



Iowa Testing Programs

Measuring Student Growth with the Iowa Assessments

ITP Research Series

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Measuring Student Growth in Iowa with the *Iowa Assessments*

Understanding how students change and grow over time is extremely important as teachers and schools design education programs tied to standards in reading, mathematics, and other key content areas. Student achievement and growth can be characterized in a variety of ways, including proficiency, growth scores, and status relative to a goal such as college readiness. The *Iowa Assessments* have a long history of assessing and monitoring growth and college readiness. This report describes the achievement growth of Iowa students using several metrics on the *Iowa Assessments*. It is designed to complement available information on status summaries (for example, proficiency rates) and to provide additional information on student growth and status with respect to college readiness.

Growth was examined across two pairs of school years for five different tests, including Reading, Mathematics, Written Expression, Science, and Social Studies. The time periods compared were 1) 2013-2014 school year to 2014-2015 school year and 2) 2014-2015 school year to 2015-2016 school year. The sample consisted of approximately 230,000 Iowa students in Grades 3-10. Students were included if they tested in the subject during the same administration period in adjacent years. Two different growth metrics (Gain Scores and Iowa Growth Scores) are presented here. Both metrics are anchored using the National Standard Score (NSS) scale of the *Iowa Assessments*. In addition, on-track college readiness results are provided for Grades 6-10.

Results

Gain Scores

Gain scores can be used to quantify the change in performance from one year to the next for either an individual student or for a group of students. Average gain scores are calculated by subtracting each student's prior-year score from their current-year score (i.e., $NSS_{Year2} - NSS_{Year1}$) and then taking the average over all students. The sign and magnitude of the gain scores are important in indicating the change in performance. The magnitude of the gain score indicates how much the group of students has changed, whereas the sign indicates if the gain is positive (signifying improvement) or negative (signifying decline).

Tables 1-5 give the average gain scores of all students from one grade to the next for Reading, Mathematics, Written Expression, Science, and Social Studies. Results for both pairs of schools years are very similar across subjects. Mean differences are positive, indicating that students are showing improvement in every subject and at every grade level. Graphs of Gain Scores for Reading and Mathematics are presented in Figures 1 and 2.

Table 1: Average Gain Scores in Reading

Grade Pair	2013-2014 to 2014-2015			2014-2015 to 2015-2016		
	N	Gain Score	SD	N	Gain Score	SD
All	232716	16.07	22.30	238343	14.59	22.20
3-4	34359	21.93	19.46	35775	21.55	19.25
4-5	34610	17.40	20.44	35172	15.24	20.26
5-6	33215	11.41	21.88	34621	9.25	21.72
6-7	33397	15.54	22.24	34351	13.25	22.41
7-8	34027	18.60	23.25	34311	16.70	22.84
8-9	30677	18.52	24.25	30932	16.83	24.38
9-10	32431	8.78	21.69	33181	9.10	21.80

Table 2: Average Gain Scores in Mathematics

Grade Pair	2013-2014 to 2014-2015			2014-2015 to 2015-2016		
	N	Gain Score	SD	N	Gain Score	SD
All	232077	14.78	16.99	238468	14.02	16.98
3-4	32789	17.20	14.09	35791	16.71	14.14
4-5	34644	15.62	15.28	35194	14.25	15.09
5-6	34111	13.94	15.36	34633	13.29	15.32
6-7	33625	17.74	15.35	34369	16.85	15.24
7-8	33877	12.63	16.71	34337	11.54	16.48
8-9	30654	13.46	19.76	30950	11.90	20.05
9-10	32377	12.77	20.87	33194	13.23	21.08

Table 3: Average Gain Scores in Written Expression*

Grade Pair	2013-2014 to 2014-2015			2014-2015 to 2015-2016		
	N	Gain Score	SD	N	Gain Score	SD
All	110497	15.11	25.29	100537	14.27	25.30
3-4	15724	23.34	21.22	14322	23.26	21.04
4-5	15718	14.99	22.42	14544	13.71	22.63
5-6	16207	9.51	24.86	14343	8.12	24.69
6-7	15922	20.49	25.93	14797	18.87	25.97
7-8	16366	10.47	27.17	14927	9.21	26.81
8-9	13631	19.51	28.47	12333	18.35	28.71
9-10	16929	8.85	22.44	15271	9.35	22.82

*Based on schools that opt to administer the Written Expression test (representing approximately 45% of the Iowa students).

Table 4: Average Gain Scores in Science

Grade Pair	2013-2014 to 2014-2015			2014-2015 to 2015-2016		
	N	Gain Score	SD	N	Gain Score	SD
All	230803	14.62	22.51	234222	14.14	22.46
3-4	32729	20.63	17.52	33679	20.84	17.55
4-5	33568	11.03	18.86	33800	10.63	18.67
5-6	34020	12.74	20.92	34382	11.83	20.87
6-7	33507	20.28	21.65	34139	19.02	21.84
7-8	33957	18.97	23.68	34136	17.72	23.44
8-9	30640	9.07	26.23	30951	8.92	26.20
9-10	32382	9.10	24.13	33135	9.48	24.49

Table 5: Average Gain Scores in Social Studies*

Grade Pair	2013-2014 to 2014-2015			2014-2015 to 2015-2016		
	N	Gain Score	SD	N	Gain Score	SD
All	123977	16.60	22.12	126872	15.90	22.05
3-4	18090	20.59	16.38	19474	20.20	16.19
4-5	19026	14.75	16.96	19219	14.07	16.83
5-6	17227	13.56	19.70	17501	12.71	19.81
6-7	18370	19.79	22.12	18939	18.82	22.06
7-8	18939	13.82	22.43	19440	12.26	22.27
8-9	14716	29.15	25.36	14834	28.54	25.14
9-10	17609	6.66	24.69	17465	6.45	25.17

*Based on schools that opt to administer the Social Studies test (representing approximately 53% of the Iowa students).

Figure 1. Average Gain Scores in Reading

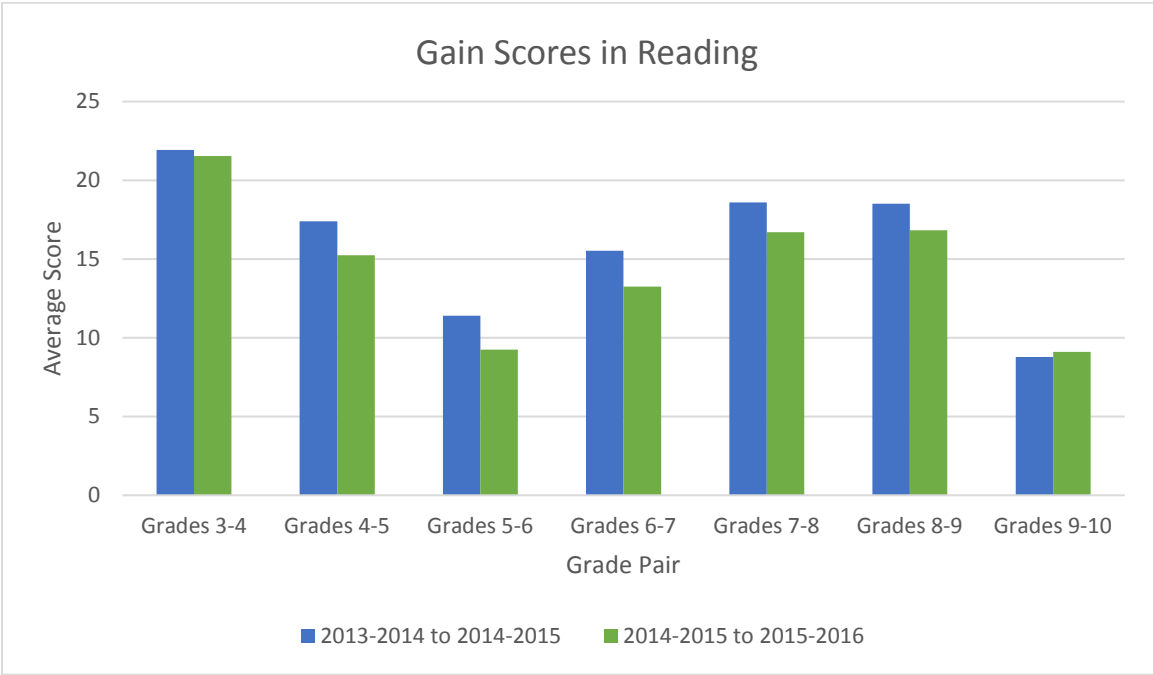
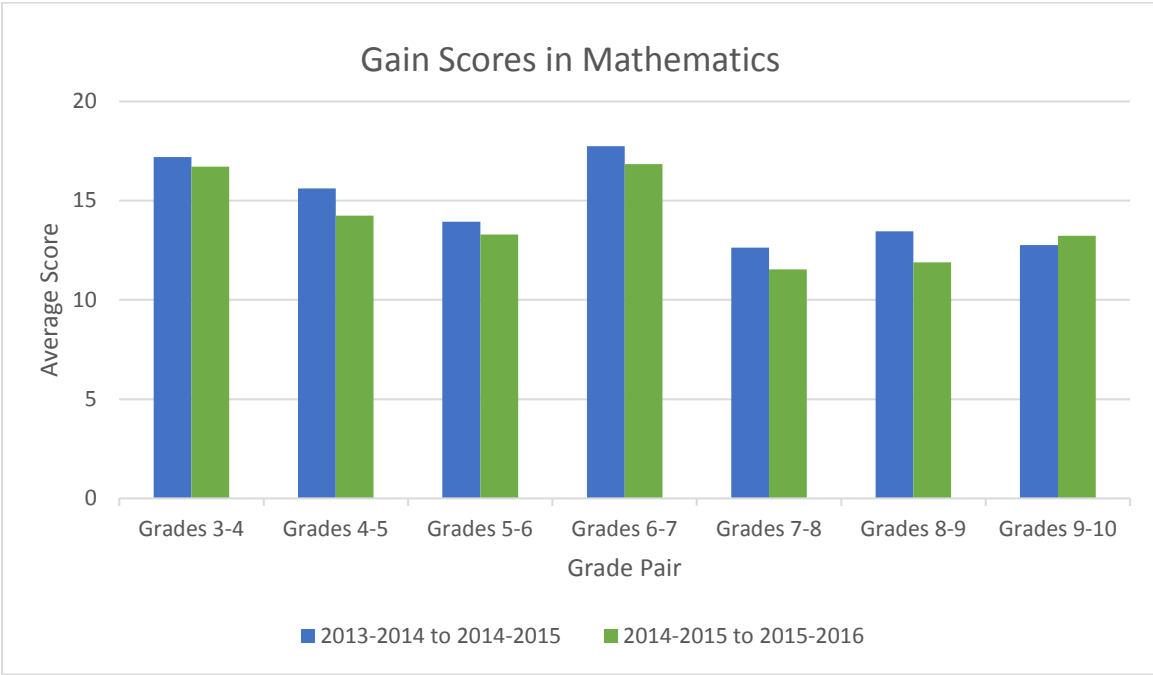


Figure 2. Average Gain Scores in Mathematics



Iowa Growth Scores

The Iowa Growth Scores can be used to determine whether an individual student or a group of students has made a year's worth of growth given the change that was *expected* of that student or students. Expected growth is based on a nationally representative group of students who took the appropriate assessments at the grade levels of interest. When a student has grown as much as expected since the previous year, this student is keeping pace with other students in the nation. The Iowa Growth Score is the difference between the observed NSS in year 2 and the expected NSS in year 2, where the expected score is conditional on a student's year 1 performance. The Iowa Growth Score represents the increment of the gain score that is different than the expected growth. As with gain scores, the sign of this value is important. If the value is positive, then the student has exceeded expectations in growth. When the value is zero or close to zero, then the student has met expectations in growth. When the value is negative, then the achievement level of the student has not increased as much as would be expected based on a national representative sample of students.

Tables 6-10 give the average Iowa Growth Scores of all students from one grade to the next on the *Iowa Assessments* for Reading, Mathematics, Written Expression, Science, and Social Studies. Because the data does not include predicted Written Expression scores for Grades 8 and above, Written Expression only includes information for students who were in Grades 3-7 in year 1 (and thus Grades 4-8 in year 2). Results for both pairs of school years are again very similar across subjects. Overall Iowa Growth Scores are positive, indicating that students exceeded expected growth in each subject. In particular, Iowa students tend to grow more than expected in Reading, Mathematics, Science, and Social Studies. Iowa students are showing more growth than expected as compared to the nation; however, this varies by grade. The overall Iowa Growth Scores are close to zero for Written Expression, indicating that students met expectations for growth. When the Iowa Growth Scores are negative, this does not mean that students did not improve in that area, but rather that they did not increase as much as expected. Less than expected growth (i.e., negative Iowa Growth Scores) was seen more frequently for middle school grades. This trend is often seen during these transition years. Graphs of the Iowa Growth Scores for Reading and Mathematics are presented in Figures 3 and 4.

In addition, score distributions of the most recent two years (from the 2014-2015 school year to the 2015-2016 school year) were examined for Reading, Mathematics, and Science for Grades 3-8 (Appendices A-C). Included with the histograms illustrating these distributions are means, standard deviations, and minimum and maximum values. Interpretations of results are articulated through the following example. Statewide, the average Iowa Growth Score from Grade 3 to 4 was 6.6 units, the middle of the histogram, meaning 6.6 units greater than expected. The standard deviation for grade pair 3/4 is about 19, indicating that about two-thirds of the growth scores were within 19 units of the mean growth score of 6.6. Overall and as expected, the score distributions were unimodal and symmetrical about the middle (Appendices A-C). The distributions were centered above zero for most grade pairs in Reading, Mathematics and Science, indicating that Iowa students are performing better than expected as compared to the national sample of students.

Table 6: Average Iowa Growth Scores in Reading

Grade Pair	2013-2014 to 2014-2015			2014-2015 to 2015-2016		
	N	Iowa Growth Score	SD	N	Iowa Growth Score	SD
All	232716	4.68	22.20	238343	3.25	22.12
3-4	34359	6.95	19.24	35775	6.61	19.06
4-5	34610	4.32	20.04	35172	2.26	19.92
5-6	33215	-1.07	21.93	34621	-3.11	21.80
6-7	33397	4.51	22.43	34351	2.26	22.61
7-8	34027	8.33	23.41	34311	6.49	23.02
8-9	30677	9.50	24.21	30932	7.82	24.31
9-10	32431	0.37	21.94	33181	0.75	22.04

Table 7: Average Iowa Growth Scores in Mathematics

Grade Pair	2013-2014 to 2014-2015			2014-2015 to 2015-2016		
	N	Iowa Growth Score	SD	N	Iowa Growth Score	SD
All	232077	2.15	17.37	238468	1.35	17.40
3-4	32789	0.27	14.36	35791	-0.21	14.42
4-5	34644	0.06	15.52	35194	-1.32	15.43
5-6	34111	-0.19	16.10	34633	-0.83	16.06
6-7	33625	5.48	16.04	34369	4.54	15.92
7-8	33877	1.36	16.70	34337	0.28	16.47
8-9	30654	3.86	19.98	30950	2.29	20.25
9-10	32377	4.53	21.25	33194	5.05	21.48

Table 8: Average Iowa Growth Scores in Written Expression*

Grade Pair	2013-2014 to 2014-2015			2014-2015 to 2015-2016		
	N	Iowa Growth Score	SD	N	Iowa Growth Score	SD
All	79937	0.85	25.70	72933	-0.21	25.59
3-4	15724	3.65	22.53	14322	3.83	22.14
4-5	15718	-2.20	23.68	14544	-3.46	23.88
5-6	16207	-4.95	25.32	14343	-6.43	25.14
6-7	15922	8.64	26.54	14797	6.93	26.59
7-8	16366	-0.76	27.75	14927	-2.00	27.38
8-9						
9-10						

*Based on schools that opt to administer the Written Expression test (approximately 45% of the Iowa students).

Table 9: Average Iowa Growth Scores in Science

Grade Pair	2013-2014 to 2014-2015			2014-2015 to 2015-2016		
	N	Iowa Growth Score	SD	N	Iowa Growth Score	SD
All	230803	2.08	22.98	234222	1.60	22.93
3-4	32729	3.06	17.97	33679	3.32	17.94
4-5	33568	-4.86	19.92	33800	-5.31	19.76
5-6	34020	-0.92	21.56	34382	-1.87	21.52
6-7	33507	8.55	22.45	34139	7.26	22.63
7-8	33957	7.80	23.93	34136	6.55	23.68
8-9	30640	-0.33	26.54	30951	-0.43	26.48
9-10	32382	1.04	24.58	33135	1.44	24.94

Table 10: Average Iowa Growth Scores in Social Studies*

Grade Pair	2013-2014 to 2014-2015			2014-2015 to 2015-2016		
	N	Iowa Growth Score	SD	N	Iowa Growth Score	SD
All	123977	3.78	22.63	126872	2.99	22.57
3-4	18090	3.99	17.05	19474	3.61	16.85
4-5	19026	-1.37	18.04	19219	-2.13	17.87
5-6	17227	-1.20	19.85	17501	-2.18	20.01
6-7	18370	7.61	22.59	18939	6.56	22.52
7-8	18939	2.57	22.97	19440	1.01	22.84
8-9	14716	19.33	25.50	14834	18.74	25.26
9-10	17609	-1.71	25.02	17465	-1.92	25.49

*Based on schools that opt to administer the Social Studies test (representing approximately 53% of the Iowa students).

Figure 3. Average Iowa Growth Scores in Reading

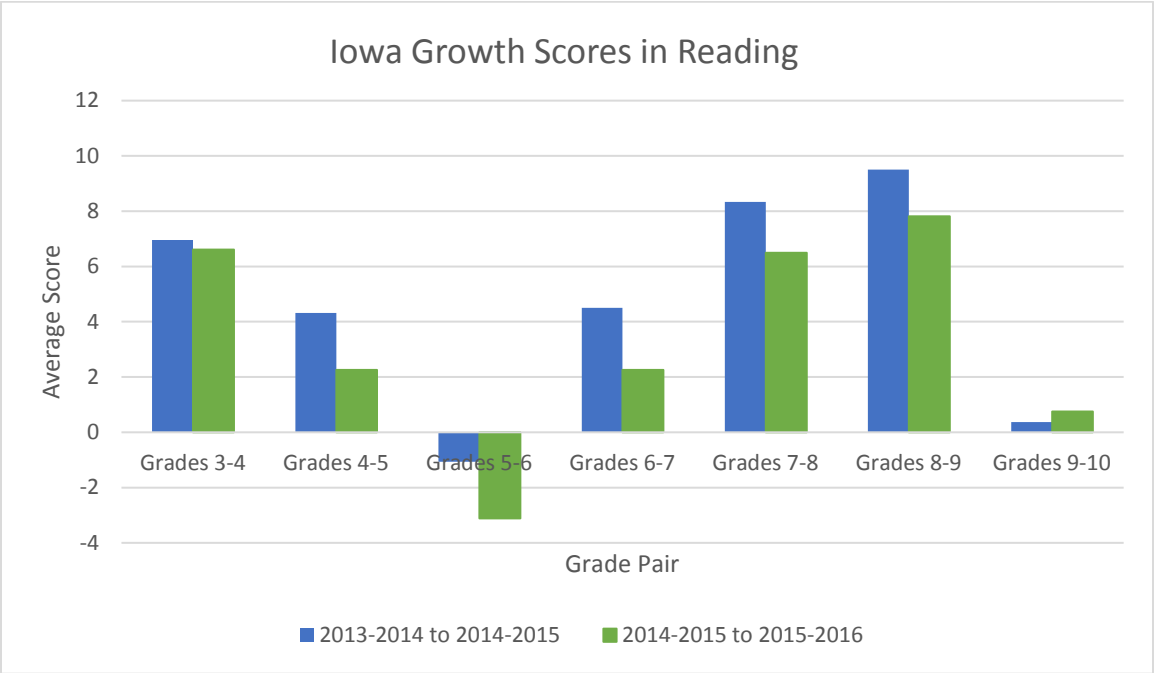
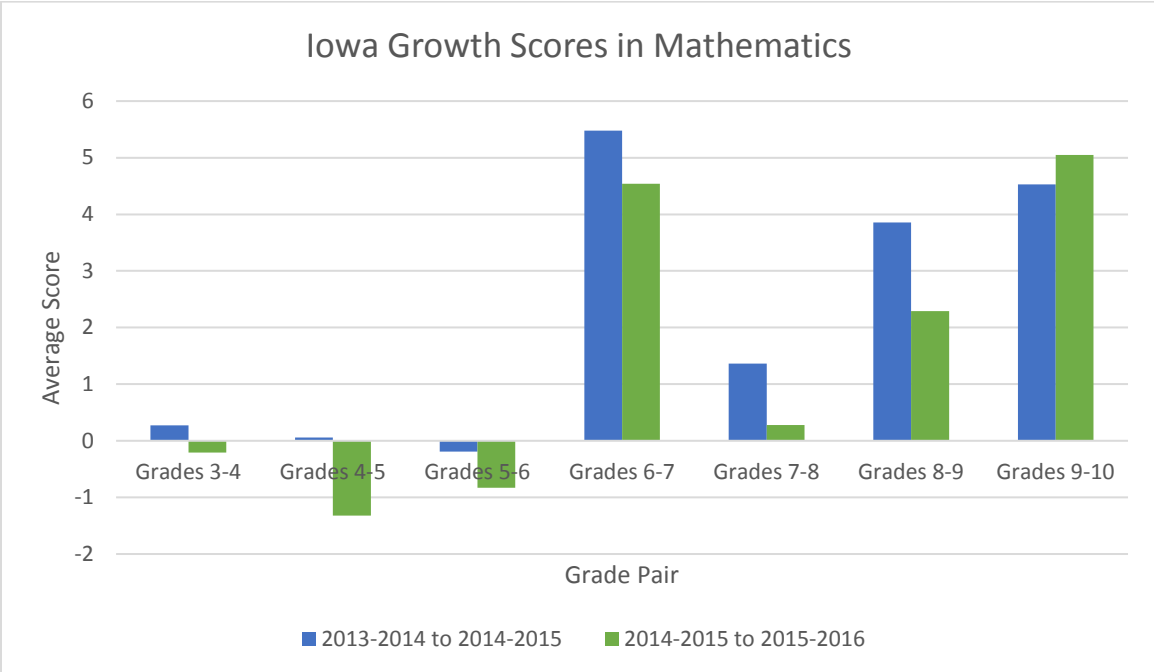


Figure 4. Average Iowa Growth Scores in Mathematics



Examining Gain Scores by Proficiency Level

A key feature of the *Iowa Assessments* is the ability to track student growth over time by levels of proficiency. Table 11 provides average gain scores for 2014-2015 to 2015-2016 school years by proficiency categories, as determined by the state of Iowa and used for accountability purposes. The proficiency level was defined using students' 2014-2015 performances.

The expected growth scores, as defined previously, are provided in Table 11 as a point of reference to aid in interpretation of these results. The national model for the expected growth scores suggests that students performing well (for example, advanced category) on the *Iowa Assessments* during the first year, also perform well the second year. Students who did not perform well in the first year (not proficient), performed better in the second year but less so than advanced students. For example, in Reading, the expected growth of an advanced student in Grade 3 is 20 standard score points when tested again in Grade 4. For a student who was not proficient in Grade 3, the expected growth is 11 standard score points. The national model also suggests that growth slows down as students move from Grade 3 to high school. For example, students who are proficient in Mathematics are expected to grow 15 standard score points from Grades 3 to 4, but only 8 standard score points from Grades 9 to 10.

In general, Iowa students are exceeding the amount of growth the nation is making, however this varies slightly by proficiency level. For example, advanced students are less likely to exceed expected growth, but not proficient students are more likely to exceed expected growth. In Reading, a not proficient student in Grade 3 was expected to gain 11 standard score points, but on average, gained 19 standard score points. This is promising news for Iowa as it means that not proficient students are more likely to show larger gains in achievement, thus moving closer to proficiency in Reading, Mathematics, and Science.

Table 11. Average Gain Scores compared to Expected Growth by Proficiency Category

Proficiency Category	Grade Pair	Subject Area					
		Reading		Mathematics		Science	
		Average Gain	Expected Growth	Average Gain	Expected Growth	Average Gain	Expected Growth
Advanced	3-4	21	20	19	23	20	23
Advanced	4-5	9	16	14	19	3	20
Advanced	5-6	1	16	11	17	9	18
Advanced	6-7	7	15	13	15	6	13
Advanced	7-8	11	14	13	13	9	13
Advanced	8-9	-1	14	2	11	0	10
Advanced	9-10	2	8	7	9	1	9
Proficient	3-4	23	15	15	15	21	19
Proficient	4-5	19	14	15	14	12	19
Proficient	5-6	12	13	13	13	11	16
Proficient	6-6	14	12	17	12	20	14
Proficient	7-8	18	11	11	11	19	12
Proficient	8-9	19	10	13	10	8	9
Proficient	9-10	9	8	11	8	7	8
Not Prof	3-4	19	11	17	13	21	13
Not Prof	4-5	15	10	13	10	18	11
Not Prof	5-6	16	9	17	11	18	10
Not Prof	6-7	19	10	21	8	25	8
Not Prof	7-8	20	9	11	9	20	8
Not Prof	8-9	31	8	19	8	23	10
Not Prof	9-10	20	7	24	6	24	6

Growth Towards College Readiness

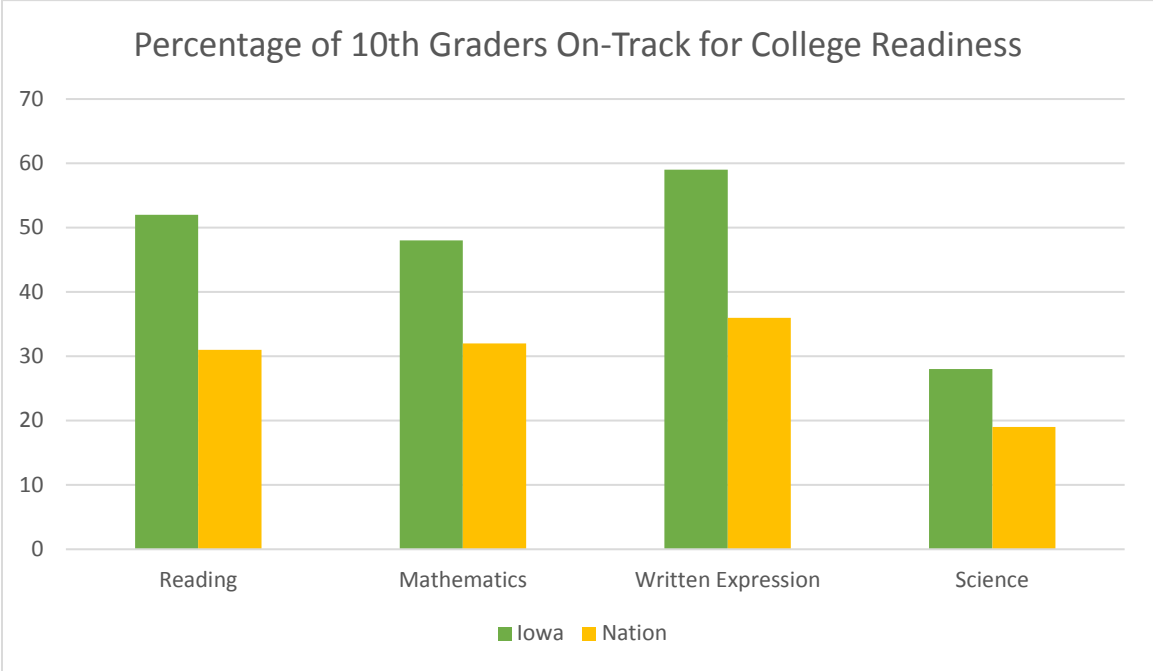
Research shows that younger students who take rigorous curricula are more prepared to graduate from high school ready for college or career (ACT, 2015). In addition, the level of academic achievement that students in middle school achieve has a strong impact on their readiness for college coursework. Beginning in Grade 6, the *Iowa Assessments* provide information about whether a student is on target to achieving the knowledge and skills necessary to be successful in credit-bearing first-year college courses. Table 12 provides the percentages of Iowa students that are on-track to meet these targets in Grades 6 through 10. In addition, the estimated percentages of students in the nation are also provided as a frame of reference. These national percentages are based on research conducted with students that successfully completed postsecondary coursework. Figure 5 provides a histogram of the same information for students in Grade 10. A greater percentage of Iowa students are on-track when compared to the nation for all testing areas. In addition, the percentage of students on-track increases as students’ progress through school.

Table 12. Percentage of Iowa Students and Students Nationally On-Track for College Readiness

Grade	Subject Area							
	Reading		Mathematics		Written Expression*		Science	
	Iowa	Nation	Iowa	Nation	Iowa*	Nation	Iowa	Nation
6	42	31	40	32	44	36	19	19
7	45	31	41	32	48	36	22	19
8	45	31	39	32	45	36	30	19
9	53	31	45	32	59	36	29	19
10	52	31	48	32	59	36	28	19

*Based on schools that opt to administer the Written Expression test (approximately 45% of the Iowa students).

Figure 5. Percentage of 10th Grade Iowa Students and Students Nationally On-Track for College Readiness



Summary

This report summarized achievement growth for Iowa students and highlighted promising findings. Foremost, Iowa students are exceeding expected growth in nearly every grade and subject area. In particular, Iowa students are showing more growth than expected in Reading, Mathematics, and Science. In addition, not proficient students are exceeding expected growth even more than other students. This is especially notable as this trend will lead to not proficient students becoming proficient. Finally, Iowa students are more likely to be on-track for college readiness as compared to the nation, and the percentage of students on-track increases as students' progress through school. Monitoring growth is an essential element to measuring achievement and ensuring college readiness for Iowa students. The *Iowa Assessments* are a valuable tool and will continue to be used to monitor these trends.

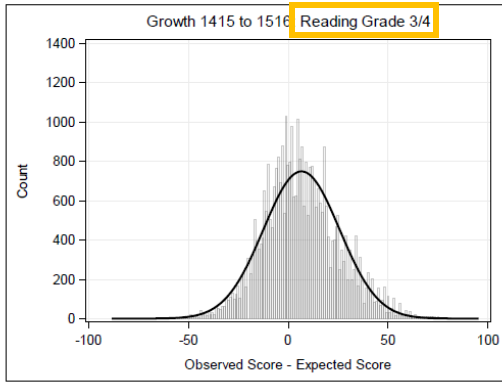
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<https://itp.education.uiowa.edu/ia/Research.aspx>

Appendix A

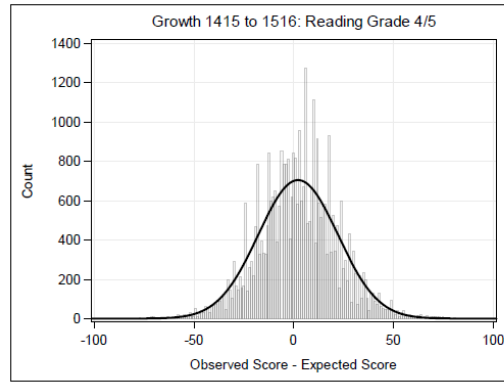
Distributions of Iowa Growth Scores in Reading

Reading



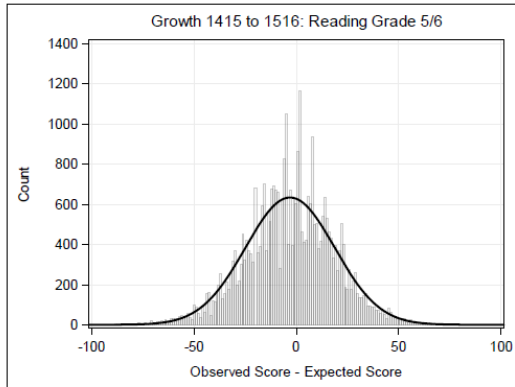
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N	Mean	Std Dev	Minimum	Maximum
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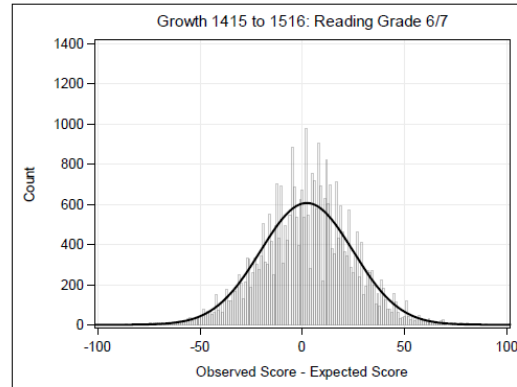
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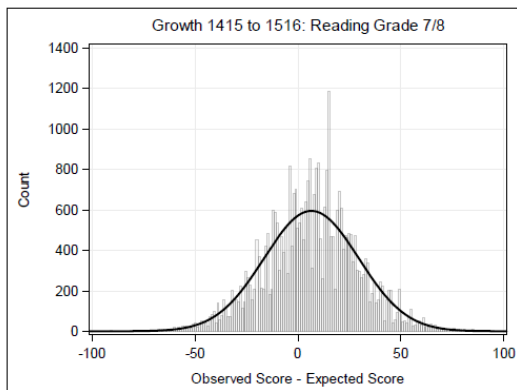
The MEANS Procedure

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N	Mean	Std Dev	Minimum	Maximum
34621	-3.11	21.80	-123.00	111.00



The MEANS Procedure

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N	Mean	Std Dev	Minimum	Maximum
34351	2.26	22.61	-123.00	120.00



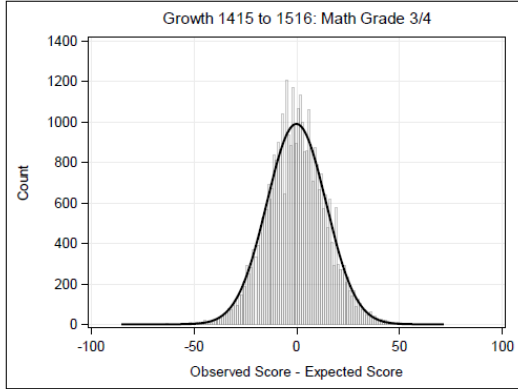
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Appendix B

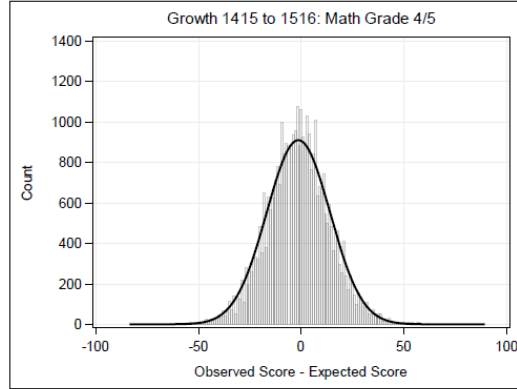
Distributions of Iowa Growth Scores in Mathematics

Mathematics



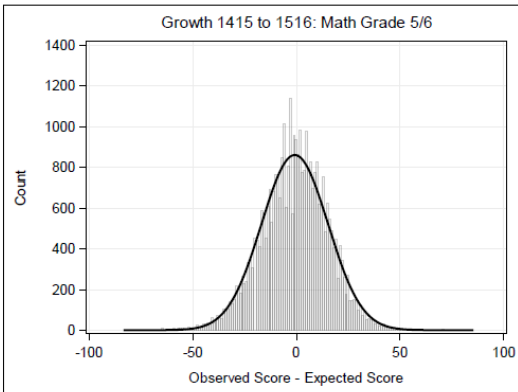
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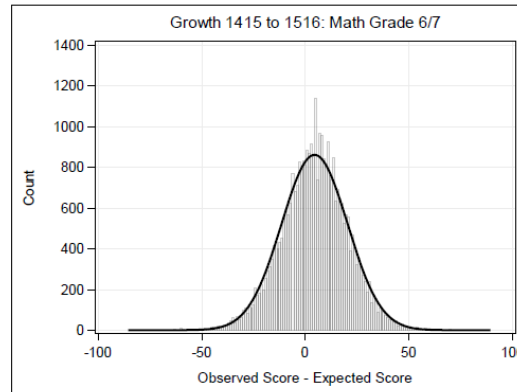
The MEANS Procedure

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N	Mean	Std Dev	Minimum	Maximum	
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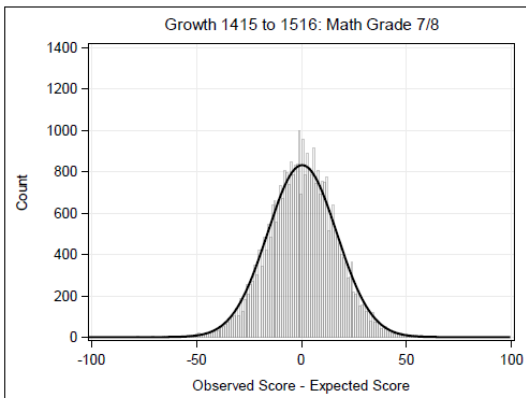
The MEANS Procedure

Analysis Variable : Change_M					
N	Mean	Std Dev	Minimum	Maximum	
34633	-0.83	16.06	-83.00	85.00	



The MEANS Procedure

Analysis Variable : Change_M					
N	Mean	Std Dev	Minimum	Maximum	
34369	4.54	15.92	-85.00	89.00	



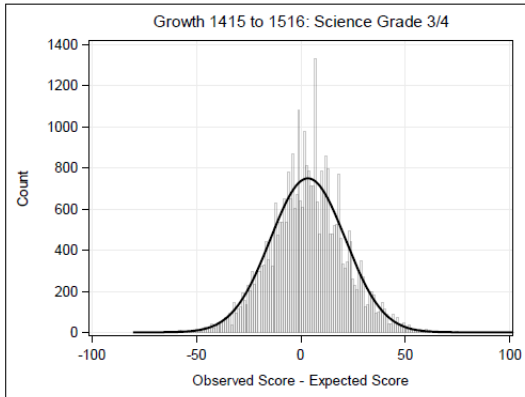
The MEANS Procedure

Analysis Variable : Change_M					
N	Mean	Std Dev	Minimum	Maximum	
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Appendix C

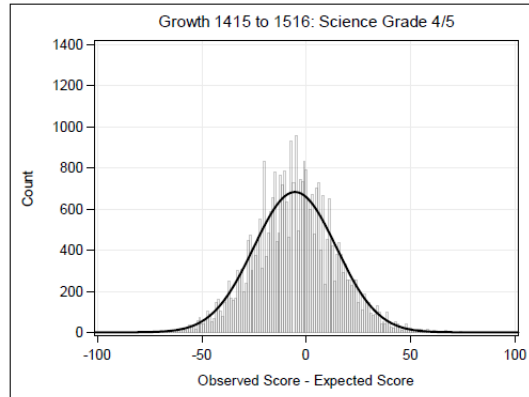
Distributions of Iowa Growth Scores in Science

Science



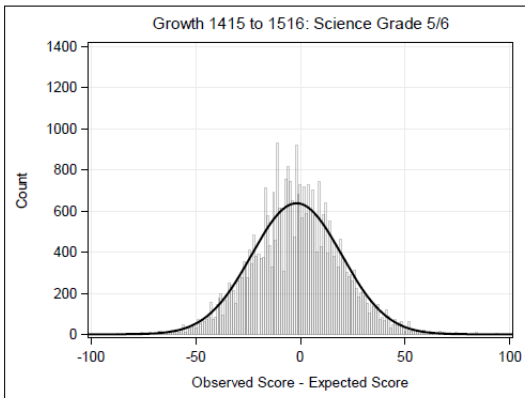
The MEANS Procedure

Analysis Variable : Change_SC					
N	Mean	Std Dev	Minimum	Maximum	
33679	3.32	17.94	-80.00	115.00	



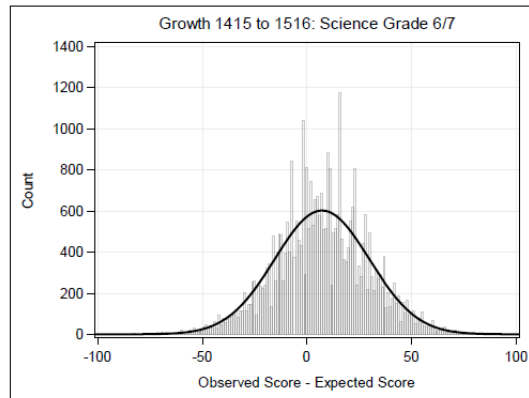
The MEANS Procedure

Analysis Variable : Change_SC					
N	Mean	Std Dev	Minimum	Maximum	
33800	-5.31	19.76	-114.00	110.00	



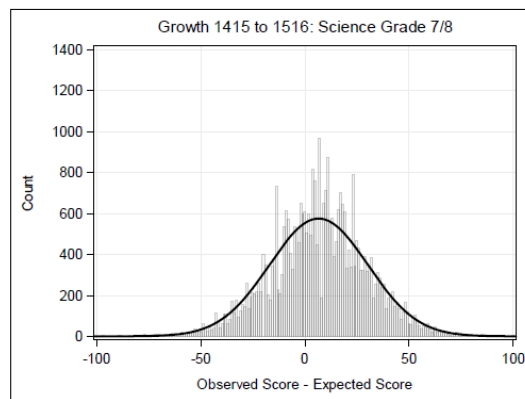
The MEANS Procedure

Analysis Variable : Change_SC					
N	Mean	Std Dev	Minimum	Maximum	
34382	-1.87	21.52	-127.00	111.00	



The MEANS Procedure

Analysis Variable : Change_SC					
N	Mean	Std Dev	Minimum	Maximum	
34139	7.26	22.63	-131.00	116.00	



The MEANS Procedure

Analysis Variable : Change_SC					
N	Mean	Std Dev	Minimum	Maximum	
34136	6.55	23.68	-147.00	142.00	