The Relationship between Student *Participation* on the Smarter Balanced Interim Assessment Blocks and Student *Growth* on the Smarter Balanced Summative Assessment

CSDE

CONNECTICUT STATE DEPARTMENT OF EDUCATION

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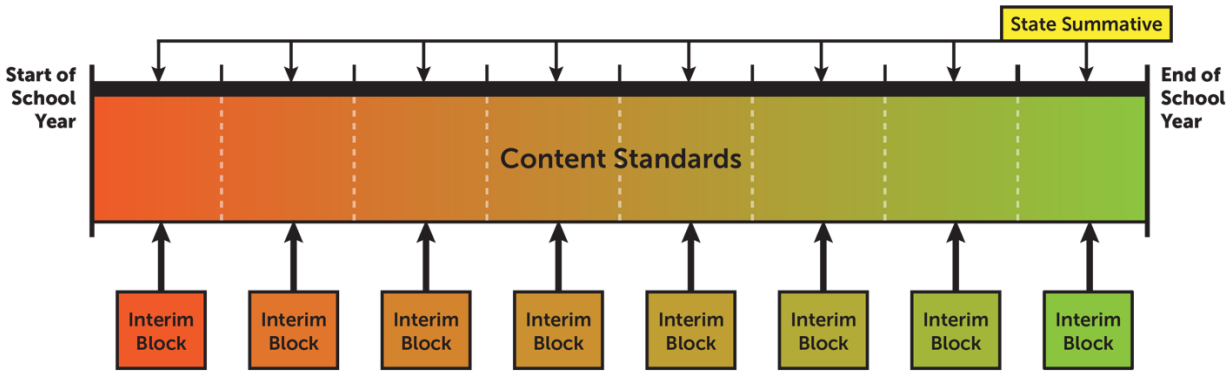
Contents

Background

Connecticut adopted the Common Core State Standards in July 2010, which are now known as the Connecticut Core Standards. The Connecticut State Department of Education (CSDE) began a partnership with other states, as part of the Smarter Balanced Assessment Consortium, to develop an assessment system that is aligned to those standards. In 2014-15, the CSDE administered the first operational version of the Smarter Balanced summative (end of grade) assessments as its accountability assessment in Grades 3 through 8. In subsequent years, Smarter Balanced released Interim Assessment Blocks (IABs) in English language arts (ELA) and mathematics. Unlike the summative assessment, which samples the content standards for the *entire* grade, the IABs are short, fixed-form assessments that focus on a subset of the grade-level standards (Smarter Balanced, 2019). Figure 1 visually illustrates the difference in scope between the state summative assessment and the IABs in the Smarter Balanced assessment system.

Figure 1: Content Coverage of Summative Assessment and IABs



There are many benefits to utilizing the IABs when using the Smarter Balanced system. These interims are intentionally designed with a narrower focus in order to allow teachers and students to gain greater insight into how students are progressing. Teachers can use the information from the IABs to adjust their instruction to enhance student learning. The IABs contain high-quality test questions that are developed in the same rigorous manner as for the summative and cover the range of depth of knowledge described in the Connecticut Core Standards. They are delivered on the same testing platform as the summative assessments and incorporate a wide array of accommodations and supports. The tests are scored immediately; moreover, teachers can view the test questions, scoring rubrics, and student responses to obtain greater insight into student cognition and reasoning. In addition to

administering the entire IAB as a stop-and-test event, the IABs can also be used in non-standard ways. For instance, a teacher may use test items from an IAB to illustrate the expectation of the standard, as a do-now exercise in the classroom, or as an exit ticket to check for understanding. The IABs are a critical component of the system because they can align coherently with a district's curriculum and assessment practices (Marion et al, 2019).

Method

Over the past five years, an increasing number of districts across Connecticut have begun to use the Smarter Balanced IABs with their students. While assessment alone is not an instructional intervention, there is growing interest among educators to know if student performance on the interim assessments predicts performance on the summative assessments. However, given the wide variety of standardized and non-standardized ways in which districts use the IABs, it is currently not feasible to conduct a predictive analysis with the available data. Therefore, the CSDE decided to study if *participation* in the interim assessments has any relationship to improved performance on the summative.

Phase 1 of this study will explore the relationship between 'sustained participation' in the IABs and growth on the Smarter Balanced vertical scale score on the end-of-grade summative assessment from 2017-18 to 2018-19. 'Sustained participation' is defined as a student who participates in *at least four* different IABs in a subject area during the school year. Since the IABs cover only a portion of the content standards, participation in four different IABs is considered to represent reasonable coverage of the breadth of the standards and is therefore a suitable standard for examination of growth on the end-of-grade summative score. Moreover, administration of four or more different IABs during the school year may be representative of a more systematic integration of the IABs into the curriculum.

Future phases of this study will compare the item pools between the IABs and the summative assessments. The studies will explore the relationship between participation in specific IABs and their relationship to improvements in claim scores and/or aggregate assessment target performance.

Data

The data for Phase 1 of this study were the following administrative, student-level data sets:

- the interim assessment participation data in the 2018-19 school year; and
- the spring 2018 and spring 2019 summative assessment results to evaluate growth.

Results

The number of times a specific IAB was administered in both ELA and mathematics is presented in Tables 1, 2, and 3[1]. The ELA *Read Informational Texts* was the most frequently administered ELA block across Grades 3 through 8, followed by *Read Literary Texts* block (Table 1). The least administered block was *Brief Writes* except in Grade 3 where the least frequently administered block was *Revision*.

Table 1. Number of ELA IABs Administered in 2018-19

Interim Block	# Items	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Brief Writes	6	6,127	3,536	4,145	2,887	2,531	2,463
Editing	14-15	8,315	7,818	7,541	10,644	10,093	11,384
Revision	15	4296	3801	5020	7343	5979	n/a
Language and Vocabulary Use	15	8,433	8,378	8,433	6,833	5,450	n/a
Listen/Interpret	14-15	9,671	8,771	8,974	6,658	4,428	5,491
Read Informational Texts	14-16	18,310	17,967	18,310	16,773	15,139	15,357
Read Literary Texts	12-16	14,796	14,107	14,154	11,086	10,879	12,728
Research	18	4,835	5,229	5,868	5,908	5,658	6,922

Due to the organization of the Connecticut Core Standards in mathematics, the IABs in Grades 3-5 are different from those in Grades 6-8. In the elementary grades, *Number and Operations in Base Ten* was the most frequently administered block in all grades (Table 2). The next most frequently administered block in Grade 3 was *Operations and Algebraic Thinking* and in Grades 4 and 5 was *Number and Operations - Fractions*.

Table 2: Number of Mathematics IAB's Administered in 2018-19 – Grades 3-5

Interim Block	# Items	Grade 3	Grade 4	Grade 5
Geometry	11-13	6,640	6,922	6,119
Measurement and Data	14-15	9,040	5,732	8,931
Number and Operations - Fractions	14-15	16,663	17,829	18,691
Number and Operations in Base Ten	14-15	20,543	23,446	22,106
Operations and Algebraic Thinking	15-16	18,976	14,394	10,564

[1] This represents the number of times an IAB was started. If the same student started the same IAB twice, then these tables will count it as two administrations. Approximately 90 percent of students take a specific IAB only once.

In Grades 6 and 7, *Ratio and Proportional Relationships* was the most frequently administered block, followed by *The Number System,* while in Grade 8, *Functions* and *Expressions & Equations* had similar frequency of usage (Table 3).

Table 3: Number of Mathematics IAB's Administered in 2018-19 – Grades 6-8

Interim Block	# Items	Grade 6	Grade 7	Grade 8
Expressions & Equations	14-16	14,736	15,620	13,043
Expressions & Equations II (with Probability and Statistics)	13			8,030
Functions	15			13,140
Geometry	13-14	5,801	4,729	9,226
Ratio and Proportional Relationships	13	18,582	18,087	
The Number System	13-15	17,485	17,072	7,366
Statistics and Probability	13-15	3,480	2,811	

Among the students in Grades 3 through 8 who took the Smarter Balanced summative assessments statewide, 60 percent took at least one IAB in ELA, and 63 percent took at least one IAB in mathematics during the 2018-19 school year (Table 4). In both ELA and mathematics, student participation was stronger in the elementary grades (3-5) than in the middle school grades (6-8).

Table 4. Percentage of Students Taking at Least One IAB

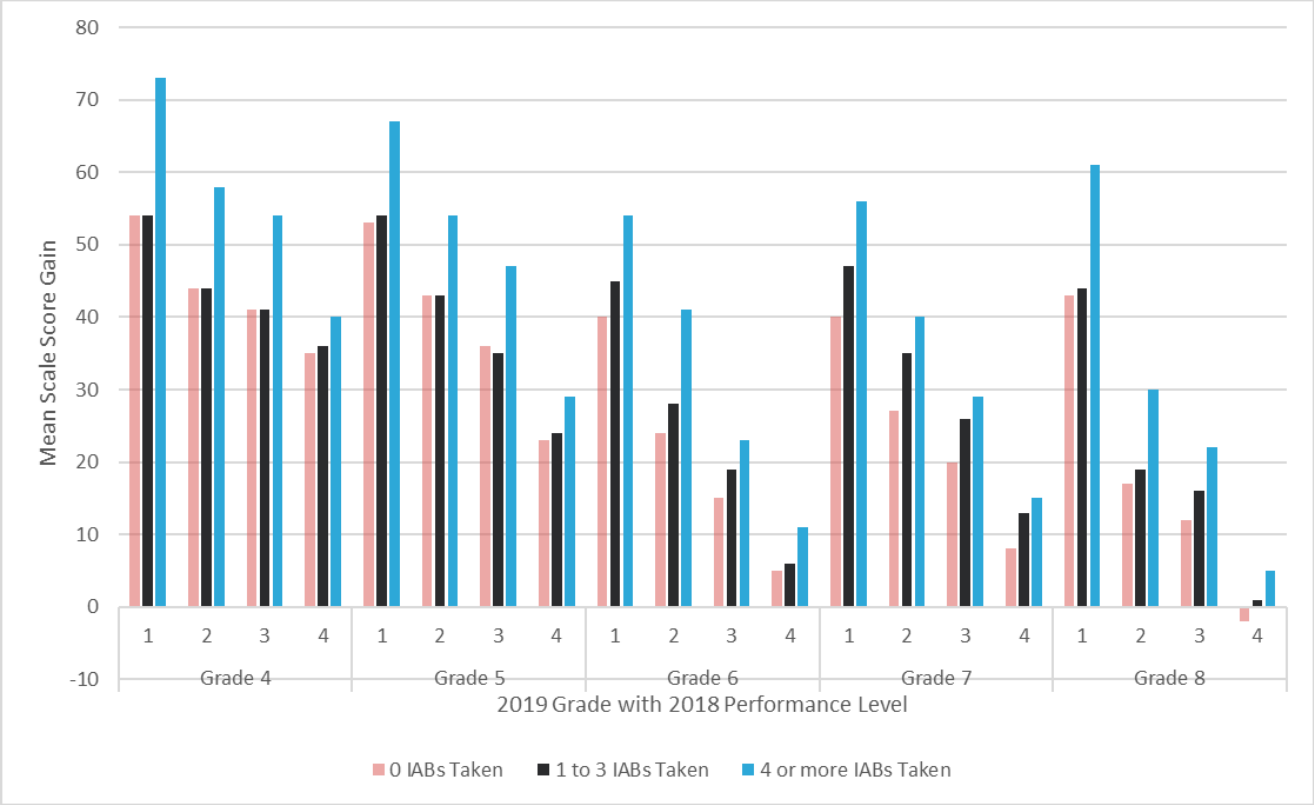
GRADE	ELA	Math
3	66	67
4	65	65
5	64	66
6	57	63
7	53	61
8	54	57
Total	**60**	**63**

Tables 5 (ELA) and 6 (math) show the essential outcomes from Phase 1. Students who took the assessment in spring 2018 and in the next higher grade in spring 2019 were matched based on their state assigned unique student identifier. The mean scale score gain from spring 2018 to spring 2019 achieved by these matched students was grouped based on their spring 2018 performance level (PL). In ELA, these data show the following (Table 5 and Figure 2):

Table 5: Number/Percentage of Students Taking ELA IABs and Mean Scale Score Gain on the ELA Summative Assessment from Spring 2018 to Spring 2019

2019 Grade	2018 PL	Total Matched Students	0 IABs Taken			1-3 IABs Taken			4 or more IABs Taken		
			N	%	Mean Gain	N	%	Mean Gain	N	%	Mean Gain
4	1	8355	3033	36.3	54	4523	54.1	54	799	9.6	73
	2	8346	2944	35.3	44	4303	51.6	44	1099	13.2	58
	3	8490	2935	34.6	41	4267	50.3	41	1288	15.2	54
	4	10723	3435	32.0	35	5123	47.8	36	2165	20.2	40
5	1	9859	3550	36.0	53	5307	53.8	54	1002	10.2	67
	2	6617	2365	35.7	43	3354	50.7	43	898	13.6	54
	3	8645	3026	35.0	36	4309	49.8	35	1310	15.2	47
	4	11663	3991	34.2	23	5566	47.7	24	2106	18.1	29
6	1	8560	3866	45.2	40	4021	47.0	45	673	7.9	54
	2	7008	2894	41.3	24	3276	46.7	28	838	12.0	41
	3	11560	4883	42.2	15	5048	43.7	19	1629	14.1	23
	4	10496	4418	42.1	5	4339	41.3	6	1739	16.6	11
7	1	8470	4287	50.6	40	3571	42.2	47	612	7.2	56
	2	8449	3994	47.3	27	3598	42.6	35	857	10.1	40
	3	12208	5609	45.9	20	5122	42.0	26	1477	12.1	29
	4	8155	3574	43.8	8	3515	43.1	13	1066	13.1	15
8	1	8415	3826	45.5	43	4174	49.6	44	415	4.9	61
	2	8247	3782	45.9	17	3849	46.7	19	616	7.5	30
	3	13294	6137	46.2	12	5971	44.9	16	1186	8.9	22
	4	7582	3470	45.8	-2	3343	44.1	1	769	10.1	5
Total		**185142**	**76019**	**41.1**		**86579**	**46.8**		**22544**	**12.2**	

Figure 2: Mean Scale Score Gain on ELA Summative Assessment from Spring 2018 to Spring 2019 Based on ELA IAB Participation



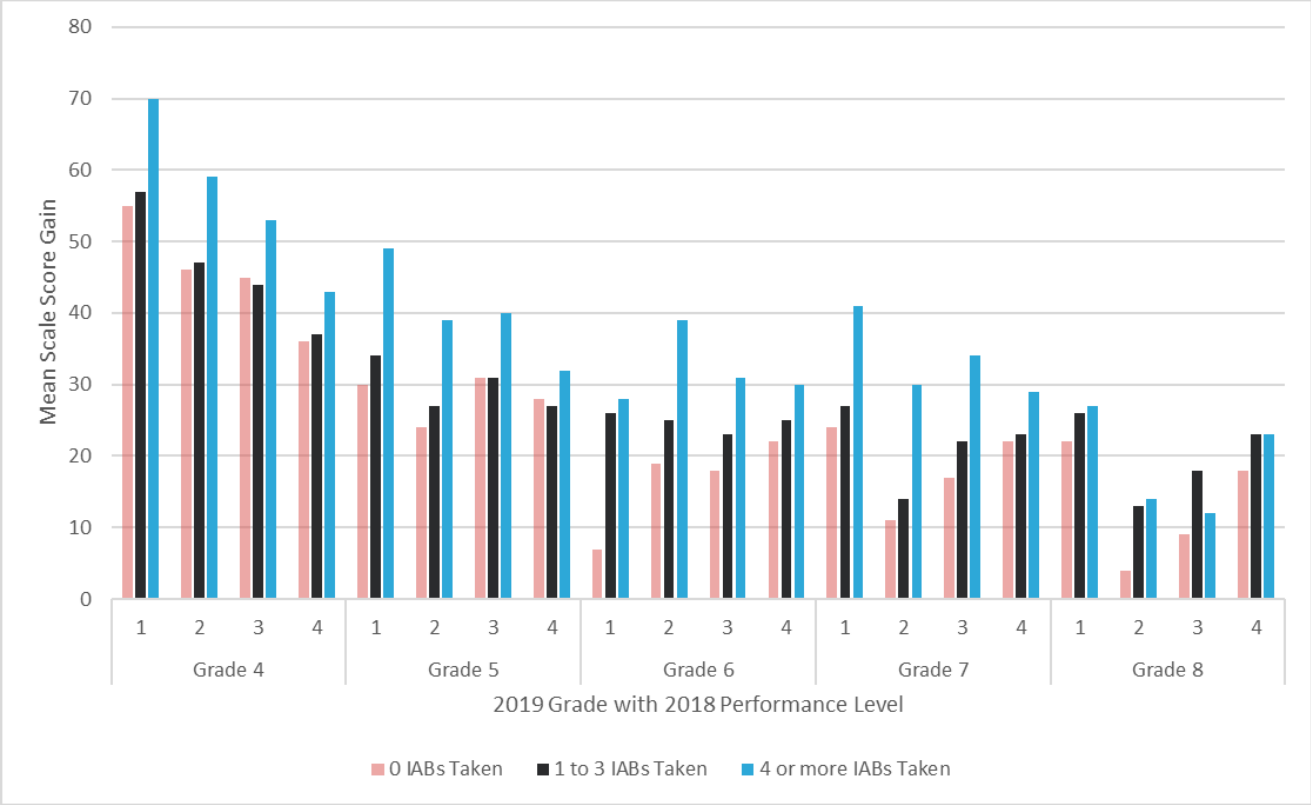
- About 41 percent of all matched students did not take even one IAB; nearly 47 percent took 3 or fewer IABs, while a little over 12 percent took 4 or more IABs. Generally, students at a lower performance level tended to take 4 or more IABs at a lower rate, than their higher performing peers. Table 7 (see Appendix) disaggregate these data further by free-or-reduced price meal eligibility status (FRPM). It shows that a smaller percentage of students who were eligible for FRPM took 4 or more IABs (10.2) as compared to those not eligible (13.7).
- Among students in every grade and at every performance level, those who took 4 or more IABs generally showed substantially greater mean scale score gain on the summative from spring 2018 to spring 2019 than those who took fewer or no IABs. This remains true even when the data are further disaggregated by eligibility for FRPM (Table 7 and Figure 4 in Appendix).
- The growth demonstrated by students who took 3 or fewer IABs was similar to those who took no IABs in Grades 4 and 5, but was greater in Grades 6 through 8.
- As expected, mean gains were generally greater in the lower grades and for those at lower performance levels.

The findings in mathematics are in some ways similar to those in ELA, but there are differences (Table 6 and Figure 3).

Table 6: Number/Percentage of Students Taking Math IABs and Mean Scale Score Gain on the Math Summative Assessment from Spring 2018 to Spring 2019

2019 Grade	2018 PL	Total Matched Students	0 IABs Taken			1-3 IABs Taken			4 or more IABs Taken		
			N	%	Mean Gain	N	%	Mean Gain	N	%	Mean Gain
4	1	8442	3232	38.3	55	4674	55.4	57	536	6.3	70
	2	8016	2849	35.5	46	4361	54.4	47	806	10.1	59
	3	10461	3592	34.3	45	5533	52.9	44	1336	12.8	53
	4	8967	2932	32.7	36	4644	51.8	37	1391	15.5	43
5	1	7227	2790	38.6	30	3971	54.9	34	466	6.4	49
	2	10575	3522	33.3	24	6051	57.2	27	1002	9.5	39
	3	10268	3303	32.2	31	5710	55.6	31	1255	12.2	40
	4	8640	2870	33.2	28	4605	53.3	27	1165	13.5	32
6	1	10546	4183	39.7	7	5961	56.5	26	402	3.8	28
	2	10038	3458	34.4	19	6022	60.0	25	556	5.5	39
	3	7578	2666	35.2	18	4432	58.5	23	480	6.3	31
	4	9405	3506	37.3	22	5064	53.8	25	835	8.9	30
7	1	10227	4810	47.0	24	5083	49.7	27	334	3.3	41
	2	10469	3858	36.9	11	6025	57.6	14	586	5.6	30
	3	8070	2770	34.3	17	4635	57.4	22	665	8.2	34
	4	8412	2929	34.8	22	4600	54.7	23	883	10.5	29
8	1	10998	5187	47.2	22	5405	49.1	26	406	3.7	27
	2	9756	3845	39.4	4	5433	55.7	13	478	4.9	14
	3	8260	3327	40.3	9	4518	54.7	18	415	5.0	12
	4	8427	3609	42.8	18	4391	52.1	23	427	5.1	23
Total		**184782**	**69238**	**37.5**		**101118**	**54.7**		**14424**	**7.8**	

Figure 3: Mean Scale Score Gain on Math Summative Assessment from Spring 2018 to Spring 2019 Based on Math IAB Participation



- Compared to ELA, a slightly greater percentage of students (62.5 compared to 58.9) took at least one math IAB, more also took 3 or fewer IABs (54.7 compared to 46.8,) but far fewer took 4 or more IABs (7.8 compared to 12.2). Generally, students at lower performance levels tended to take 4 or more IABs at a lower rate, than their higher achieving peers. Table 8 (see Appendix) disaggregate these data further by FRPM eligibility. It shows that a smaller percentage of students who were eligible for FRPM took 4 or more IABs (6.3) as compared to those not eligible (9.0).
- Among students in every grade and at every performance level (except Levels 3 and 4 in Grade 8), those who took 4 or more IABs generally showed substantially greater mean scale score gain on the summative from spring 2018 to spring 2019 than those who took fewer or no IABs. This remains true even when the data are further disaggregated by eligibility for FRPM (Table 8 and Figure 5 in Appendix).
- The growth demonstrated by students who took 3 or fewer IABs was similar to those who took no IABs in Grades 4 and 5, but was greater in Grades 6 through 8.

- As expected, mean gains were greater in the lower grades and for those at lower performance levels.

Conclusion

This report illustrates that in both ELA and math, in all grades, and regardless of the performance level or socioeconomic status of the student, those who take four or more different IABs during the year generally demonstrate substantially greater mean scale score gain than those taking fewer or no IABs. While these are descriptive results and as such do not support a causal inference, they do call for further qualitative inquiry into the ways in which the IABs may be supporting educators to implement high quality instruction. Future phases of this study will also take a closer look at the change in claim score categories and assessment target performance based on participation in the corresponding IAB(s).

References

Marion, S., Thompson, J., Evans, C., Martineau, J, and Dadey, N. (2019). *A Tricky Balance: The challenges and opportunities of balanced Systems of Assessment.* Paper Presented at the Annual Meeting of the National Council on Measurement in Education. Retrieved on October 27, 2019 from https://www.nciea.org/sites/default/files/publications/A%20Tricky%20Balance_031319.pdf

Smarter Balanced (2019). *Interim Assessments Overview.* Retrieved on October 27, 2019 from https://portal.smarterbalanced.org/library/en/interim-assessments-overview.pdf

Appendix

Table 7: Number/Percentage of Students Taking ELA IABs and Mean Scale Score Gain on ELA Summative Assessment from Spring 2018 to Spring 2019

2019 Grade	2018 PL	Meal Eligibility Status 2019	Total Matched Students	0 IABs Taken			1-3 IABs Taken			4 or more IABs Taken		
				N	%	Mean Gain	N	%	Mean Gain	N	%	Mean Gain
4	1	FRPM	6118	2271	37.1	51	3294	53.8	51	553	9.0	71
		Not FRPM	2237	762	34.1	62	1229	54.9	63	246	11.0	78
	2	FRPM	4629	1707	36.9	39	2375	51.3	36	547	11.8	52
		Not FRPM	3717	1237	33.3	50	1928	51.9	53	552	14.9	64
	3	FRPM	3367	1184	35.2	33	1679	49.9	29	504	15.0	47
		Not FRPM	5123	1751	34.2	46	2588	50.5	48	784	15.3	58
	4	FRPM	2302	790	34.3	28	1046	45.4	26	466	20.2	29
		Not FRPM	8421	2645	31.4	37	4077	48.4	39	1699	20.2	42
5	1	FRPM	7004	2524	36.0	49	3788	54.1	51	692	9.9	65
		Not FRPM	2855	1026	35.9	60	1519	53.2	61	310	10.9	72
	2	FRPM	3455	1194	34.6	34	1788	51.8	36	473	13.7	46
		Not FRPM	3162	1171	37.0	51	1566	49.5	50	425	13.4	62
	3	FRPM	3461	1229	35.5	26	1696	49.0	28	536	15.5	40
		Not FRPM	5184	1797	34.7	42	2613	50.4	40	774	14.9	52
	4	FRPM	2585	947	36.6	15	1191	46.1	16	447	17.3	22
		Not FRPM	9078	3044	33.5	25	4375	48.2	26	1659	18.3	31
6	1	FRPM	6178	2915	47.2	37	2826	45.7	43	437	7.1	52
		Not FRPM	2382	951	39.9	50	1195	50.2	51	236	9.9	59
	2	FRPM	3870	1650	42.6	19	1834	47.4	24	386	10.0	40
		Not FRPM	3138	1244	39.6	30	1442	46.0	33	452	14.4	42
	3	FRPM	4389	1865	42.5	7	1968	44.8	13	556	12.7	16
		Not FRPM	7171	3018	42.1	21	3080	43.0	24	1073	15.0	27
	4	FRPM	2077	926	44.6	-5	860	41.4	2	291	14.0	6
		Not FRPM	8419	3492	41.5	7	3479	41.3	7	1448	17.2	12
7	1	FRPM	5979	3118	52.1	38	2445	40.9	46	416	7.0	52
		Not FRPM	2491	1169	46.9	45	1126	45.2	50	196	7.9	65
	2	FRPM	4455	2171	48.7	23	1916	43.0	28	368	8.3	35
		Not FRPM	3994	1823	45.6	33	1682	42.1	42	489	12.2	44
	3	FRPM	4231	2035	48.1	13	1706	40.3	18	490	11.6	26
		Not FRPM	7977	3574	44.8	24	3416	42.8	30	987	12.4	30
	4	FRPM	1340	621	46.3	8	555	41.4	7	164	12.2	15
		Not FRPM	6815	2953	43.3	8	2960	43.4	14	902	13.2	15
8	1	FRPM	5792	2636	45.5	40	2924	50.5	40	232	4.0	60
		Not FRPM	2623	1190	45.4	48	1250	47.7	53	183	7.0	63
	2	FRPM	4217	1884	44.7	12	2079	49.3	13	254	6.0	25
		Not FRPM	4030	1898	47.1	22	1770	43.9	26	362	9.0	33
	3	FRPM	4235	1911	45.1	7	1992	47.0	7	332	7.8	15
		Not FRPM	9059	4226	46.6	14	3979	43.9	20	854	9.4	24
	4	FRPM	1209	548	45.3	-8	533	44.1	-8	128	10.6	2
		Not FRPM	6373	2922	45.8	-1	2810	44.1	3	641	10.1	5
Total		**FRPM**	**80893**	**34126**	**42.2**		**38495**	**47.6**		**8272**	**10.2**	
		Not FRPM	**104249**	**41893**	**40.2**		**48084**	**46.1**		**14272**	**13.7**	
		Total	**185142**	**76019**	**41.1**		**86579**	**46.8**		**22544**	**12.2**	

Figure 4: Mean Scale Score Gain on ELA Summative Assessment from Spring 2018 to Spring 2019 Based on ELA IAB Participation (Performance Levels 1 and 2 Only)

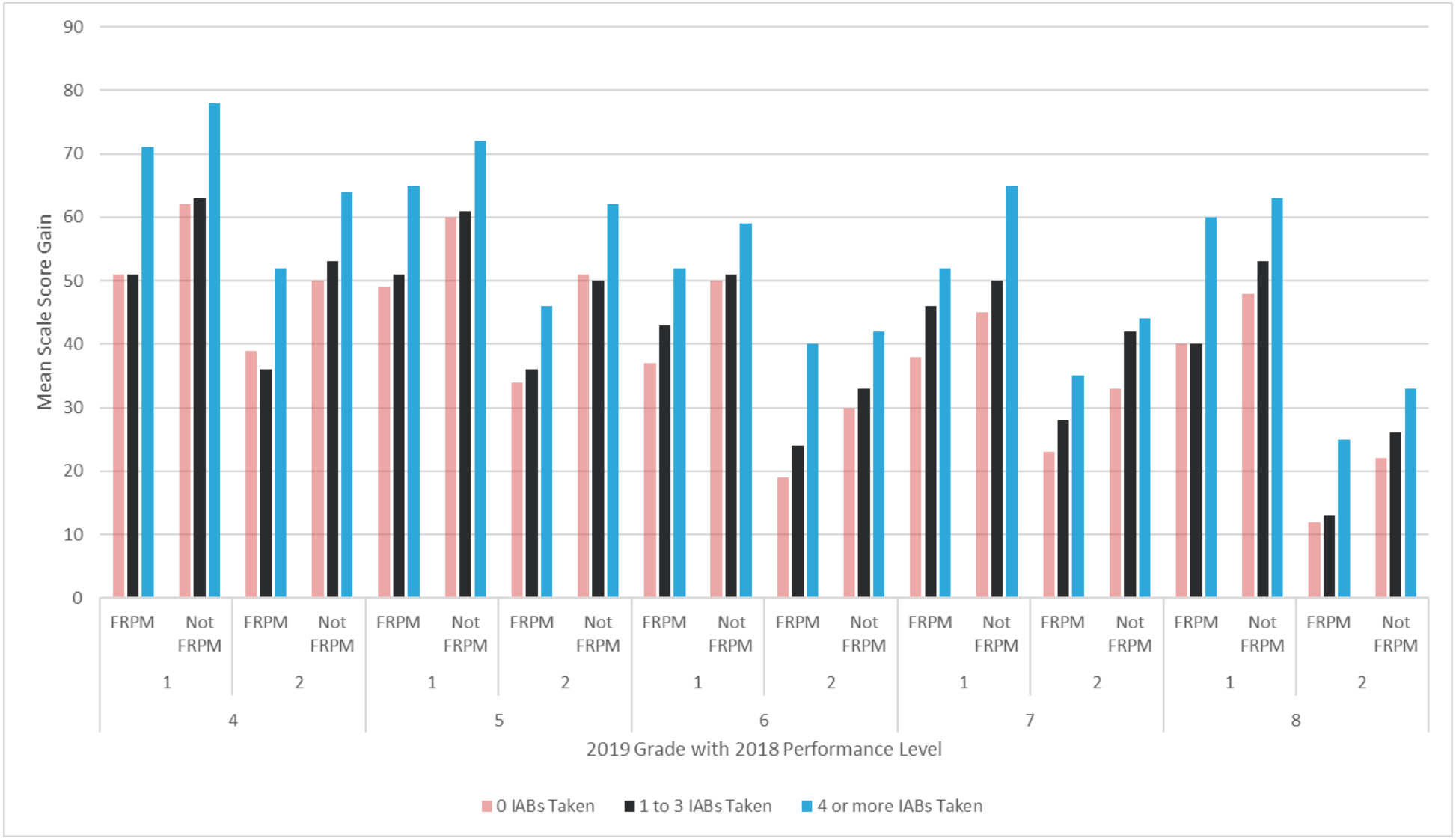


Table 8: Number/Percentage of Students Taking Math IABs and Mean Scale Score Gain on Mathematics Summative Assessment from Spring 2018 to Spring 2019

2019 Grade	2018 PL	Meal Eligibility Status 2019	Total Matched Students	0 IABs Taken			1-3 IABs Taken			4 or more IABs Taken		
				N	%	Mean Gain	N	%	Mean Gain	N	%	Mean Gain
4	1	FRPM	6258	2452	39.2	52	3456	55.2	55	350	5.6	66
		Not FRPM	2184	780	35.7	64	1218	55.8	64	186	8.5	78
	2	FRPM	4480	1622	36.2	40	2452	54.7	43	406	9.1	53
		Not FRPM	3536	1227	34.7	54	1909	54.0	53	400	11.3	64
	3	FRPM	3882	1292	33.3	36	2155	55.5	38	435	11.2	48
		Not FRPM	6579	2300	35.0	50	3378	51.3	48	901	13.7	55
	4	FRPM	1776	644	36.3	25	897	50.5	29	235	13.2	36
		Not FRPM	7191	2288	31.8	39	3747	52.1	39	1156	16.1	44
5	1	FRPM	5448	2120	38.9	28	2986	54.8	34	342	6.3	51
		Not FRPM	1779	670	37.7	36	985	55.4	34	124	7.0	44
	2	FRPM	5794	1954	33.7	18	3338	57.6	23	502	8.7	33
		Not FRPM	4781	1568	32.8	32	2713	56.7	33	500	10.5	45
	3	FRPM	3586	1126	31.4	25	2068	57.7	24	392	10.9	35
		Not FRPM	6682	2177	32.6	34	3642	54.5	35	863	12.9	42
	4	FRPM	1638	491	30.0	23	950	58.0	20	197	12.0	24
		Not FRPM	7002	2379	34.0	29	3655	52.2	29	968	13.8	33
6	1	FRPM	7456	3139	42.1	2	4030	54.1	22	287	3.8	25
		Not FRPM	3090	1044	33.8	20	1931	62.5	36	115	3.7	37
	2	FRPM	4887	1727	35.3	9	2879	58.9	19	279	5.7	37
		Not FRPM	5151	1731	33.6	29	3143	61.0	32	277	5.4	41
	3	FRPM	2489	864	34.7	7	1457	58.5	14	168	6.7	28
		Not FRPM	5089	1802	35.4	24	2975	58.5	27	312	6.1	33
	4	FRPM	1650	619	37.5	8	895	54.2	11	136	8.2	21
		Not FRPM	7755	2887	37.2	25	4169	53.8	28	699	9.0	32
7	1	FRPM	7190	3471	48.3	22	3517	48.9	26	202	2.8	37
		Not FRPM	3037	1339	44.1	28	1566	51.6	31	132	4.3	47
	2	FRPM	5004	1945	38.9	3	2851	57.0	7	208	4.2	24
		Not FRPM	5465	1913	35.0	18	3174	58.1	21	378	6.9	34
	3	FRPM	2456	858	34.9	8	1424	58.0	14	174	7.1	31
		Not FRPM	5614	1912	34.1	21	3211	57.2	26	491	8.7	34
	4	FRPM	1289	405	31.4	16	783	60.7	19	101	7.8	26
		Not FRPM	7123	2524	35.4	23	3817	53.6	24	782	11.0	29
8	1	FRPM	7431	3680	49.5	20	3493	47.0	21	258	3.5	25
		Not FRPM	3567	1507	42.2	25	1912	53.6	35	148	4.1	32
	2	FRPM	4413	1846	41.8	-4	2356	53.4	2	211	4.8	3
		Not FRPM	5343	1999	37.4	11	3077	57.6	21	267	5.0	23
	3	FRPM	2349	1033	44.0	0	1182	50.3	10	134	5.7	0
		Not FRPM	5911	2294	38.8	14	3336	56.4	21	281	4.8	18
	4	FRPM	1165	470	40.3	10	617	53.0	14	78	6.7	15
		Not FRPM	7262	3139	43.2	19	3774	52.0	24	349	4.8	25
Total		**FRPM**	**80641**	**31758**	**39.4**		**43786**	**54.3**		**5095**	**6.3**	
		Not FRPM	**104141**	**37480**	**36.0**		**57332**	**55.1**		**9329**	**9.0**	
		Total	**184782**	**69238**	**37.5**		**101118**	**54.7**		**14424**	**7.8**	

Figure 5: Mean Scale Score Gain on Math Summative Assessment from Spring 2018 to Spring 2019 Based on Math IAB Participation (Performance Levels 1 and 2 only)