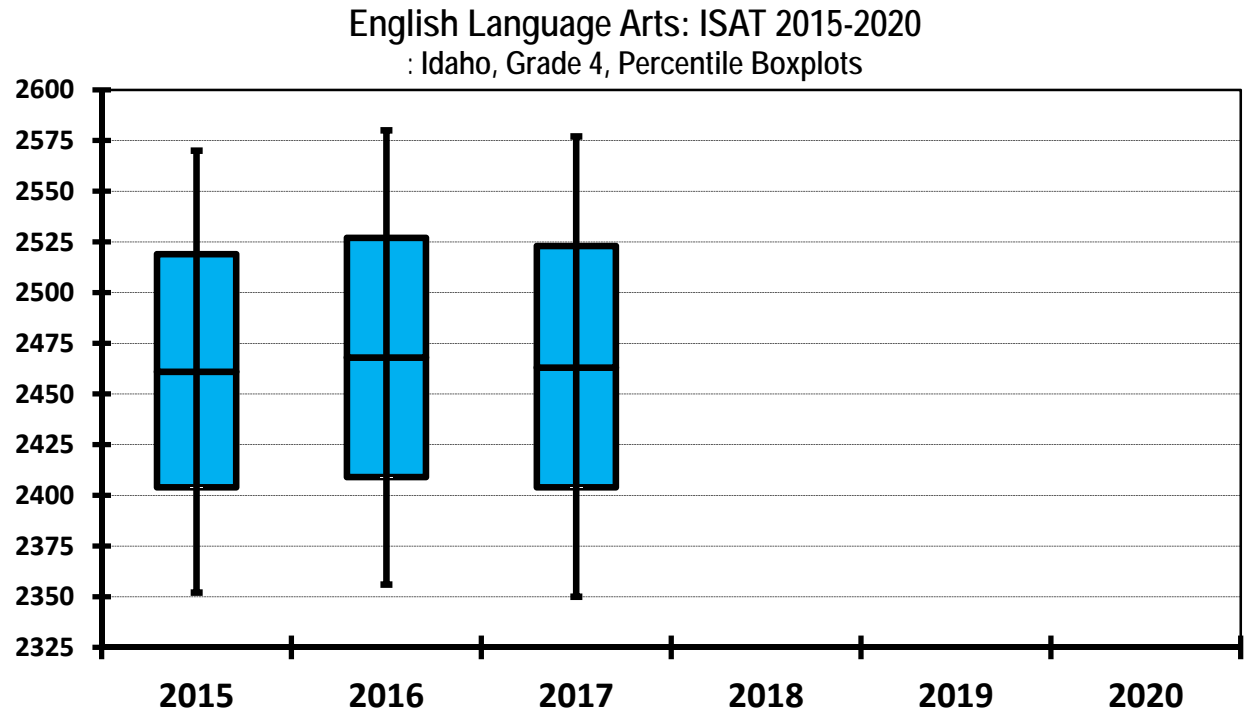


Figure A2. ISAT Reading Language Arts Test, Grade 4, 2015 to 2017. Idaho statewide scale scores for the 10th, 25th, 50th, 75th, and 90th percentiles presented in boxplot and line graph formats.

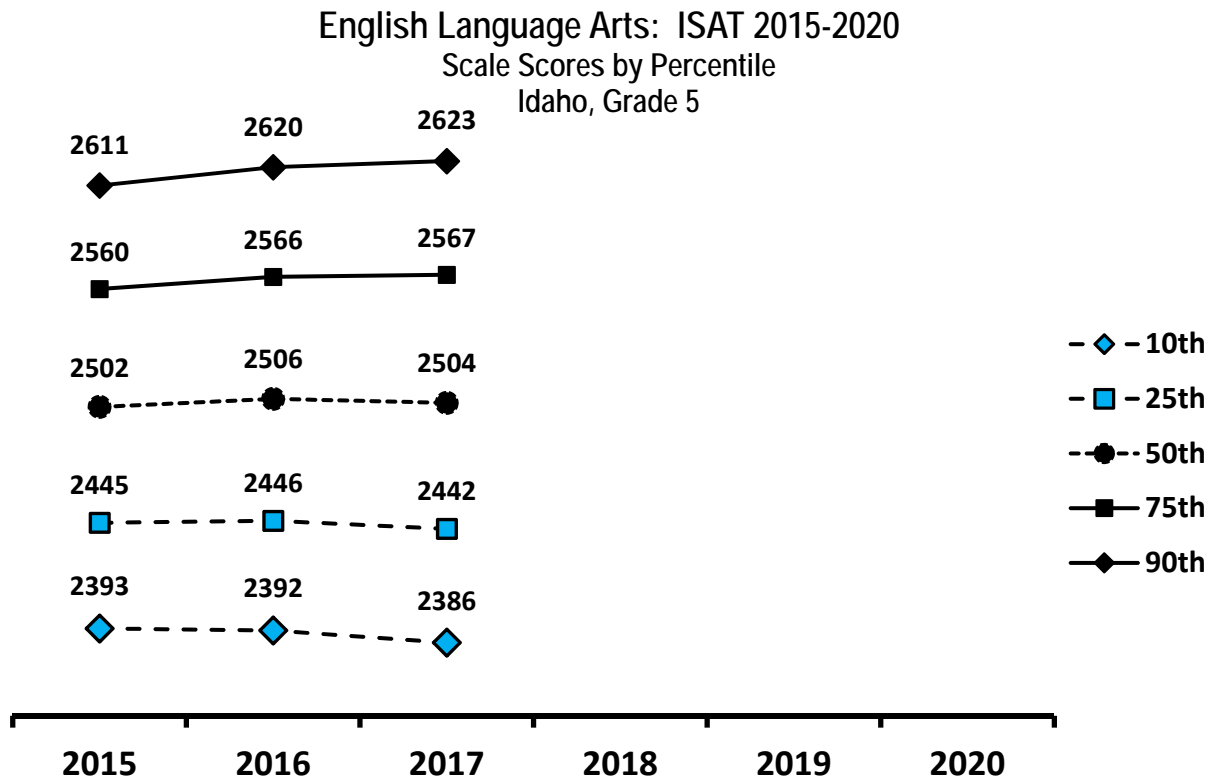
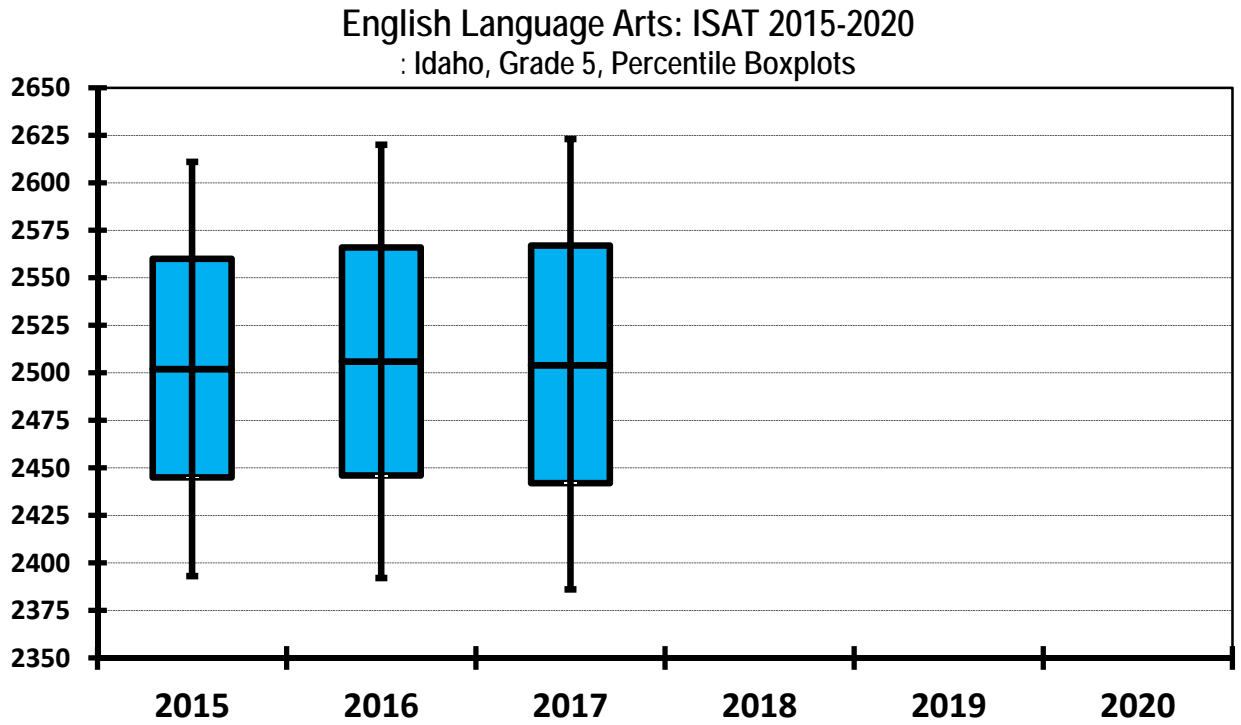


Figure A3. ISAT English Language Arts Test, Grade 5, 2015 and 2016. Idaho statewide scale scores for the 10th, 25th, 50th, 75th, and 90th percentiles presented in boxplot and line graph formats.

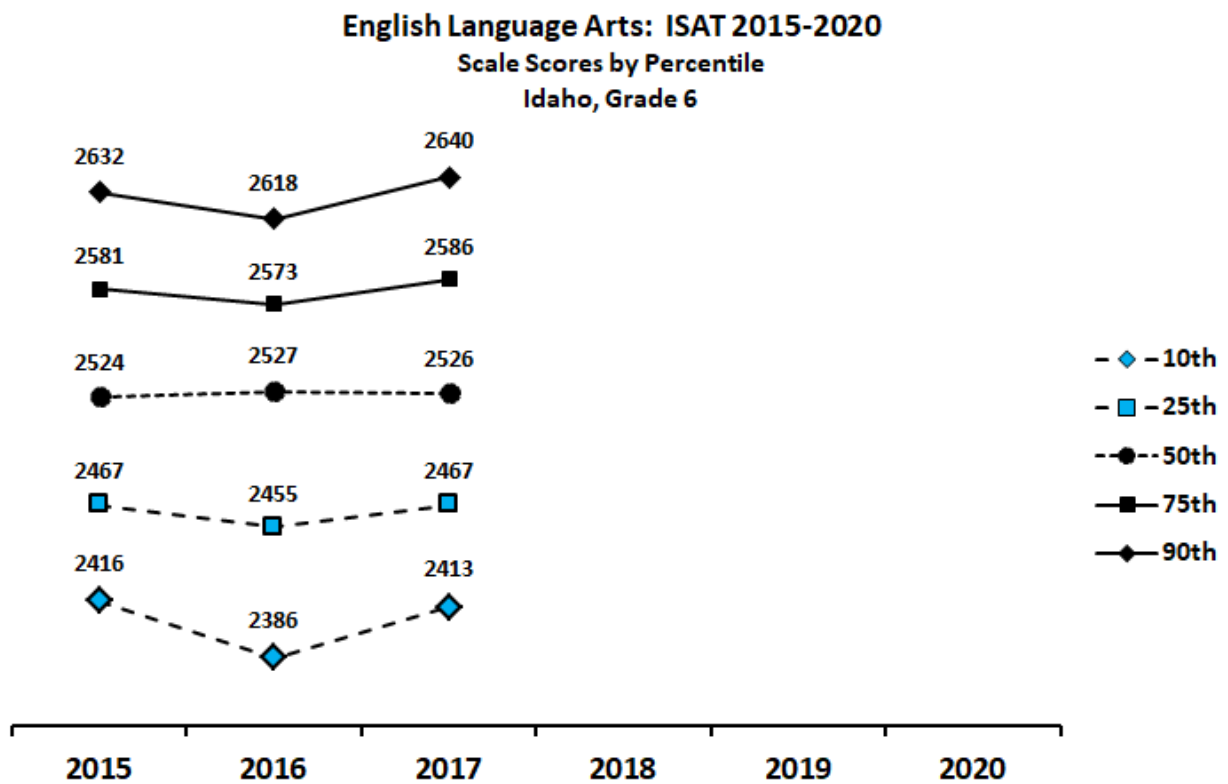
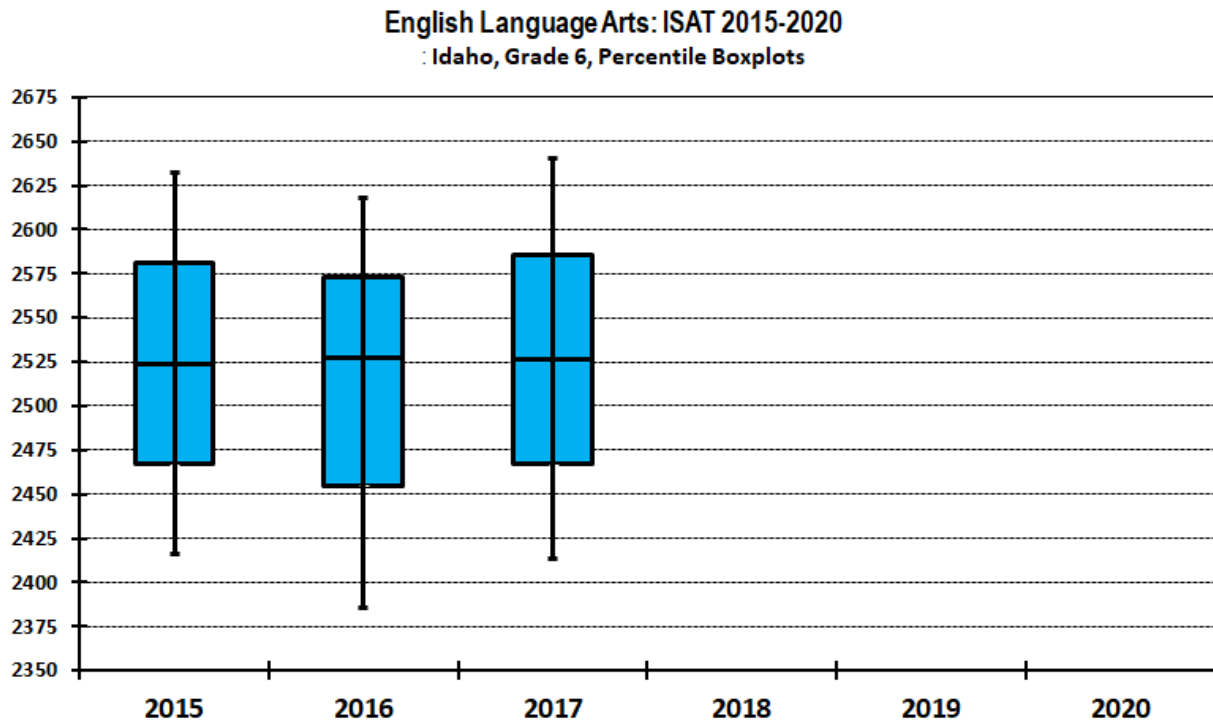


Figure A4. ISAT English Language Arts Test, Grade 6, 2015 to 2017. Idaho statewide scale scores for the 10th, 25th, 50th, 75th, and 90th percentiles presented in boxplot and line graph formats.

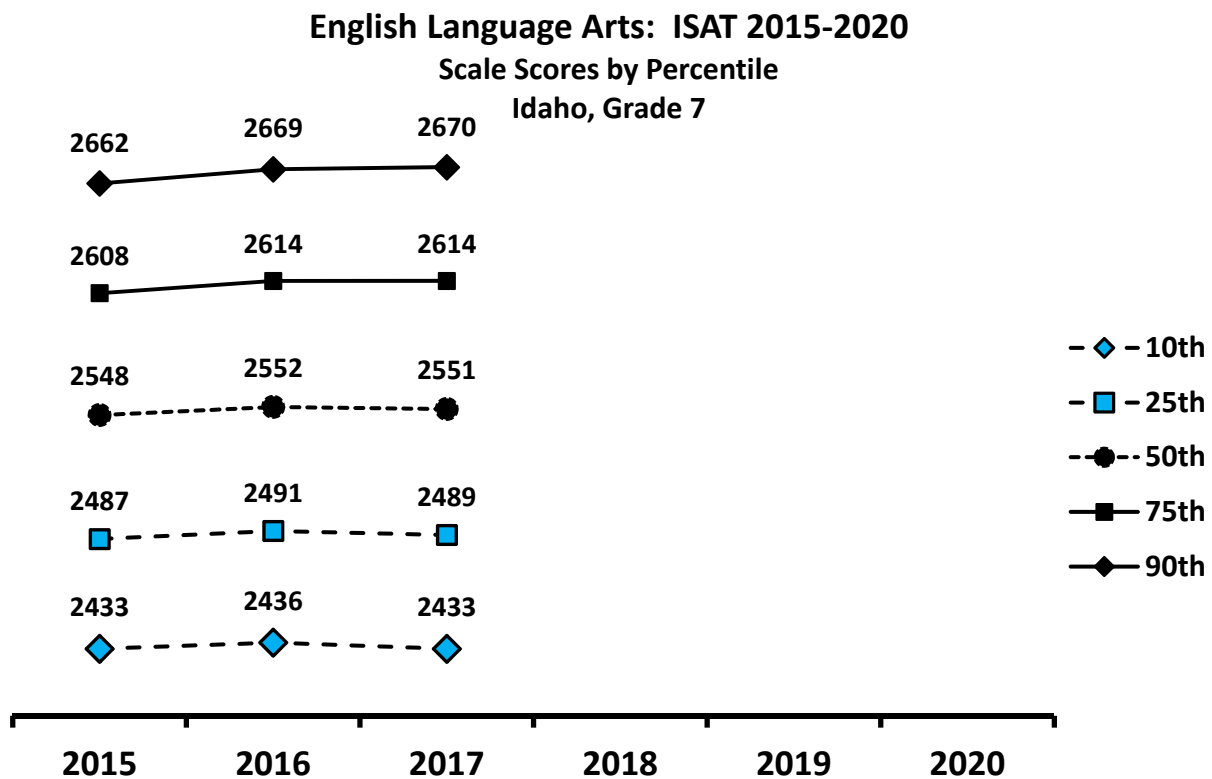
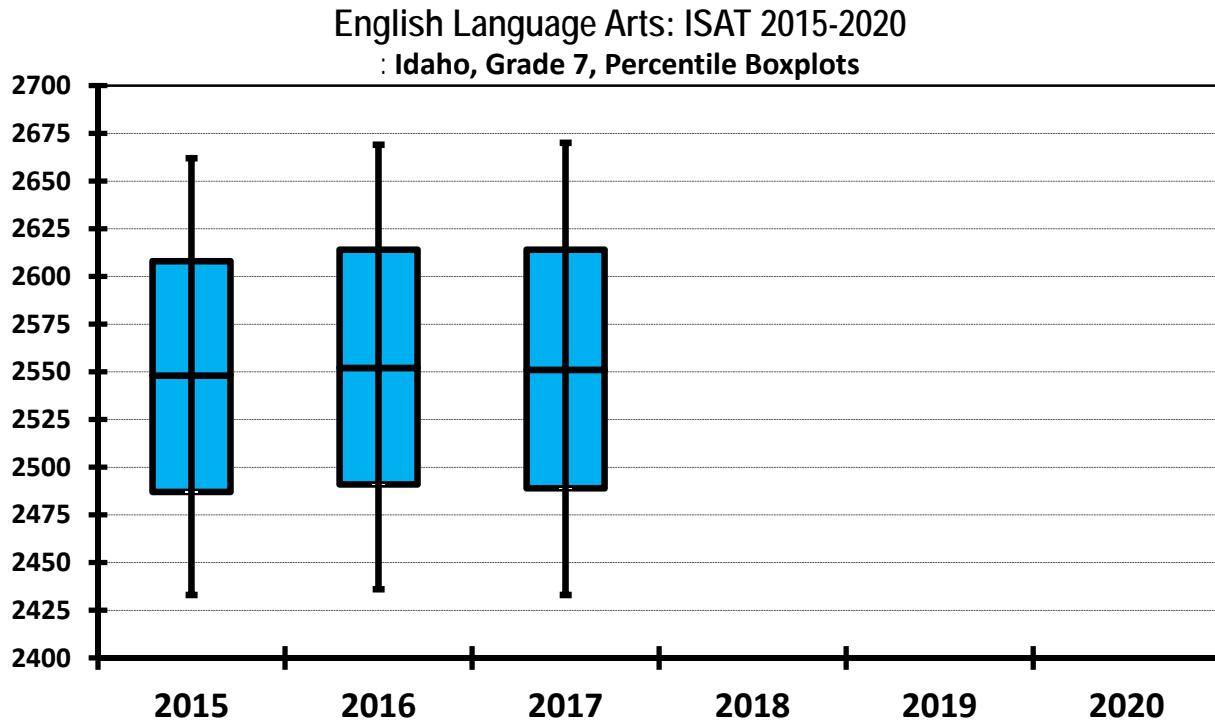


Figure A5. ISAT English Language Arts Test, Grade 7, 2015 and 2016. Idaho statewide scale scores for the 10th, 25th, 50th, 75th, and 90th percentiles presented in boxplot and line graph formats.

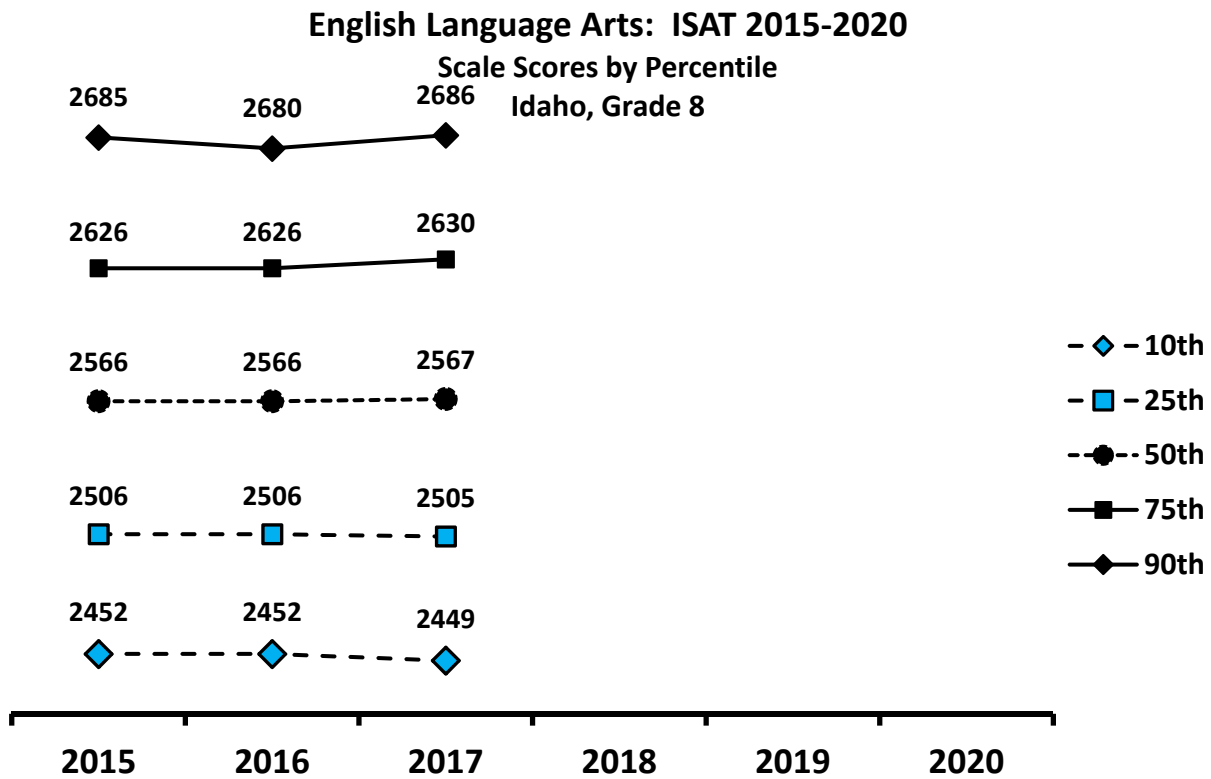
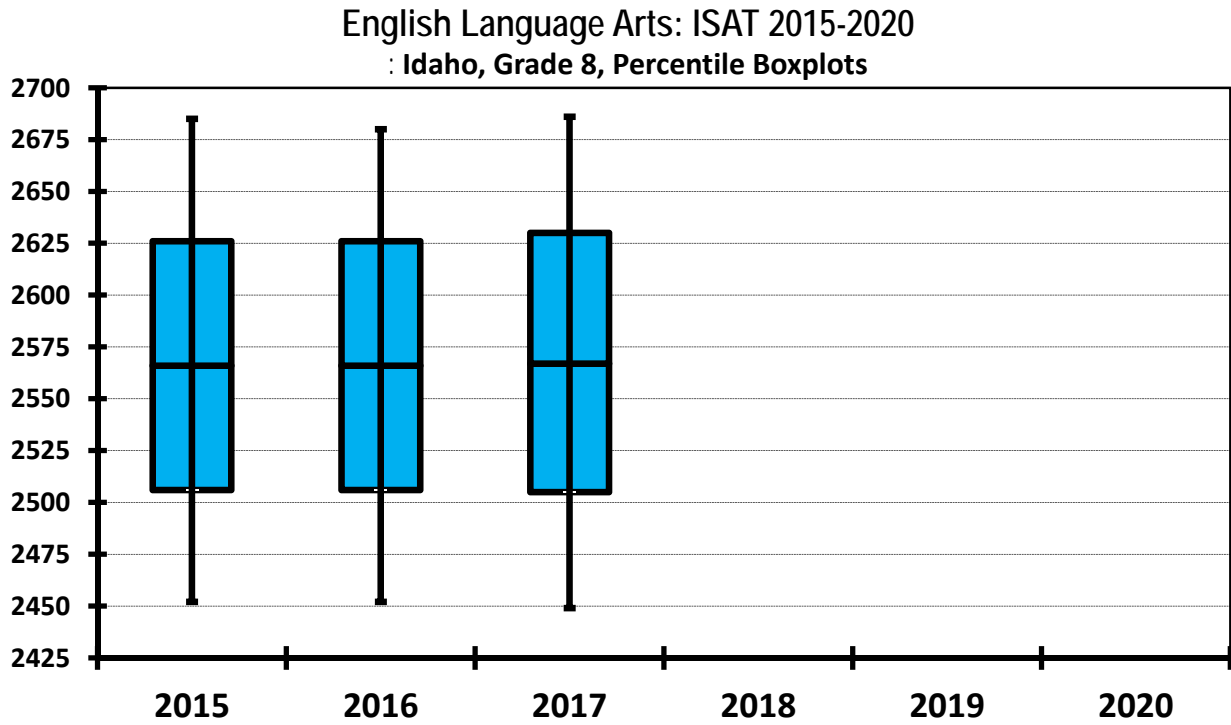


Figure A6. ISAT English Language Arts Test, Grade 8, 2015 to 2017. Idaho statewide scale scores for the 10th, 25th, 50th, 75th, and 90th percentiles presented in boxplot and line graph formats.

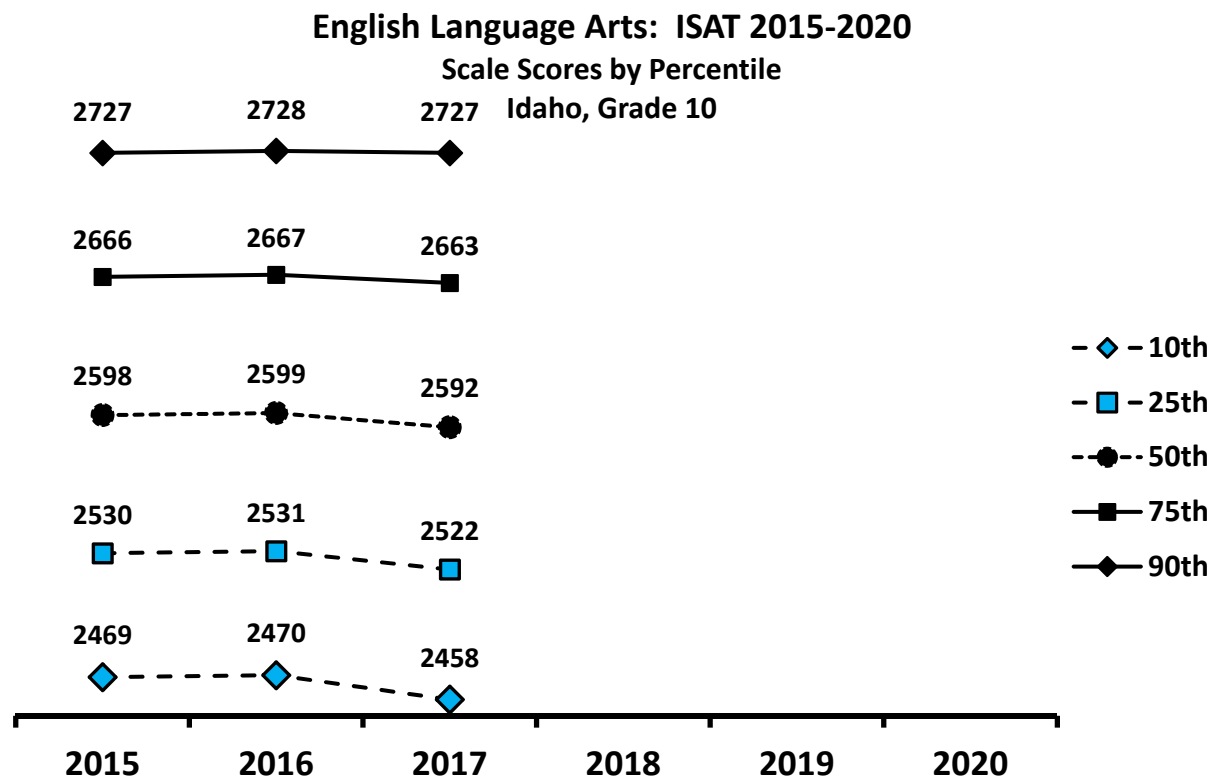
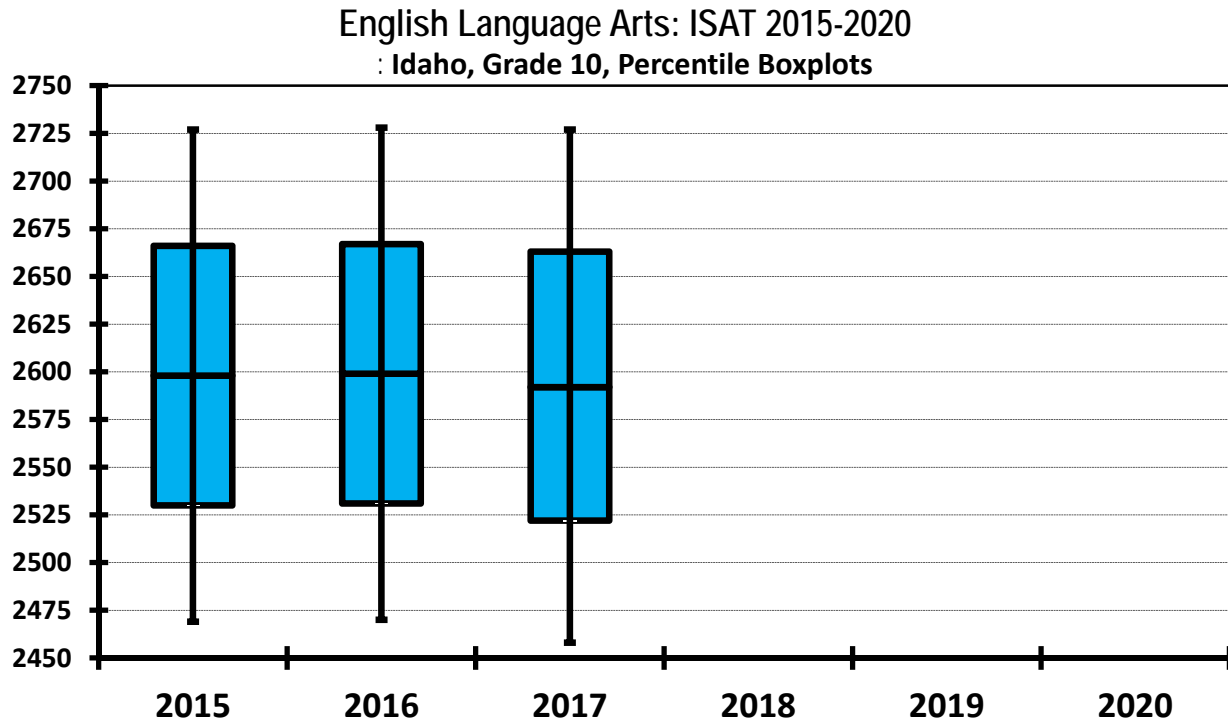


Figure A7. ISAT English Language Arts Test, Grade 10, 2015 to 2017. Idaho statewide scale scores for the 10th, 25th, 50th, 75th, and 90th percentiles presented in boxplot and line graph formats.

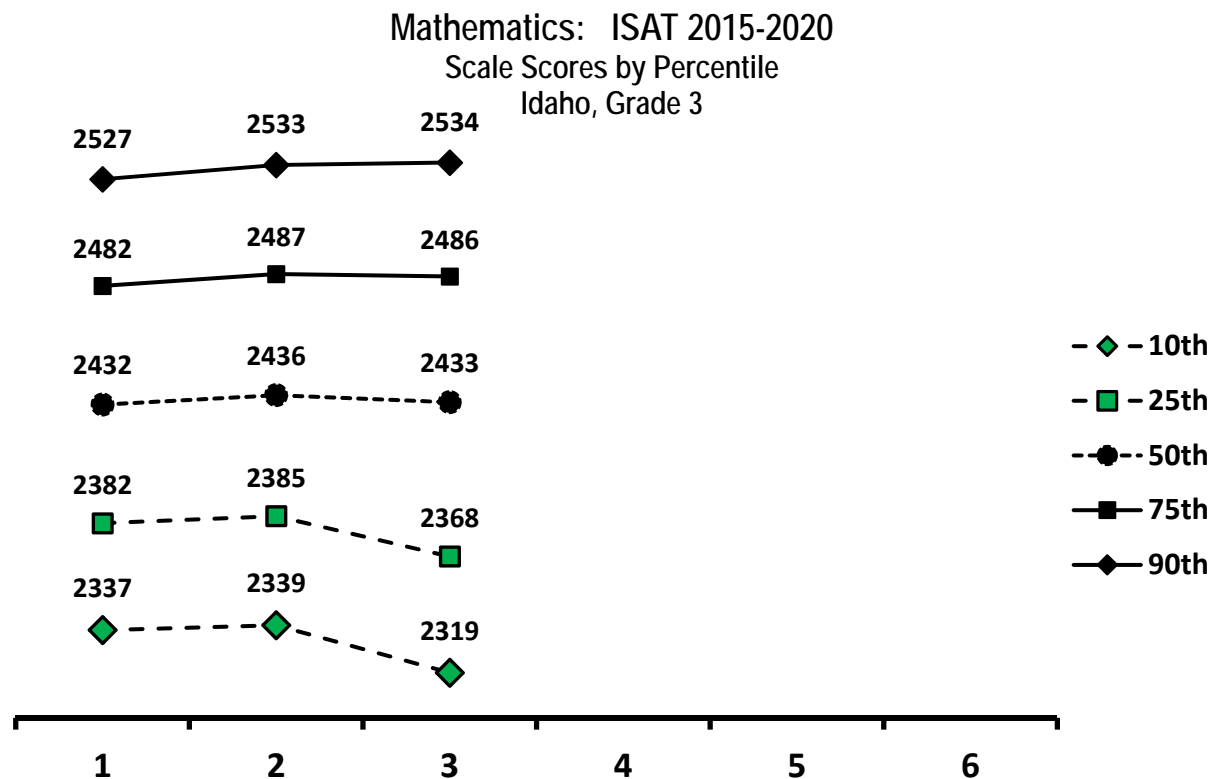
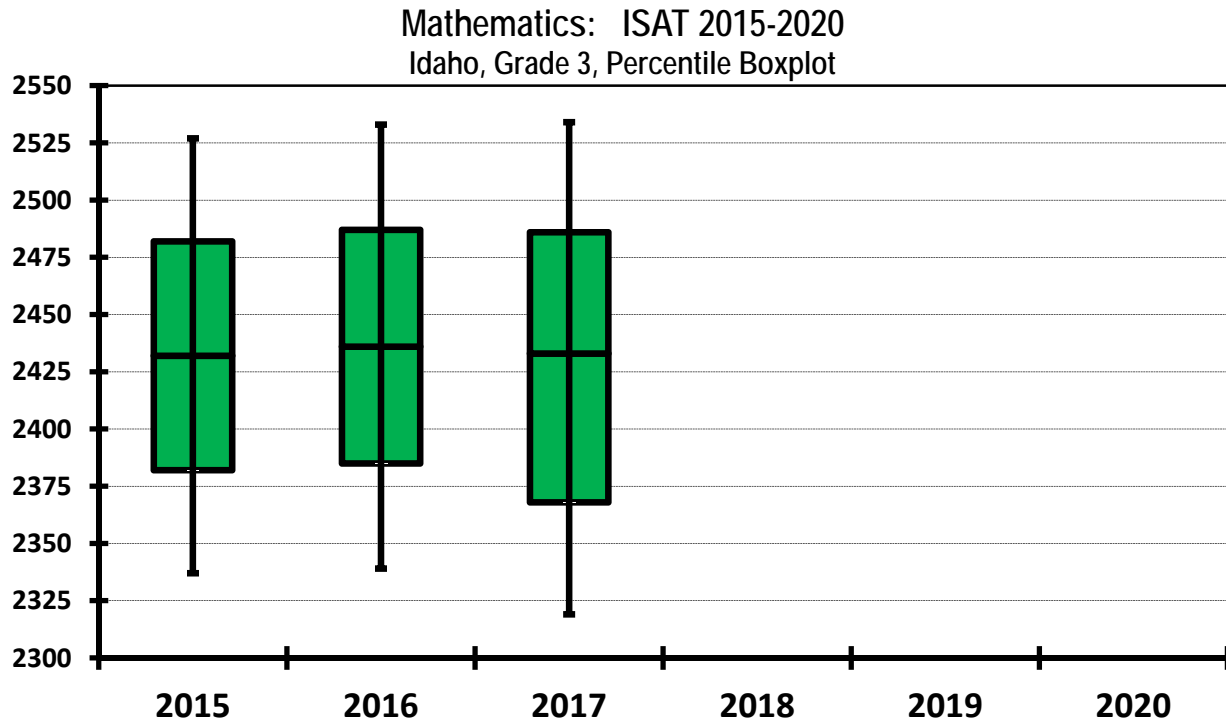


Figure A8. ISAT Mathematics Test, Grade 3, 2015 to 2017. Idaho statewide scale scores for the 10th, 25th, 50th, 75th, and 90th percentiles presented in boxplot and line graph formats.

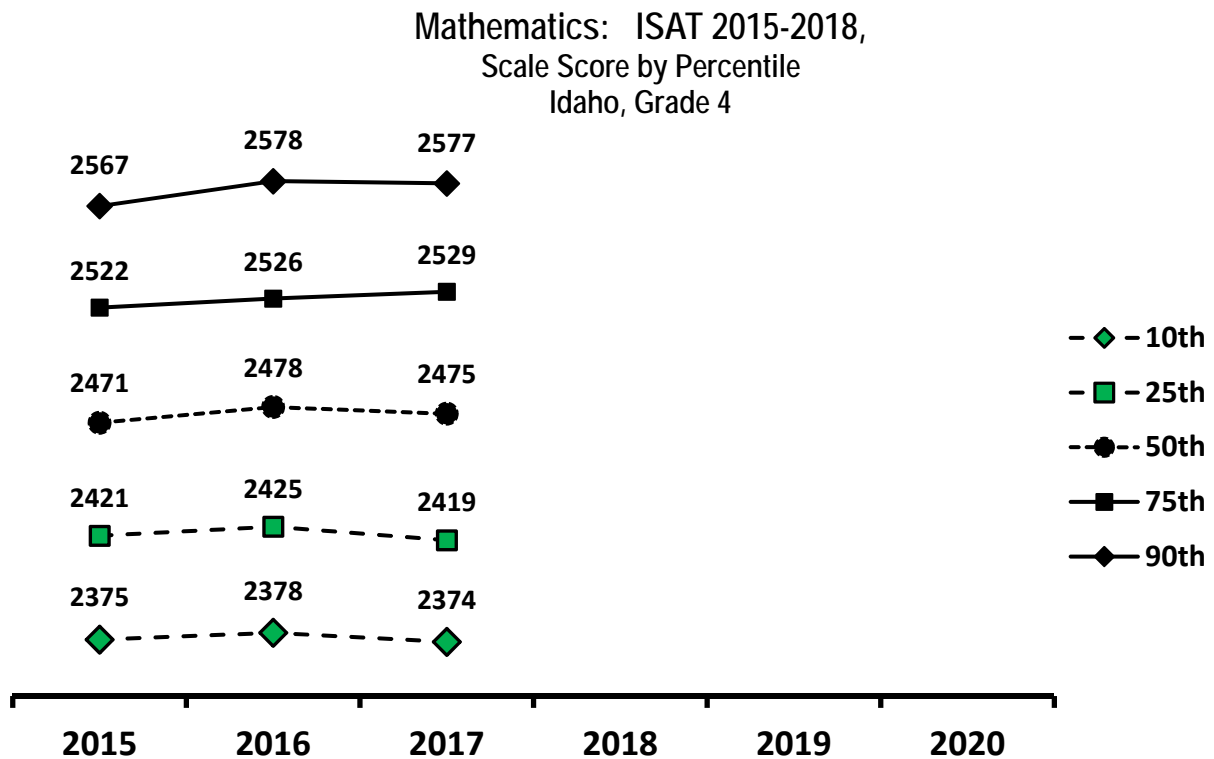
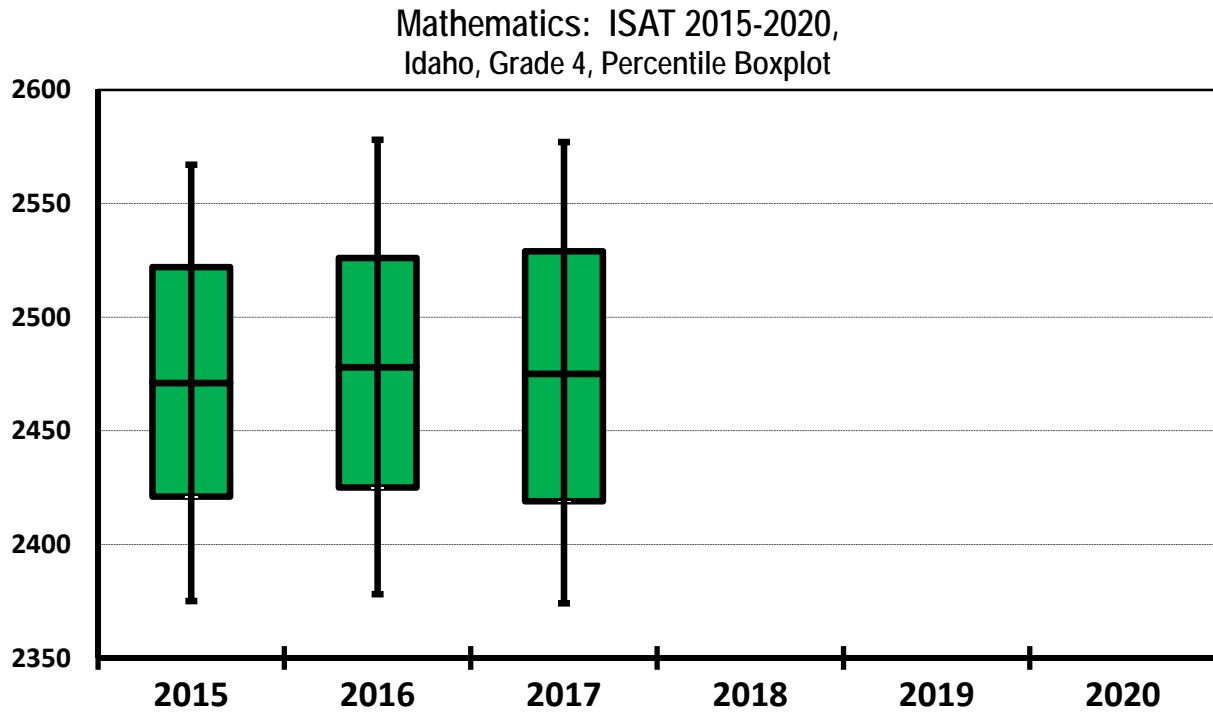


Figure A9. ISAT Mathematics Test, Grade 4, 2015 to 2017. Idaho statewide scale scores for the 10th, 25th, 50th, 75th, and 90th percentiles presented in boxplot and line graph formats.

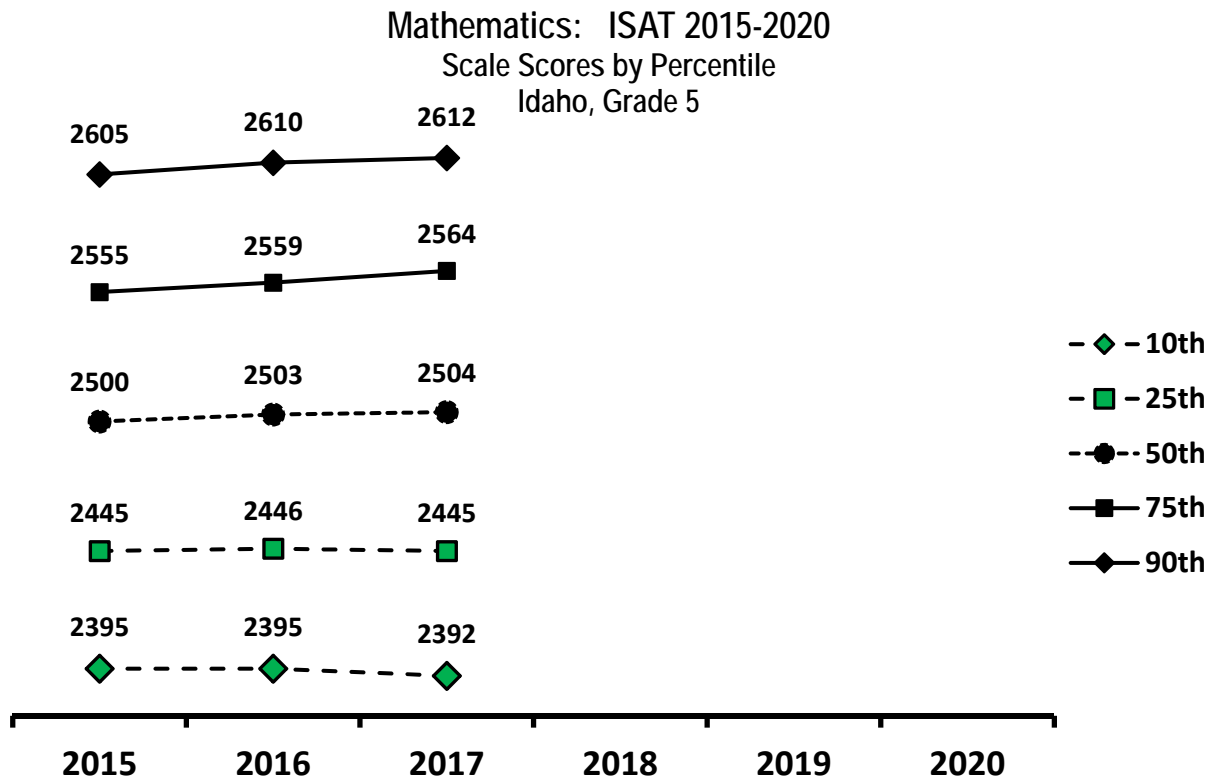
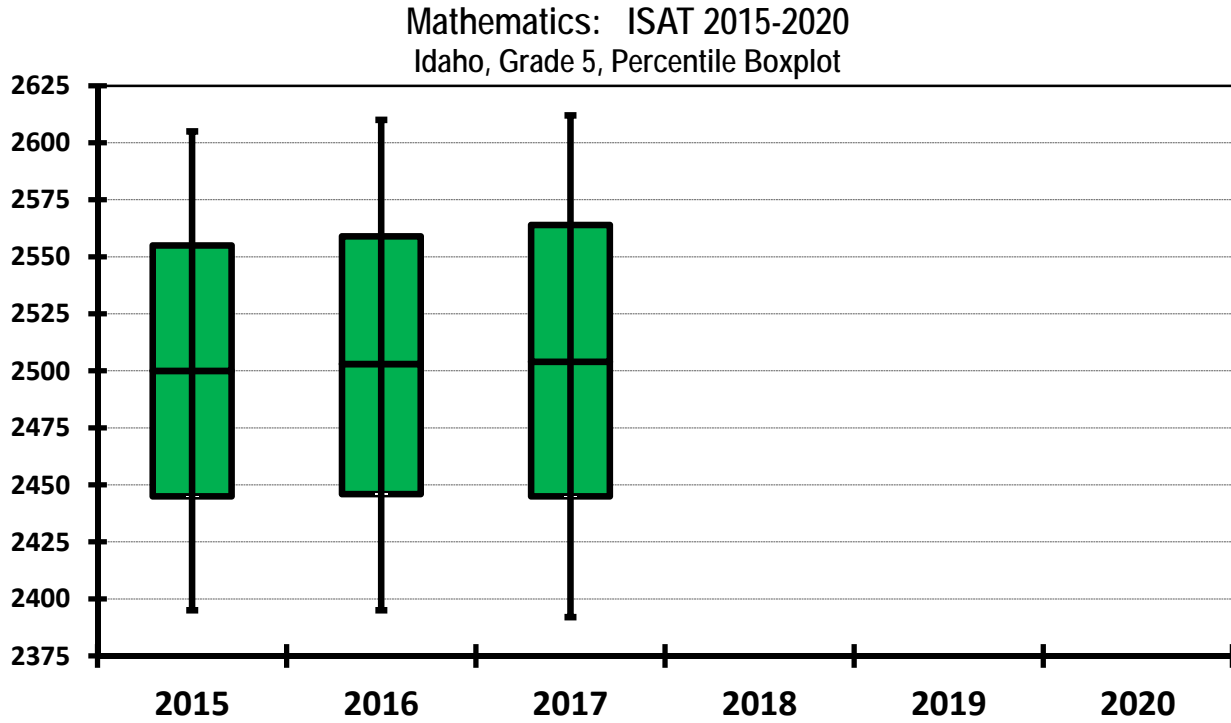


Figure A10. ISAT Mathematics Test, Grade 5, 2015 to 2017. Idaho statewide scale scores for the 10th, 25th, 50th, 75th, and 90th percentiles presented in boxplot and line graph formats.

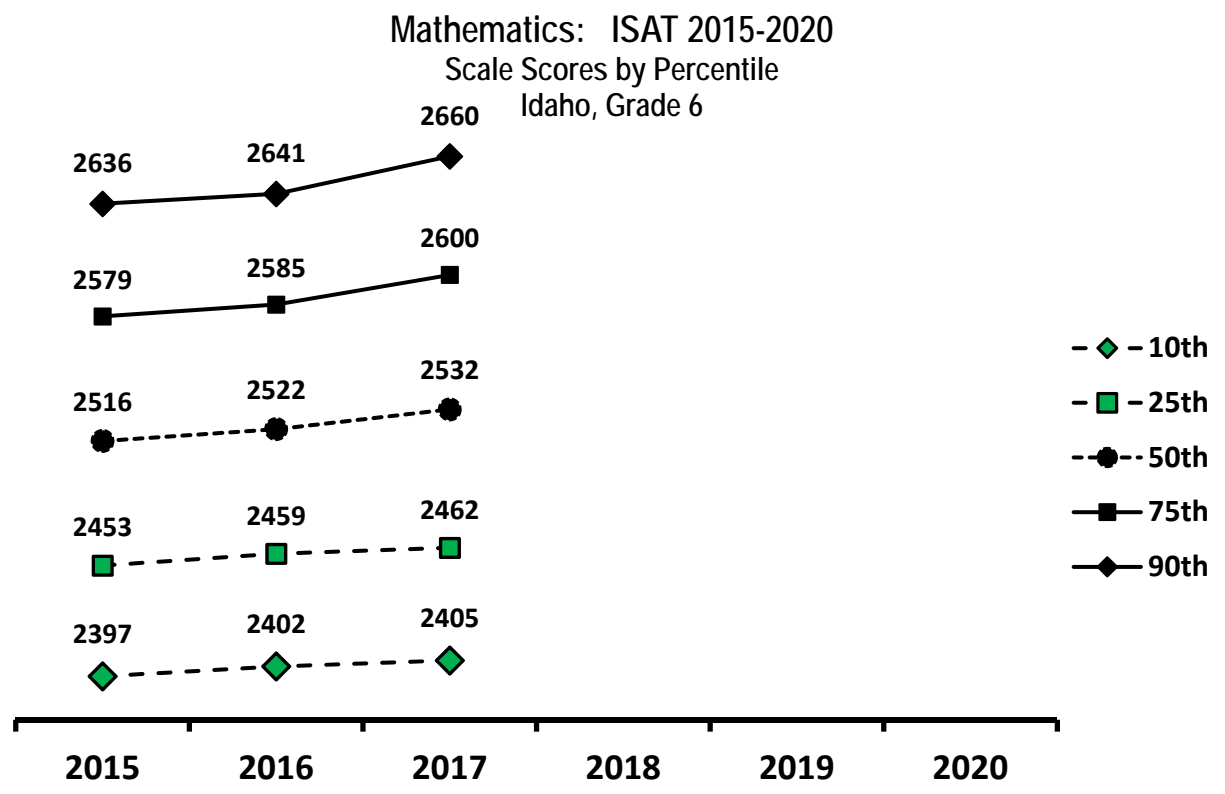
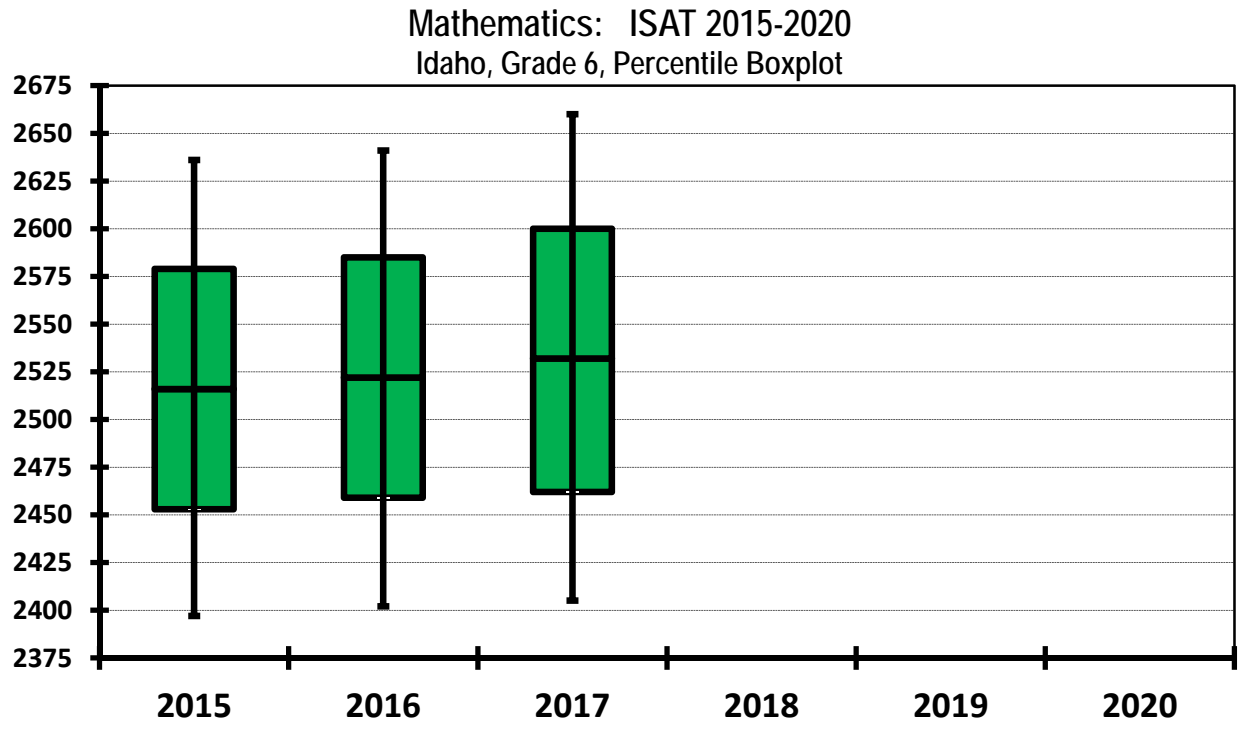


Figure A11. ISAT Mathematics Test, Grade 6, 2015 to 2017. Idaho statewide scale scores for the 10th, 25th, 50th, 75th, and 90th percentiles presented in boxplot and line graph formats.

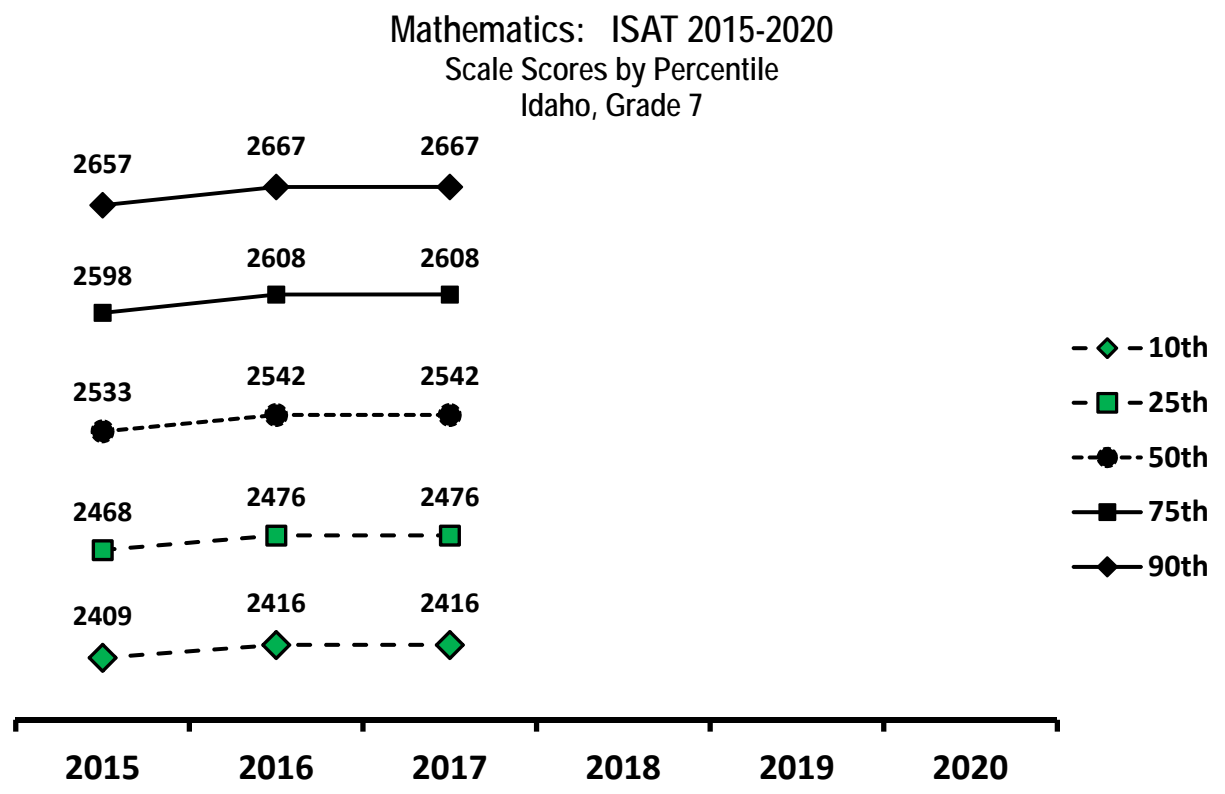
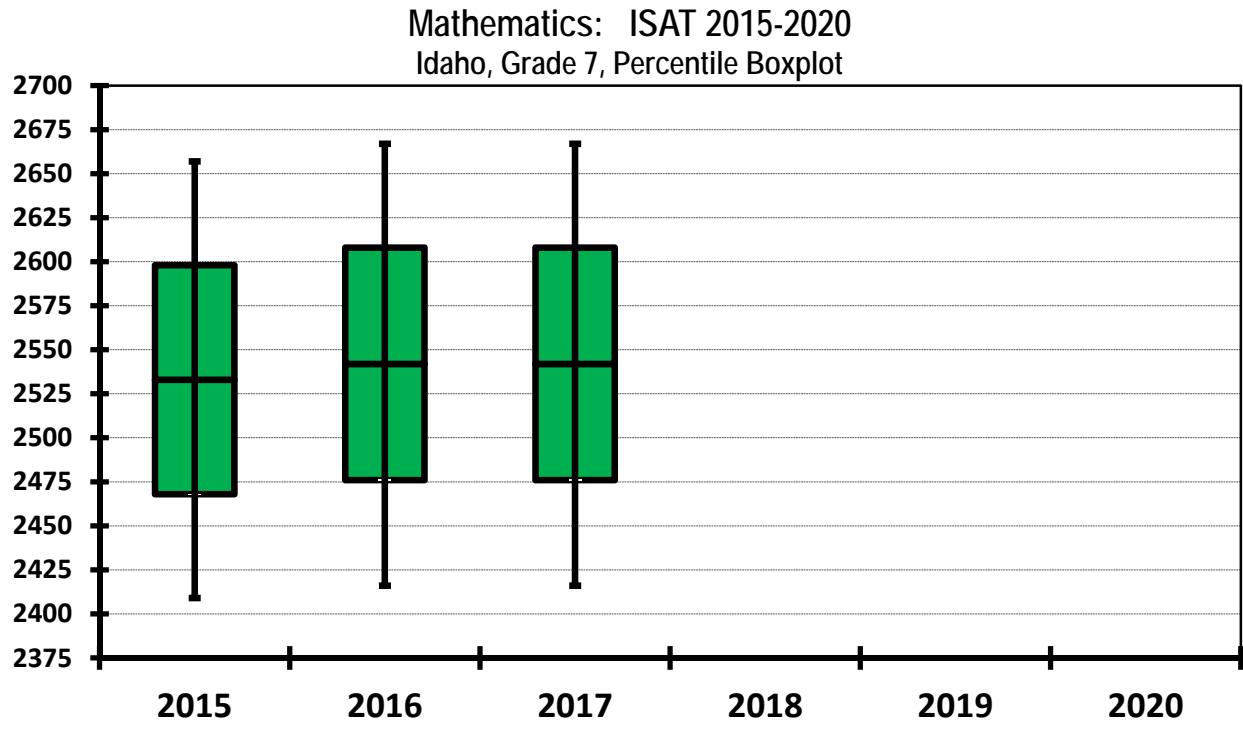


Figure A12. ISAT Mathematics Test, Grade 7, 2015 to 2017. Idaho statewide scale scores for the 10th, 25th, 50th, 75th, and 90th percentiles presented in boxplot and line graph formats.

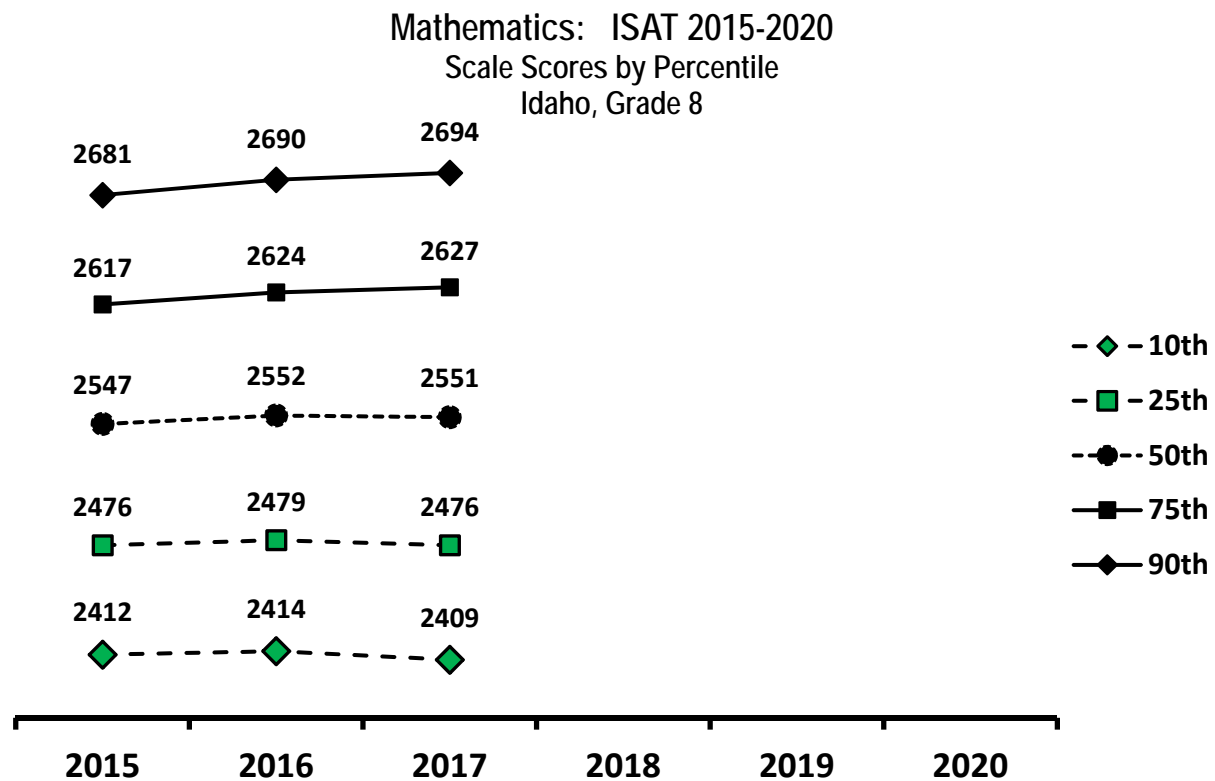
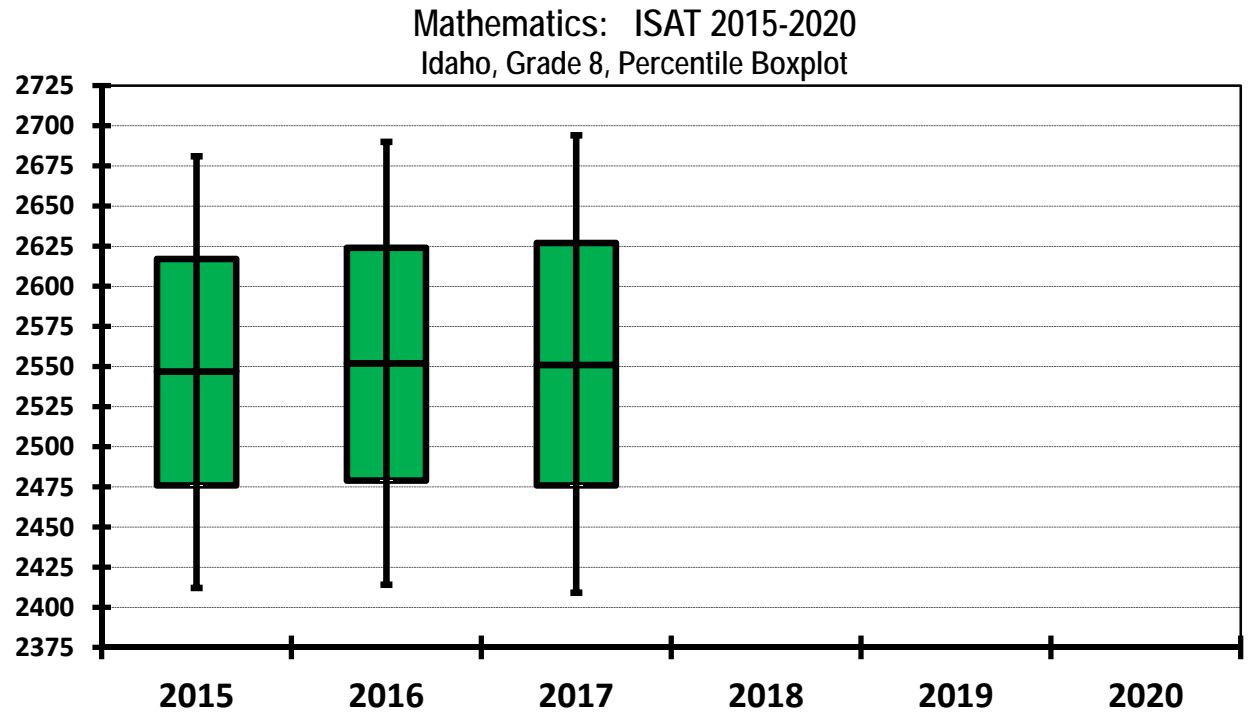


Figure A13. ISAT Mathematics Test, Grade 8, 2015 to 2017. Idaho statewide scale scores for the 10th, 25th, 50th, 75th, and 90th percentiles presented in boxplot and line graph formats.

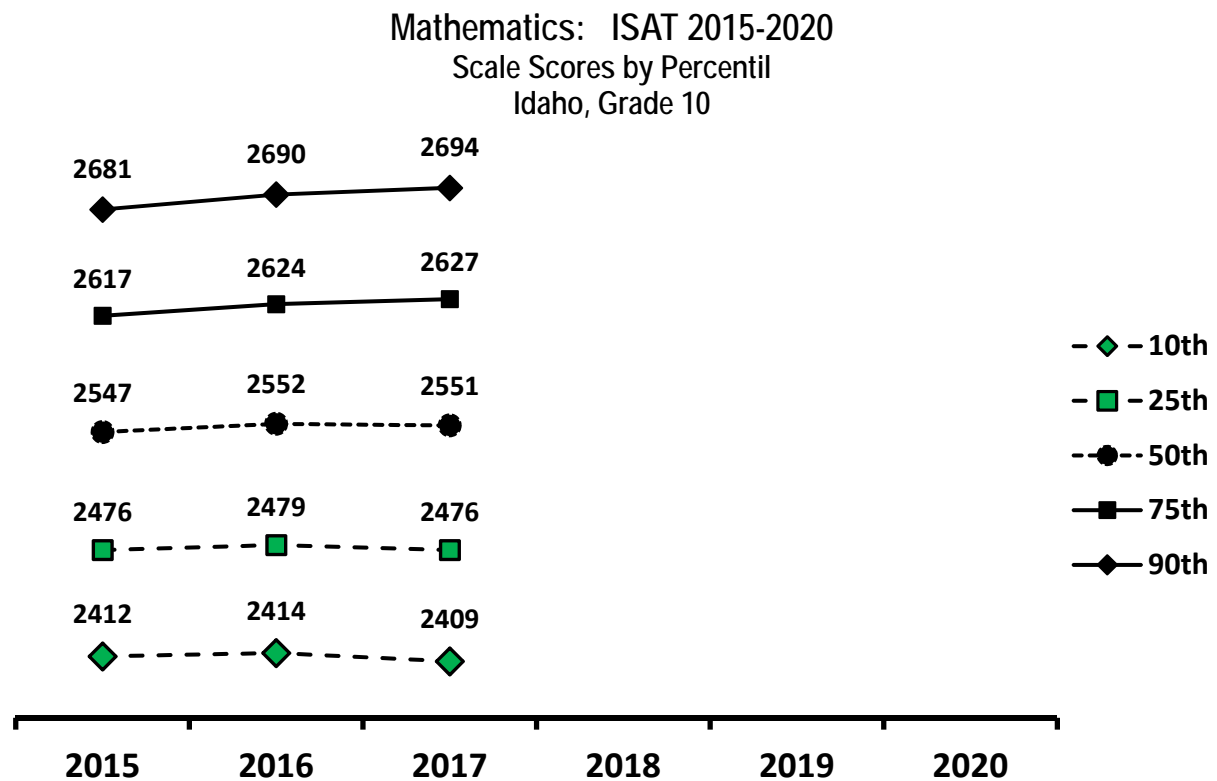
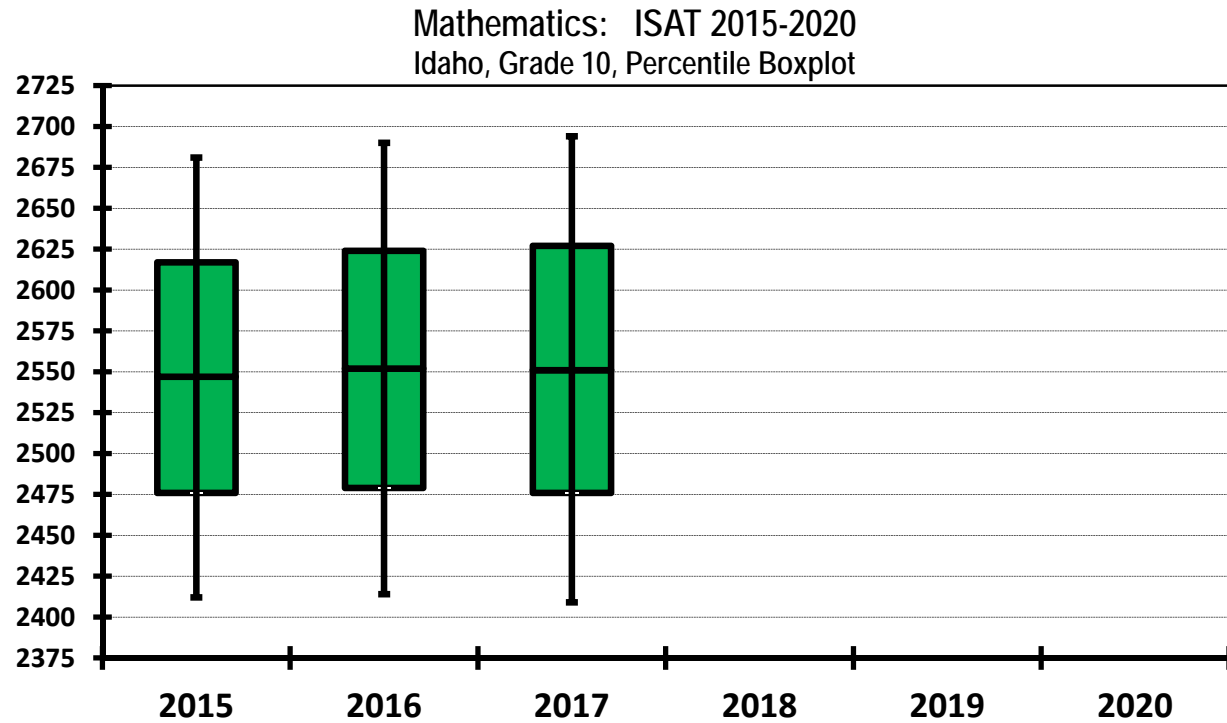


Figure A14. ISAT Mathematics Test, Grade 10, 2015 to 2017. Idaho statewide scale scores for the 10th, 25th, 50th, 75th, and 90th percentiles presented in boxplot and line graph formats.