VARC

VALUE-ADDED RESEARCH CENTER

UNIVERSITY OF WISCONSIN–MADISON

Education analytics to support students and educators

Year 8 SAGE Program Evaluation Final Report

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Evaluation Team

Dr. Robert Meyer (Principal Investigator)

Penny Clark (Project Manager)

Dr. Emin Dokumaci (Economist)

Grant Sim (Project Lead)

Tim St. Louis (Project Assistant)

Clarissa Steele (Researcher)

Jenn Vadas (Researcher)

Report Authorship

Grant Sim

Clarissa Steele

Jenn Vadas

For questions about this report or the evaluation, please contact Grant Sim at gsim@wisc.edu.

Executive Summary

The Student Achievement Guarantee in Education (SAGE) program is an initiative of the Wisconsin Department of Public Instruction (DPI) that provides funds to schools across Wisconsin to support small class sizes in kindergarten through third grade. To receive funding, DPI requires SAGE schools to have student-to-teacher ratios of either 18:1, 30:2, or 45:3. This report includes the evaluation work completed by the Value-Added Research Center (VARC) to understand the impact and outcomes of the SAGE program throughout Wisconsin. The evaluation included two major components: a statistical analysis of student growth comparing students in SAGE schools to students in non-SAGE schools, and a qualitative evaluation which incorporated interviews with SAGE principals and a survey to all SAGE schools.

By examining the characteristics of SAGE and non-SAGE students and schools in our sample, VARC found differences that restricted a straight comparison of growth between these groups of students. Thus, VARC utilized a statistical model to control for these differences with the goal of estimating the impact of the SAGE program on student growth in mathematics and reading. Results from the statistical analyses include:

- An estimated positive effect of the SAGE program on mathematics and reading growth in kindergarten through second grade as compared to students in non-SAGE schools.

Since one goal of the SAGE program is to improve the academic performance of economically disadvantaged students, VARC also statistically analyzed the differential impact of the SAGE program on these students. Results from the statistical analyses include:

- An estimated positive differential effect of the SAGE program for economically disadvantaged student growth in kindergarten through second grade for both mathematics and reading as compared to economically disadvantaged students in non-SAGE schools.

In addition to the quantitative evaluation, VARC also conducted interviews with principals and analyzed survey results from DPI's End-of-Year Report Survey to ascertain qualities and impacts of the SAGE program beyond those that a quantitative evaluation can typically provide. Results from the survey and interviews with principals include:

- School administrators and teachers are satisfied with the SAGE program,
- Nearly all SAGE classrooms implement instructional strategies that may be enhanced by the small class sizes required by SAGE,
- SAGE classrooms need less classroom management,
- SAGE classrooms have more time for individualized instruction and interventions for students, and
- The funding many schools receive from the state for SAGE does not fully cover the expenses of implementing the SAGE program.

While VARC is confident about many of these results, the evaluation is not without limitations. The possibility of small class sizes in non-SAGE schools as well as non-random selection into the SAGE program undermines the validity of the estimated effect. Additionally, by relying on assessment data for outcomes, the statistical analyses cannot capture non-academic outcomes attributable to the SAGE program. While the qualitative evaluation somewhat addresses these non-academic outcomes, the limitations of surveys for in-depth analysis and respondents' imperfect knowledge can bias these results as well. Ultimately, VARC hopes to continue to collaborate with DPI to reduce these limitations in the years to come.

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Introduction

This report presents the results of year 8 of the Student Achievement Guarantee in Education (SAGE) program evaluation by the Value-Added Research Center (VARC) of the University of Wisconsin's Wisconsin Center for Education Research. The SAGE program is an initiative of the Wisconsin Department of Public Instruction (DPI) that provides funds to schools across Wisconsin to support small class sizes in kindergarten through third grade. To receive funding, DPI requires SAGE schools to have student-to-teacher ratios of either 18:1, 30:2, or 45:3. Small class size theory claims that these ratios ensure teachers can give students in early grades the individualized instruction necessary to promote their educational development.

Historically, evaluations of SAGE lacked valid and reliable early-grade achievement data. Recently, developments and trends in the assessment systems of Wisconsin districts have opened up new possibilities for evaluating the impact of SAGE on student achievement. First, districts are increasingly recognizing the importance of testing students in early grades. Second, districts are increasingly recognizing the utility of benchmark testing students at the beginning and end of the school year. Although several benchmark assessments are available, by far, the most prevalent assessment in Wisconsin is the Measures of Academic Progress (MAP) published by the Northwest Evaluation Association (NWEA).

The MAP is an adaptive test of student achievement. Adaptive tests represent a technological advancement from typical achievement tests in that they adjust the difficulty of questions according to the difficulty of previous questions and whether they were answered correctly. Thus, results from the assessment can calibrate student achievement closer to actual achievement levels due to fewer questions that are either too easy or too difficult. The MAP uses scale scores called RIT scores to estimate achievement through a specific Item Response Theory called Rasch Modeling.[1] RIT scores range from 100 to 320, though typically they do not reach the high end until the later grades. This evaluation uses the MAP for several main reasons:

- Districts across the entire state of Wisconsin use the MAP assessment for benchmarking purposes. Unlike past evaluations which only targeted Madison and Milwaukee school districts, MAP allows the evaluation to examine impacts across a variety of districts.
- Students typically take the MAP assessment at least two times per year, once in the fall and once in the spring. This allows the evaluation to examine the impact that occurs within each school year without the need to compensate for summer impacts.
- The MAP assessment is inclusive of kindergarten through third grade. The only other assessment with the breadth of usage is the WKCE which begins in third grade.
- The psychometric properties of the MAP assessment allow this evaluation a more valid and reliable analysis than the WKCE. The results from the 2009-10 SAGE evaluation suggest that the

[1] http://www.nwea.org/support/article/532/rit-scale

MAP assessment has acceptable levels of vertical and horizontal alignment. This means that an evaluator can reliably compare student scores across grades (vertical alignment) and across time (horizontal alignment).

The evaluation of the 2009-10 SAGE program was the first to make use of MAP data. This preliminary analysis used two-level (student and school) hierarchical linear models (HLM) to examine the impact of the SAGE program on student performance. Due to the lack of matching between MAP data and state data, student-level control variables were limited to race, gender, and Fall MAP scores; it was not possible to identify which students had an individualized education program (IEP), were eligible for free or reduced price lunch, or were English Language Learners (ELL). To partially address the lack of adequate student controls, this evaluation included school controls (percent free or reduced price lunch, percent minority, percent ELL, and percent IEP). For both reading and mathematics, the analysis found positive but not statistically significant effects of the SAGE program. The magnitudes of the effect sizes were larger in earlier grades (approximately 0.1 to 0.3 standard deviations in kindergarten and first grade) for both reading and mathematics compared to later grades (approximately 0.05 standard deviations in second and third grade). These results suggest that the SAGE program may have a positive effect on both mathematics and reading achievement, but the analysis lacked sufficient power and controls to conclude if this effect was reliable.

The evaluation of the 2010-11 SAGE program addressed these deficiencies by including a larger sample of schools and by matching MAP data with state data. By matching MAP data with state data, this evaluation was able to include a more complete array of controls for isolating the SAGE effect at the student level. Furthermore, Milwaukee Public Schools began using the MAP as their benchmark assessment in 2010-11, which provided a larger sample. This analysis utilized two models to predict the impact of the SAGE program. The first model compared all SAGE schools to all non-SAGE schools within SAGE districts and controlled for student gender, race, free or reduced price lunch status, ELL status, IEP status, and both reading and mathematics baseline MAP scores. The first model estimated positive and significant effects of the SAGE program in first grade on both reading and mathematics growth. The second model compared SAGE schools to non-SAGE schools within the same school districts. This model used the same controls as the first model but also added in a district control. The second model estimated positive and nearly significant results for reading in kindergarten. Results from both of these models suggest that the SAGE program may have a positive effect on both mathematics and reading performance but only in the earlier grades. Again, this analysis lacked sufficient power and controls to conclude if any effect was reliable.

This year's evaluation of the SAGE program differs in two main aspects. First, the analysis of MAP achievement in mathematics and reading includes differential effects to determine the impact of the SAGE program on certain populations of students. Second, the year 8 evaluation also includes a qualitative study to ascertain properties and impacts of the SAGE program beyond those that a quantitative evaluation can typically provide. This report contains two main sections: the first section of the evaluation includes the main quantitative research questions, the demographics of SAGE schools, the design model for the evaluation, our findings on the main effect of the SAGE program, and our

findings on the differential effects of the SAGE program. The second section of the report includes the main qualitative research questions, findings from principal interviews, and findings from the SAGE End-of-Year Report (EOY) survey. Finally, this report will end with a summary of findings, limitations of our analysis, and thoughts for future years of analysis.

Quantitative Analysis

The year 8 quantitative analysis of the SAGE program evaluates the 2011-12 school year in an attempt to determine the impact that the SAGE program has on student performance in mathematics and reading. To provide a foundation for this quantitative analysis, this evaluation has six research questions:

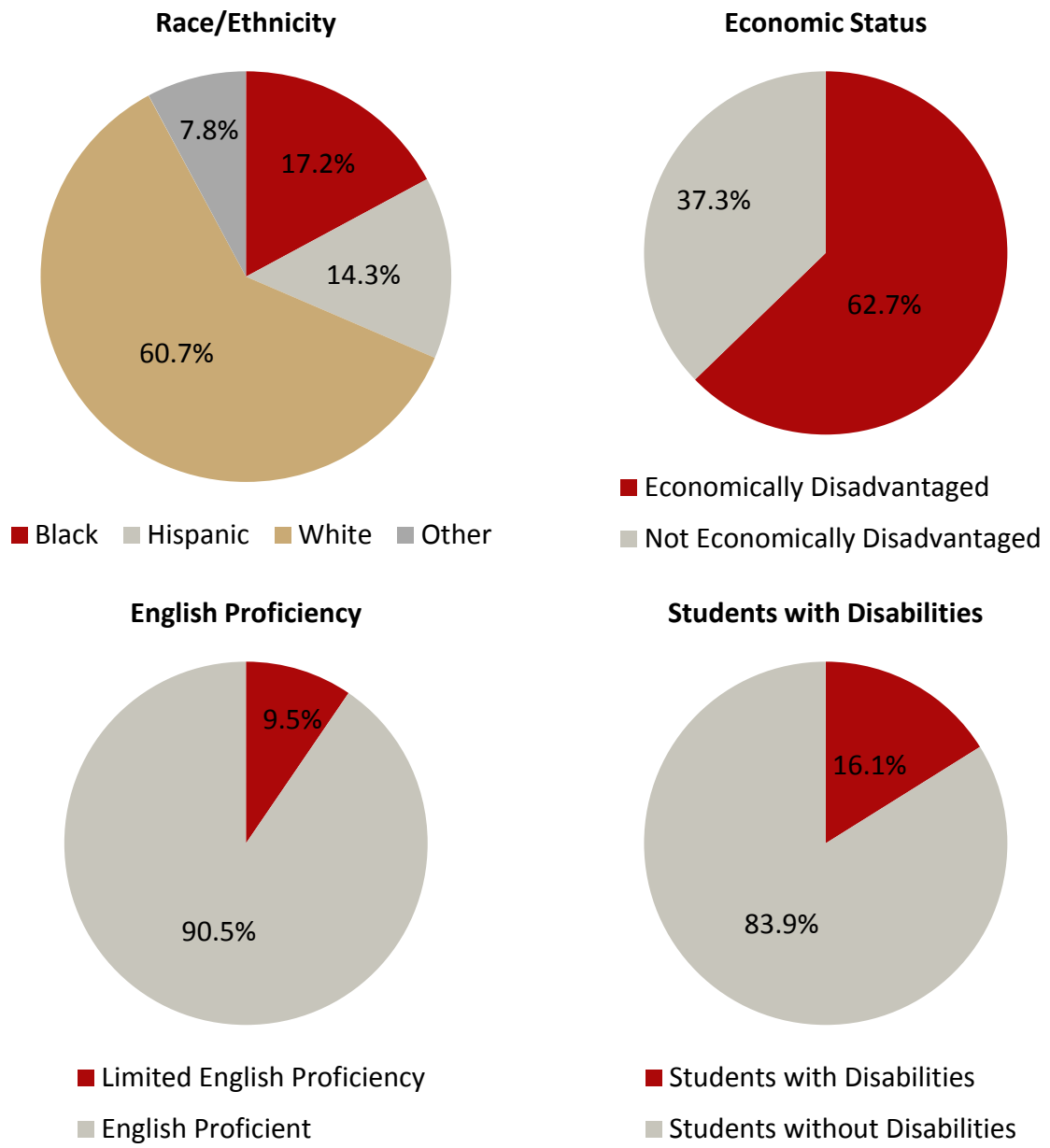
1. What are the characteristics of SAGE students and schools?
2. What is the take-up rate of the MAP in SAGE districts and schools?
3. How does the sample of schools using the MAP compare to the whole population of SAGE students?
4. How does the sample of SAGE schools compare to the sample of non-SAGE control schools?
5. What is the difference between MAP growth in SAGE schools and non-SAGE schools?
6. What is the difference between MAP growth in SAGE schools and non-SAGE schools for particular populations of students?

Research questions 1-4 provide the background necessary to design an appropriate method for analysis. For this evaluation's results to hold generalizability, the sample of SAGE schools we analyze should appear similar to the entire population of SAGE schools. Additionally, the analysis will have more power if a large percentage of both SAGE and non-SAGE schools utilize the MAP assessment. Because it is unlikely that SAGE schools and non-SAGE schools appear identical in their characteristics, this evaluation cannot make a direct comparison and thus uses statistical methods to design an analysis model to compensate for these differences. With this design model, the evaluation can then hopefully answer the final two questions related to the impact of the SAGE program.

Characteristics of SAGE Schools and Students

During the 2011-12 school year, 434 schools in 210 districts participated in the SAGE program. In these 210 districts, the remaining 263 schools did not receive SAGE funding. The number of students in SAGE schools in kindergarten through third grade was 81,706, with roughly equal proportions throughout each grade. Figure 1 shows the demographic breakdown for students in SAGE schools by race/ethnicity, economic status (as determined by free or reduced price lunch), students with disabilities, and ELL. As seen from this figure, while SAGE schools look similar to Wisconsin schools in general, they have higher proportions of economically disadvantaged students. As the funding mechanism for SAGE relies upon the number of students who qualify for free or reduced price lunch, this is not surprising.

Figure 1: Demographic breakdown of SAGE students by race/ethnicity, economic status, English proficiency, and students with disabilities in 2011-12



Source: WINSS

Table 1 examines the number of SAGE and non-SAGE students in the five most populous SAGE districts overall: Appleton, Green Bay, Madison, Milwaukee, and Racine. As expected, Milwaukee comprises the largest percentage of the SAGE population of students with approximately 17 percent of all SAGE students. When subtotaling these five districts, we see that they comprise 28 percent of all SAGE students and roughly 50 percent of all non-SAGE students in SAGE districts. As we will see later in this report, this was due to smaller SAGE districts with only one school.

Table 1: Number and percent of SAGE and Non-SAGE students by SAGE district in kindergarten through third grade in 2011-12

District	SAGE Students	Percent of ALL SAGE Students	Non-SAGE Students	Percent of All Non-SAGE Students
Appleton	1254	1.5%	3210	6.3%
Green Bay	2288	2.8%	3878	7.6%
Madison	5110	6.3%	3291	6.4%
Milwaukee	13621	16.7%	9893	19.3%
Racine	843	1.0%	5157	10.0%
Top 5 Subtotal	*23116*	*28.3%*	*25429*	*49.5%*
All Other SAGE Districts	*58590*	*71.7%*	*25916*	*50.5%*
Total	**81706**	**100.0%**	**51345**	**100.0%**

Source: 2011-12 Public Enrollment Files

Another important aspect to SAGE schools is their implementation of the small classroom requirement. As previously mentioned, under SAGE program guidelines, schools must maintain a student-to-teacher ratio of 18:1, 30:2, or 45:3 in kindergarten through third grade. As seen in Table 2, the vast majority, or 96 percent, of SAGE classrooms utilized an 18:1 configuration in 2011-12. To compare the differences across grades, Table 3 shows the average number of students and the standard deviation from this average across the four SAGE grades and by the three classroom configurations. This table shows that little difference exists across grades in the number of students outside of those classrooms with a mixed-grade configuration. By examining the distribution of classrooms with the 18:1 configuration, as seen in Figure 2, we see that the majority of classrooms maintain a ratio of 15:1 or higher. Given this small range for most SAGE classrooms, and that the majority of the classrooms employ an 18:1 ratio, this evaluation will not differentiate impact by ratio or classroom configuration.

Table 2: Number and percent of SAGE classrooms by classroom configuration in 2011-12

Configuration	Number of Classrooms	Percent of Classrooms
18:1	4988	96.2%
30:2	197	3.8%
45:3	3	0.1%
Total	5198	100.0%

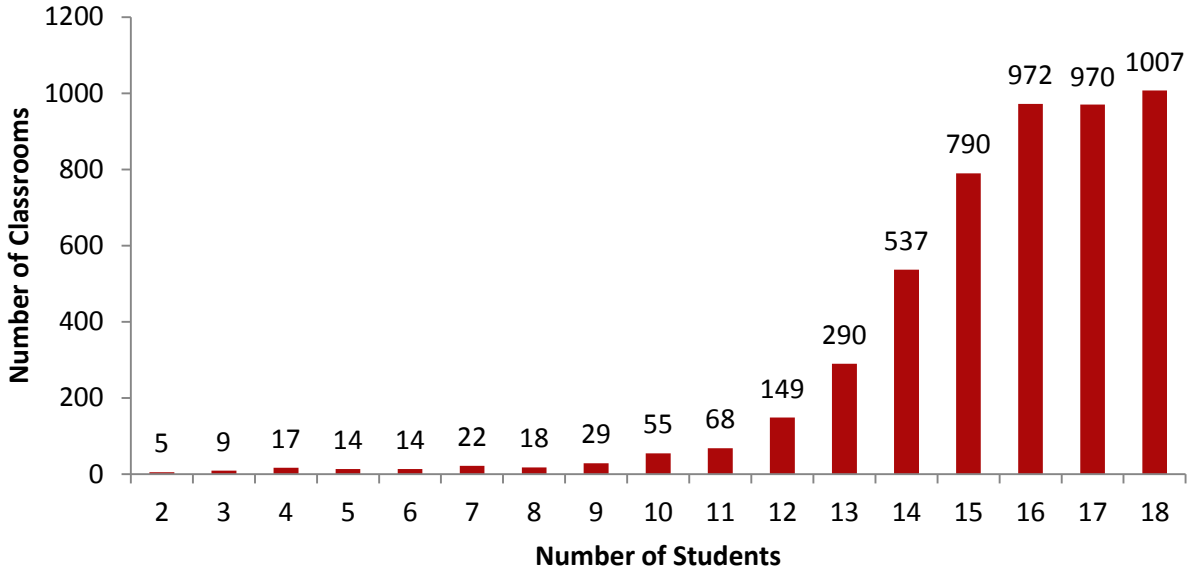
Source: SAGE Submission Report for 2011-12

Table 3: Mean number and standard deviation of students in SAGE classrooms by grade and classroom configuration in 2011-12

Grade	18:1 Configuration		30:2 Configuration		45:3 Configuration	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
K5	15.7	2.0	12.8	2.0	5.0	N/A
1st	15.7	2.0	13.2	2.0	N/A	N/A
2nd	15.8	2.0	13.0	2.1	N/A	N/A
3rd	15.8	2.0	13.4	1.5	N/A	N/A
Mixed	14.0	4.7	12.1	4.2	N/A	N/A

Source: SAGE Submission Report for 2011-12
Note: N/A indicates insufficient data

Figure 2: Distribution of students in 18:1 SAGE classrooms in 2011-12



Source: SAGE Submission Report for 2011-12

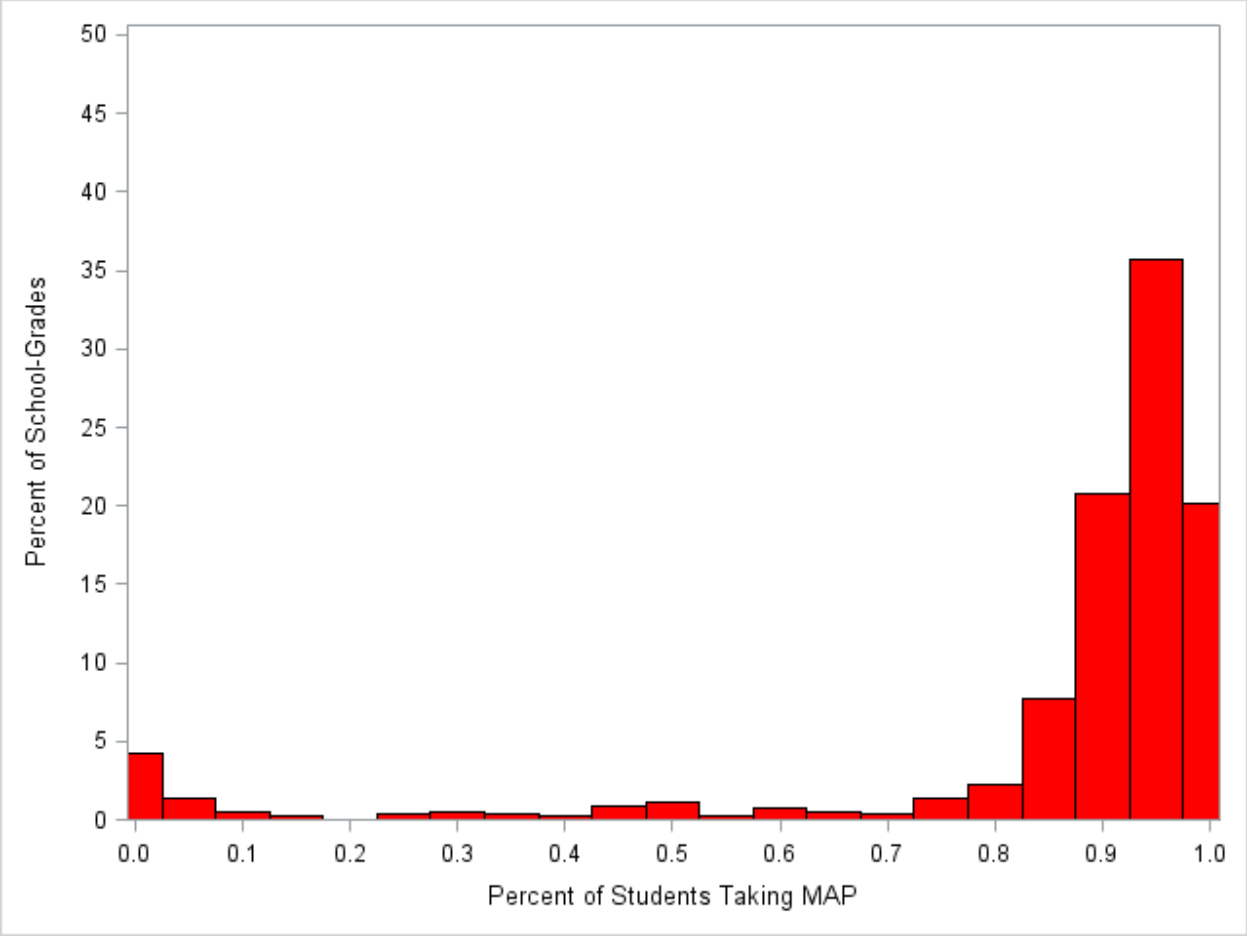
MAP Assessment Utilization and Characteristics of MAP Students

Since this evaluation uses the MAP assessment as a measure of student achievement and the state does not universally utilize the assessment across the entire population of SAGE districts, the number of students who take the MAP was the largest factor limiting the size of our analysis sample. The first step in the process of determining the sample for this analysis was to define what it meant for a student to take the MAP assessment for purposes of our evaluation. We essentially placed two restrictions limiting what it meant for a student to take the MAP. The first limitation was that students needed both a pre-test and a post-test score. This meant that each student in our sample needed to take the MAP in both the fall and the spring for inclusion in the sample. The second limitation was that students needed to take the assessment for benchmarking purposes. If students were taking the assessment for other purposes, this may have skewed the results in unexpected ways.

As the data did not include a clear indicator for which students took the MAP for benchmarking purposes, this evaluation made an assumption from looking at trends in the results. Figure 3 shows the distribution of the percent of students in each grade who took the MAP assessment overall. As seen from this figure, the majority of students who took the MAP were in grades where a large proportion of the students took the MAP. Not all grades followed this pattern; however, as just over five percent of the grades had a small proportion of their students taking the assessment (less than five percent). While this likely means that many of the grades used the assessment for benchmarking purposes, the analysis required a cutoff point for which grades in each school to include. Figure 4 shows the same distribution of students in each grade but with their average MAP achievement percentile range across the fall and spring administrations in both reading and mathematics. The left column of each section shows the grade and the right column shows the percentile range. As this figure demonstrates, the 0-25 percent tested range of students had a different average percentile range than the 25-50 percent tested, which

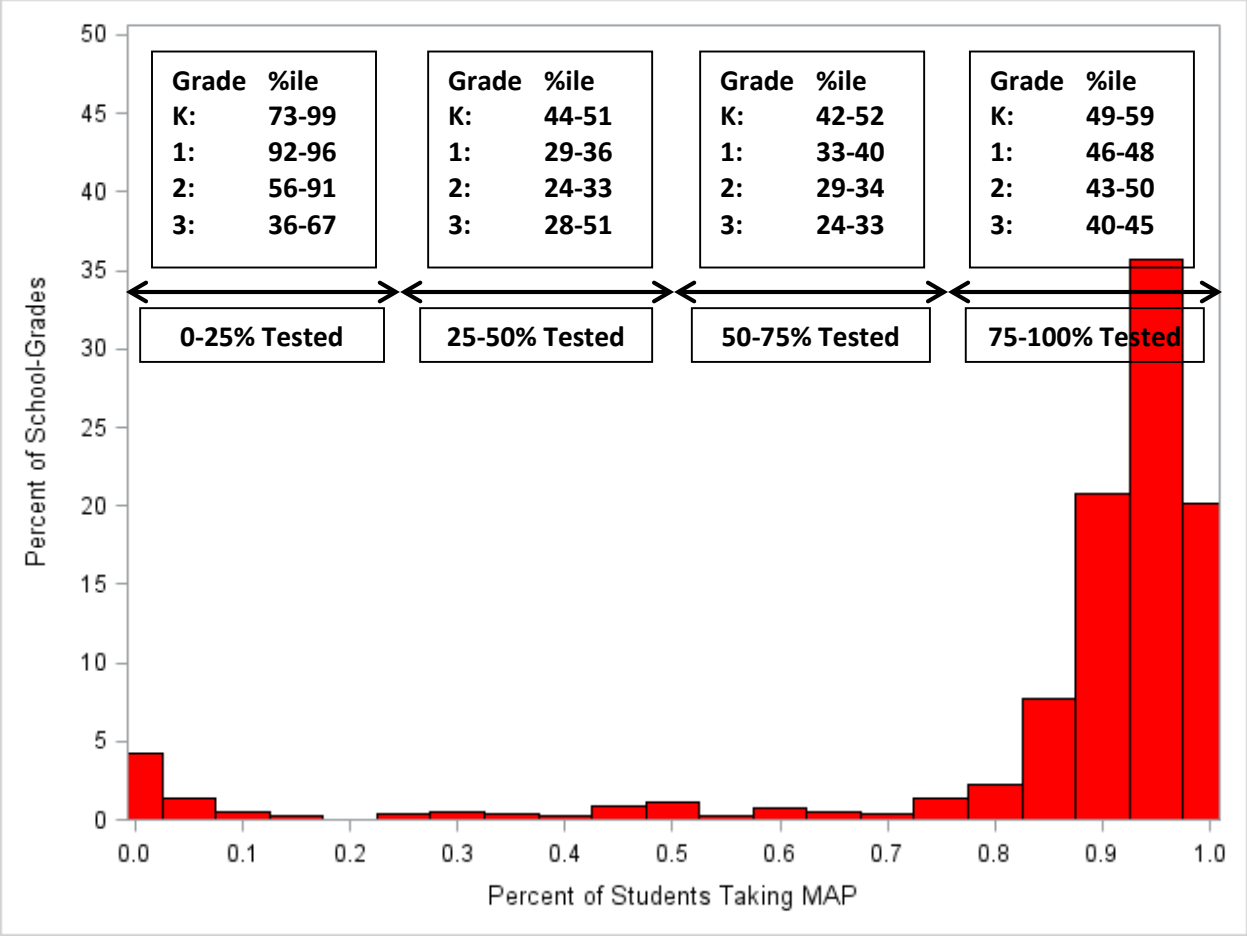
was different from the 75-100 percent tested. Using this information, this evaluation made the assumption that only students in grades within schools where 75 percent or more of the students took the MAP used the assessment for benchmarking purposes. Thus, we only included students in these grades in SAGE schools as a part of the analysis sample.

Figure 3: Distribution of the percent of students in each grade within schools taking the MAP in 2011-12



Source: 2011-12 MAP Files

Figure 4: Distribution of the percent of students in each grade within schools taking the MAP and the corresponding average percentile ranges in 2011-12



Source: 2011-12 MAP Files

With these limitations, we were able to create the analysis sample from the general population of SAGE students and non-SAGE students within SAGE districts. As the data use agreement only allowed the evaluation to obtain data from SAGE districts, the control sample inevitably came from this population. Table 4 shows the number of students in the sample in each grade for SAGE and non-SAGE schools and the corresponding percent of the general population of students. Both SAGE students and non-SAGE students in the sample follow a similar trend of having a lower representation of the whole population in kindergarten and an increasing share up to third grade, where the sample makes up roughly 50 percent of the population.

Table 4: Number of students in the analysis sample and the percent of the population by SAGE schools and non-SAGE schools in 2011-12

Grade	SAGE Schools		Non-SAGE Schools (in SAGE Districts)	
	Sample N	**% of Population**	**Sample N**	**% of Population**
K5	4776	23.0%	3218	24.3%
1st	6358	30.7%	4185	33.0%
2nd	8416	40.8%	5106	40.9%
3rd	9927	50.8%	6428	49.7%
K-3	29477	36.1%	18937	36.9%

Table 5 shows a breakdown of the number of SAGE students and non-SAGE students in the five most populous districts in our sample and the corresponding percent of the entire sample of SAGE and non-SAGE students. As this table shows, districts with higher populations make up a larger proportion of the MAP-taking population of students and make up a larger proportion of the sample than the general population. These five districts also contain over 70 percent of the non-SAGE population. This further emphasizes the theme from Table 1 where the control group is limited to mostly larger districts. This table also illustrates that Milwaukee, as the largest district in the state and a district with mandatory MAP utilization, contains the largest single district population of SAGE and non-SAGE students in our sample.

Table 5: Number and percent of SAGE and Non-SAGE students in the analysis sample by SAGE district in kindergarten through third grade in 2011-12

District	SAGE Students	Percent of ALL SAGE Students	Non-SAGE Students	Percent of All Non-SAGE Students
Appleton	814	2.8%	2050	10.8%
Beloit	1840	6.2%	23	0.1%
Milwaukee	10544	35.8%	8348	44.1%
Waukesha	86	0.3%	3131	16.5%
West Allis – West MKE	2246	7.6%	0	0.0%
Top 5 Subtotal	*15530*	*52.7%*	*13552*	*71.6%*
All Other SAGE Districts	*13947*	*47.3%*	*5385*	*28.4%*
Total	**29477**	**100.0%**	**18937**	**100.0%**

Since just over one-third of the general population of SAGE and non-SAGE students within SAGE districts took the MAP assessment for benchmarking purposes, it is important for this evaluation to consider the generalizability of any results to the overall population of students. To examine any differences, we compared the race/ethnicity, economically disadvantaged status, students with disabilities, and ELLs for MAP and non-MAP students within the general population of SAGE districts. Figure 5 and Figure 6 show these comparisons for all students in kindergarten through third grade. As seen, more students in SAGE districts who are African-American or economically disadvantaged and fewer who have limited English proficiency took the MAP.

Figure 5: Race/ethnicity of students in kindergarten through third grade by MAP utilization in 2011-12

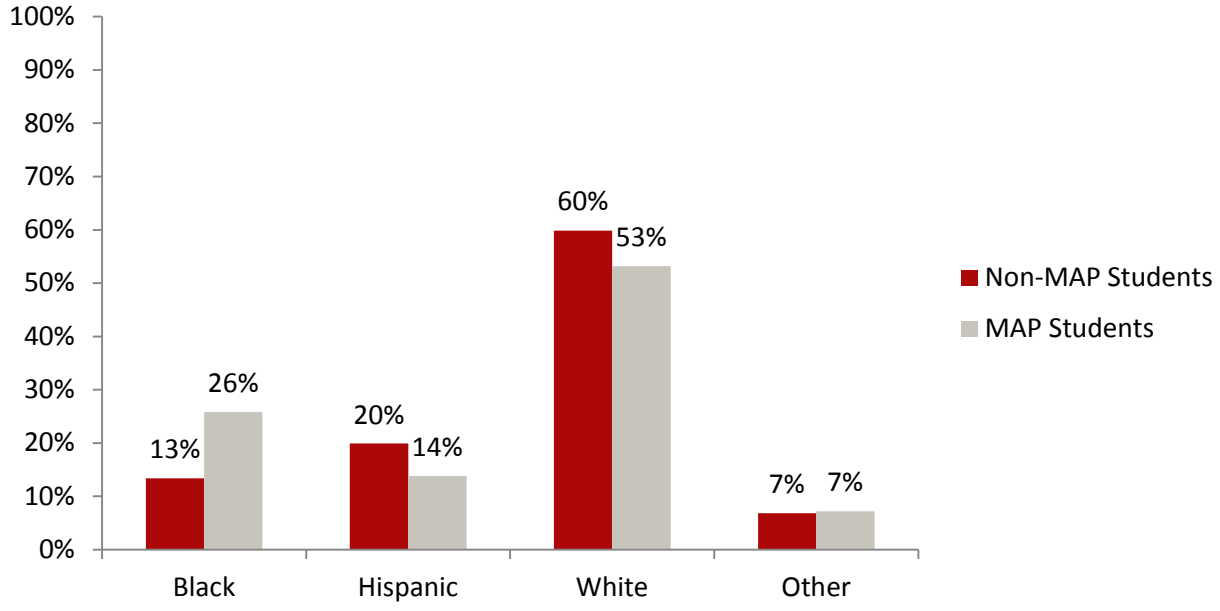
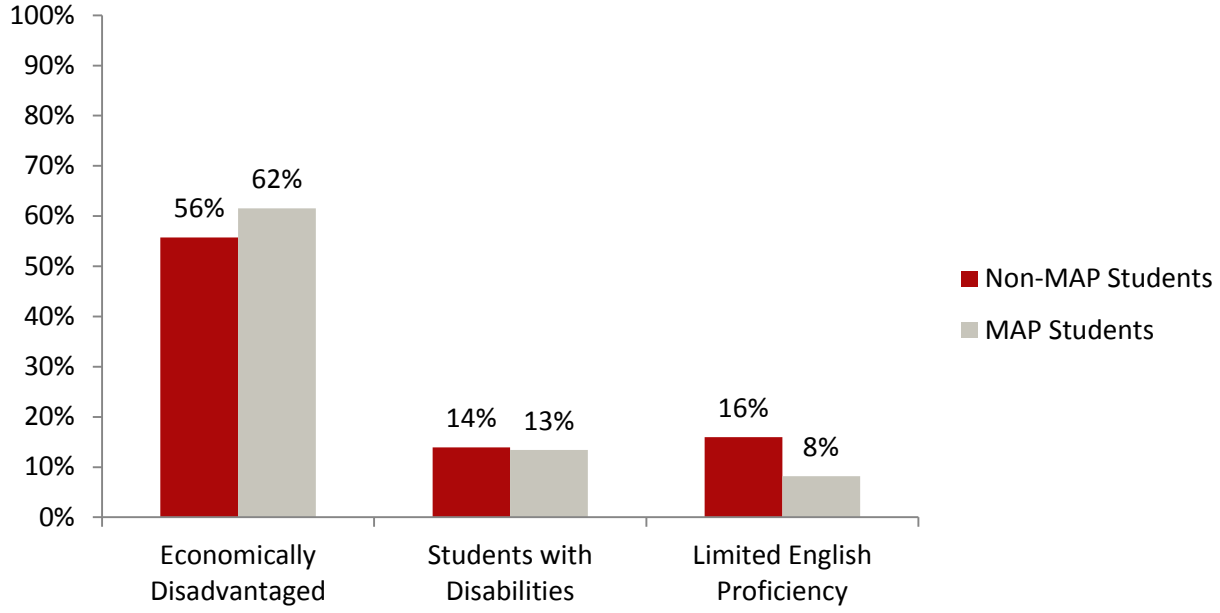


Figure 6: Percent of kindergarten through third grade students who were economically disadvantaged, students with disabilities, and limited English proficient by MAP utilization in 2011-12



Figures 7 – 14 show the same information for each grade individually. As these figures demonstrate, the difference between the analysis sample of students who took the MAP and those students who did not take the MAP is largest in kindergarten and diminishes by third grade. This

indicates that it may be difficult to generalize any results from the earliest grades to the entire population of students.

Figure 7: Race/ethnicity of students in *kindergarten* by MAP utilization in 2011-12

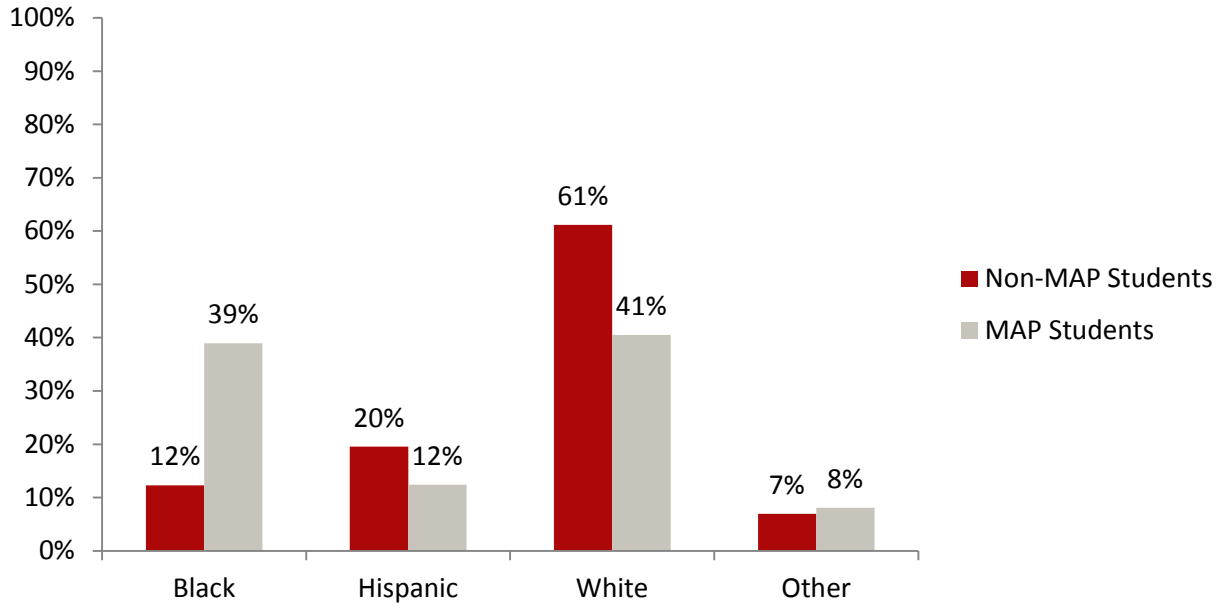


Figure 8: Percent of *kindergarten* students who were economically disadvantaged, students with disabilities, and limited English proficient by MAP utilization in 2011-12

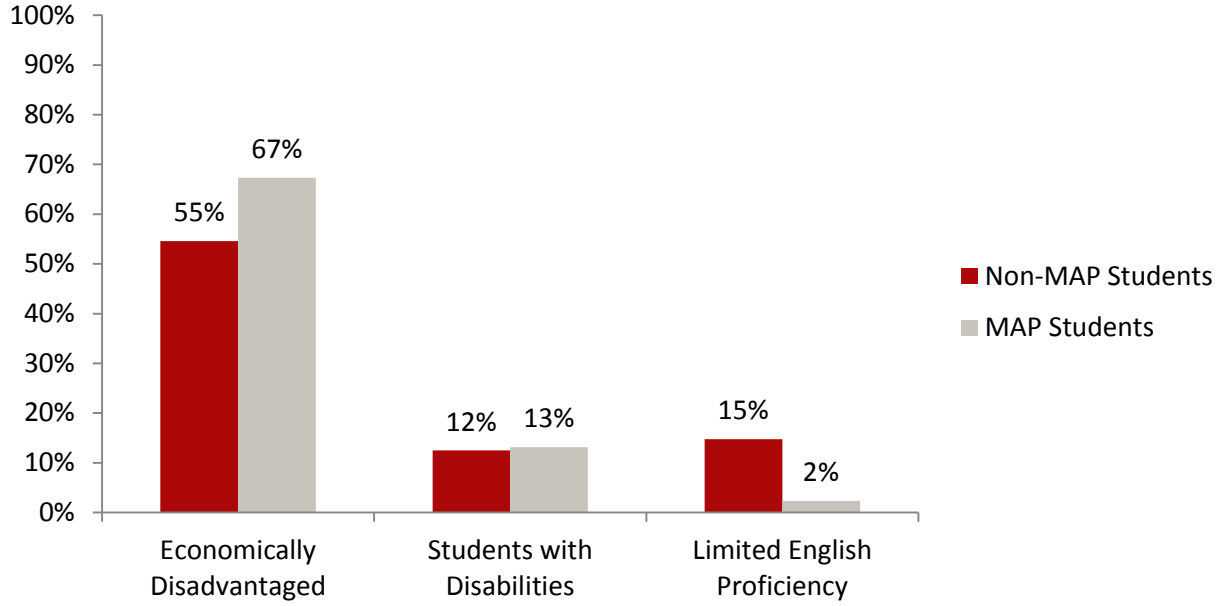


Figure 9: Race/ethnicity of students in *first grade* by MAP utilization in 2011-12

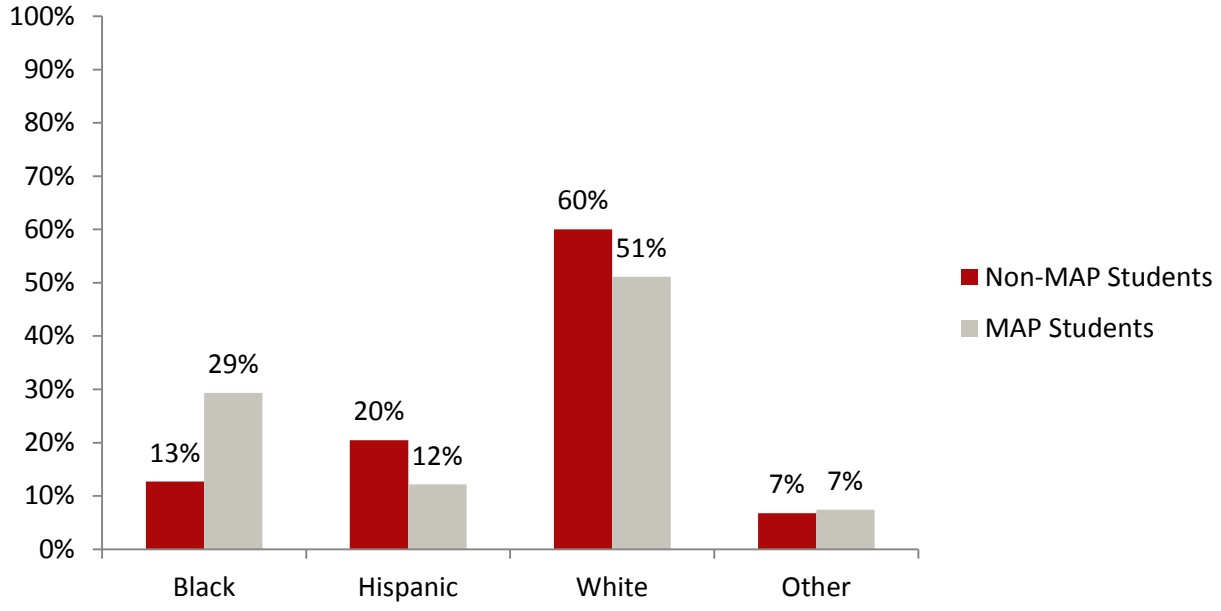


Figure 10: Percent of *first grade* students who were economically disadvantaged, students with disabilities, and limited English proficient by MAP utilization in 2011-12

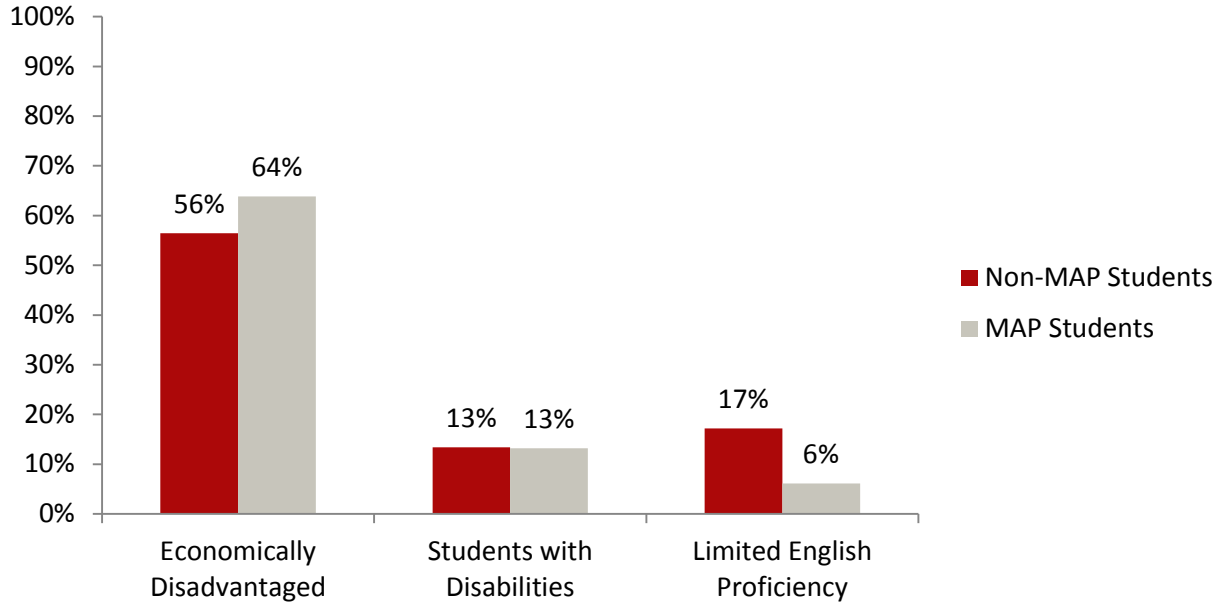


Figure 11: Race/ethnicity of students in *second grade* by MAP utilization in 2011-12

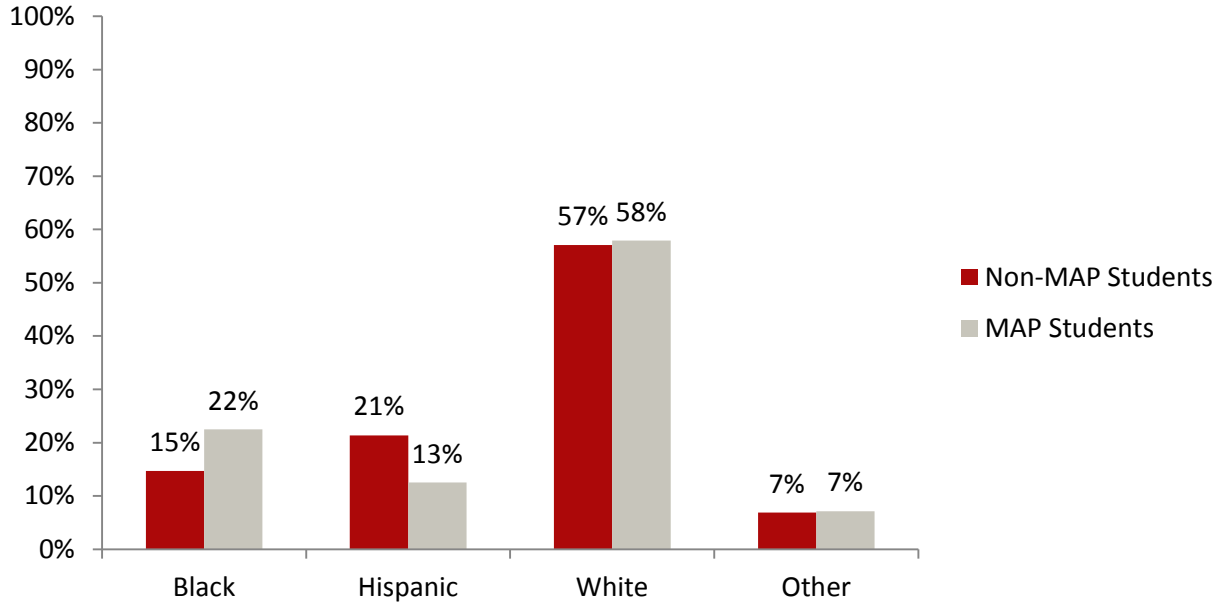


Figure 12: Percent of *second grade* students who were economically disadvantaged, students with disabilities, and limited English proficient by MAP utilization in 2011-12

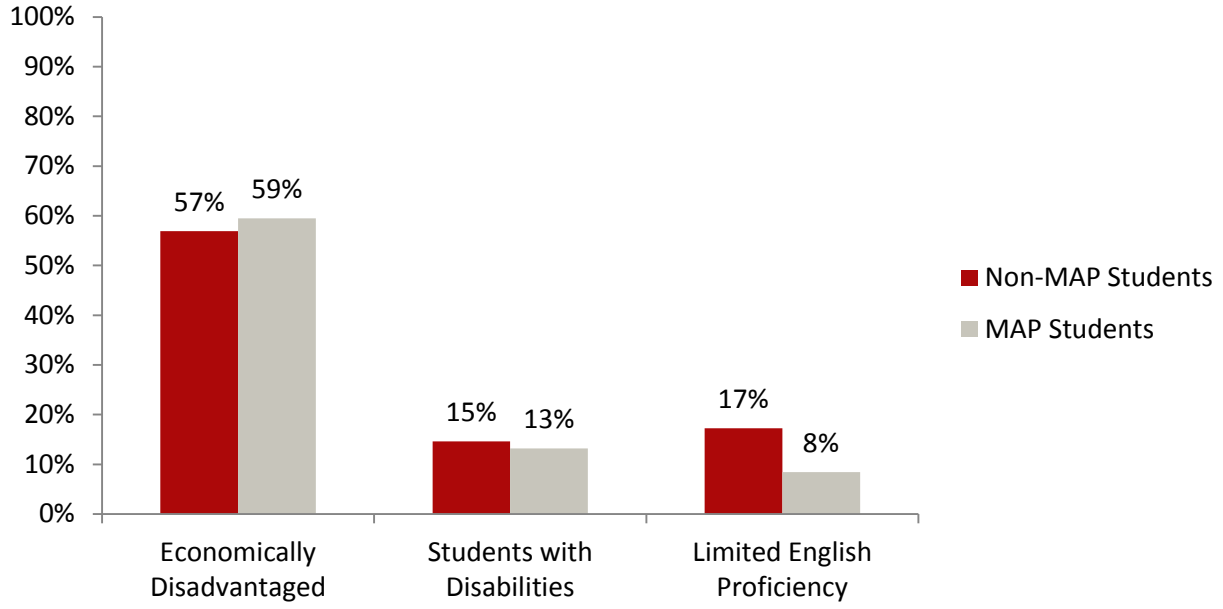


Figure 13: Race/ethnicity of students in *third grade* by MAP utilization in 2011-12

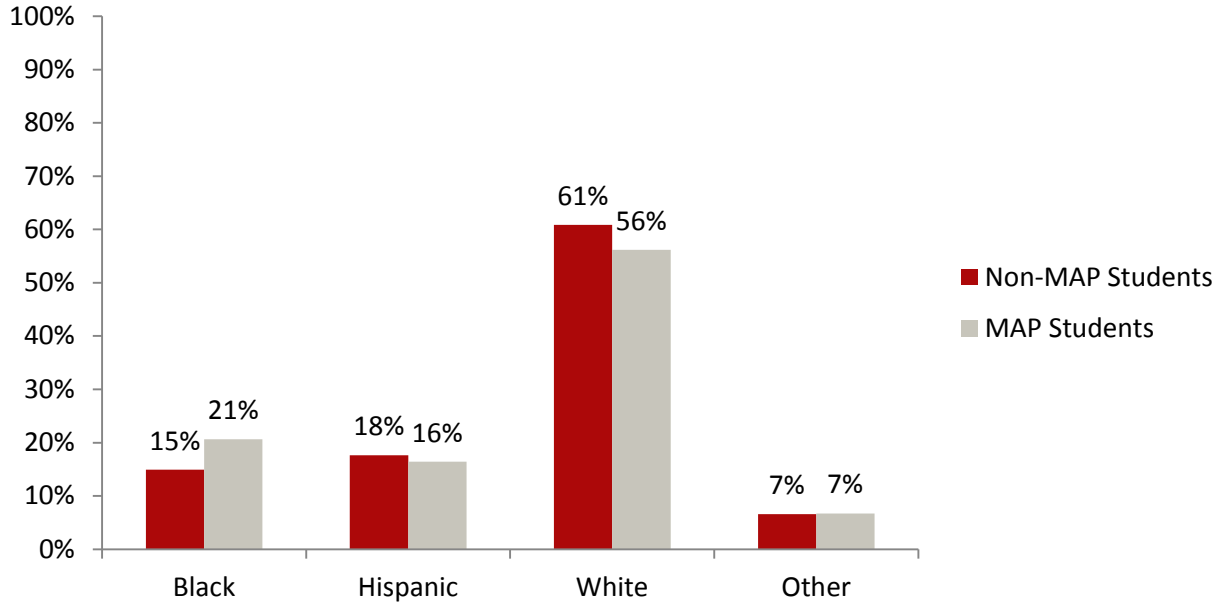
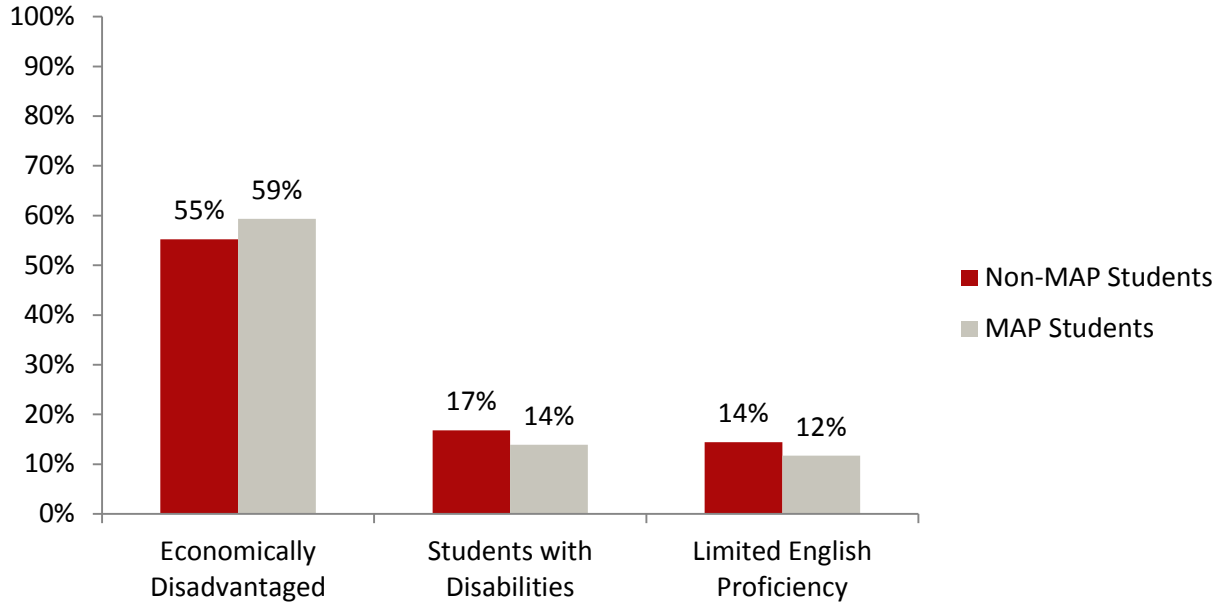


Figure 14: Percent of *third grad*e students who were economically disadvantaged, students with disabilities, and limited English proficient by MAP utilization in 2011-12



Characteristic Comparison of SAGE and Non-SAGE Students in the Analysis Sample

Another useful comparison in the evaluation of the SAGE program is the characteristics of students in SAGE compared to the control group of non-SAGE students in SAGE districts. If we see differences in the types of students that belong to each group, then an evaluation cannot utilize a simple analysis comparing performance of the two groups. Figure 15 and Figure 16 show the breakdown of the percent of students by race/ethnicity, economically disadvantaged status, students with disabilities, and ELLs for SAGE and non-SAGE students across the SAGE grades of kindergarten through third grade. SAGE schools have a higher proportion of African-American students, a higher proportion of economically disadvantaged students, and a lower proportion of white students than non-SAGE schools in the sample. Since these demographics do not vary highly between grades, this report only shows the breakdown for kindergarten through third grade.

Figure 15: Race/ethnicity of analysis sample students in kindergarten through third grade by SAGE participation in 2011-12

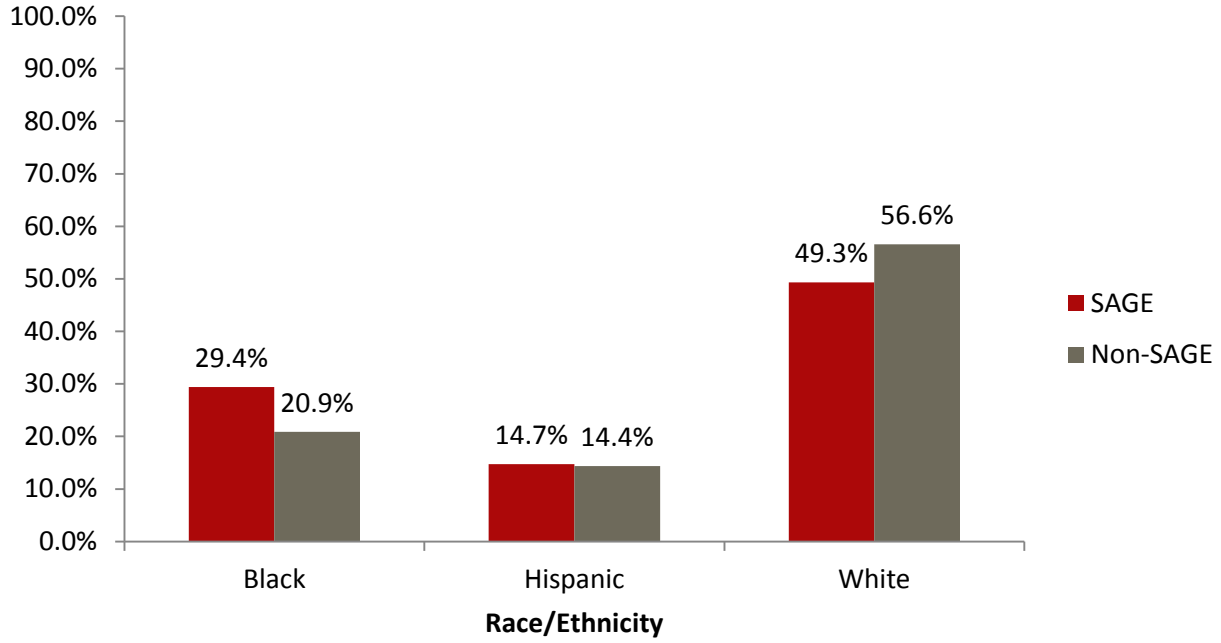
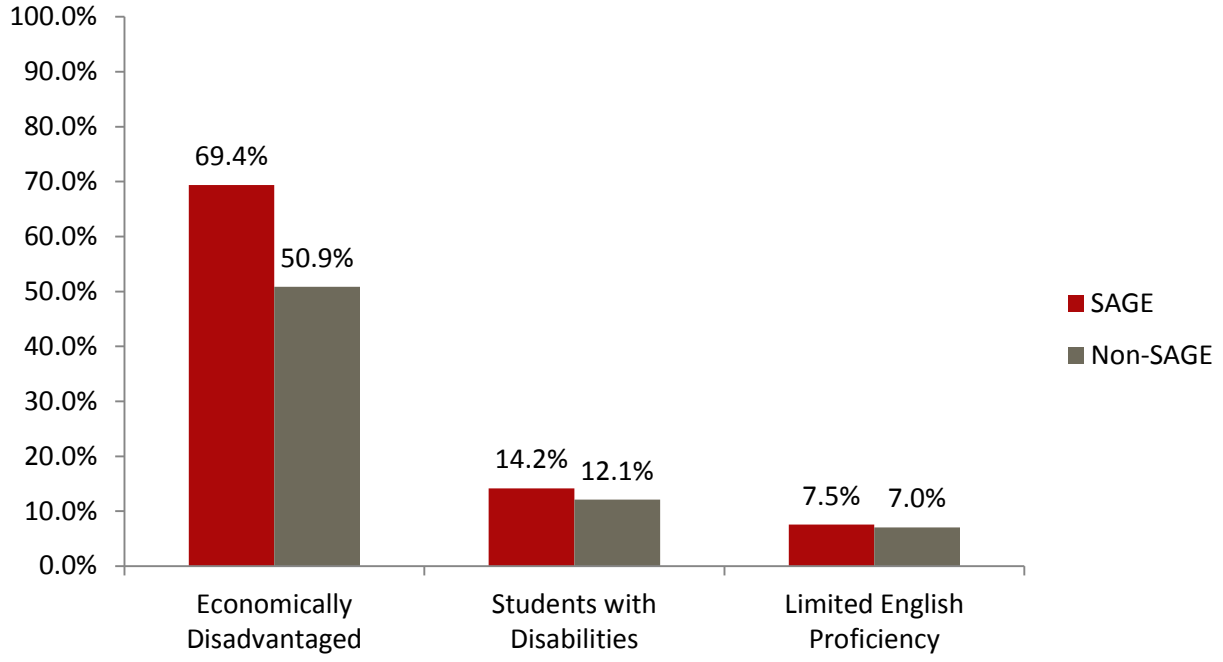


Figure 16: Percent of kindergarten through third grade analysis sample students who were economically disadvantaged, students with disabilities, and limited English proficient by SAGE participation in 2011-12



An additional approach to differentiating students is by their geographical setting. Using the National Center for Educational Statistics codes for district setting, this analysis grouped districts into three distinct groups: rural, non-Milwaukee urban, and Milwaukee. Since Milwaukee is the largest district in the state, it makes up the largest single district proportion of the sample, so evaluations often differentiate it from other urban districts in Wisconsin. This evaluation created a separate group for this district. Figures 17 – 19 show the breakdown of the analysis sample by district setting, grade, and SAGE status. These figures demonstrate that rural districts consisted of a larger proportion of the SAGE analysis sample than the non-SAGE analysis sample, especially in the earlier grades. They also show a gap between the proportion of SAGE and non-SAGE students in non-Milwaukee urban districts, mostly in the later grades. While Milwaukee contained the largest proportion of SAGE and non-SAGE students in earlier grades, by third grade, this diminishes.

Figure 17: Percent of analysis sample students in rural districts by grade and by SAGE participation in 2011-12

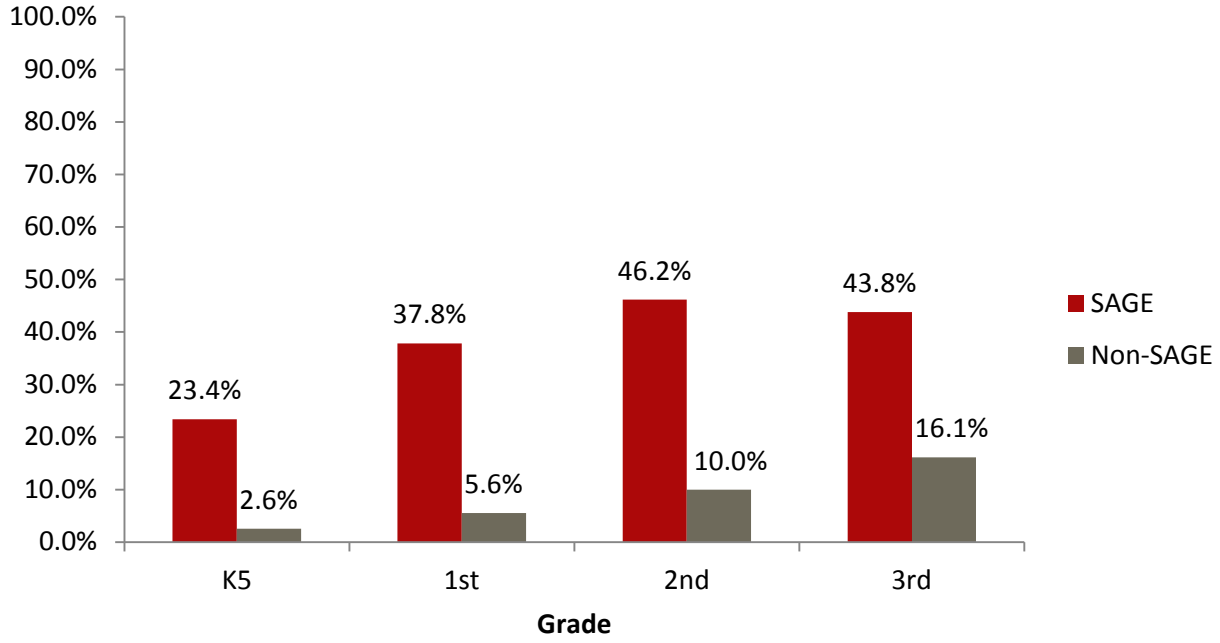


Figure 18: Percent of analysis sample students in non-Milwaukee urban districts by grade and by SAGE participation in 2011-12

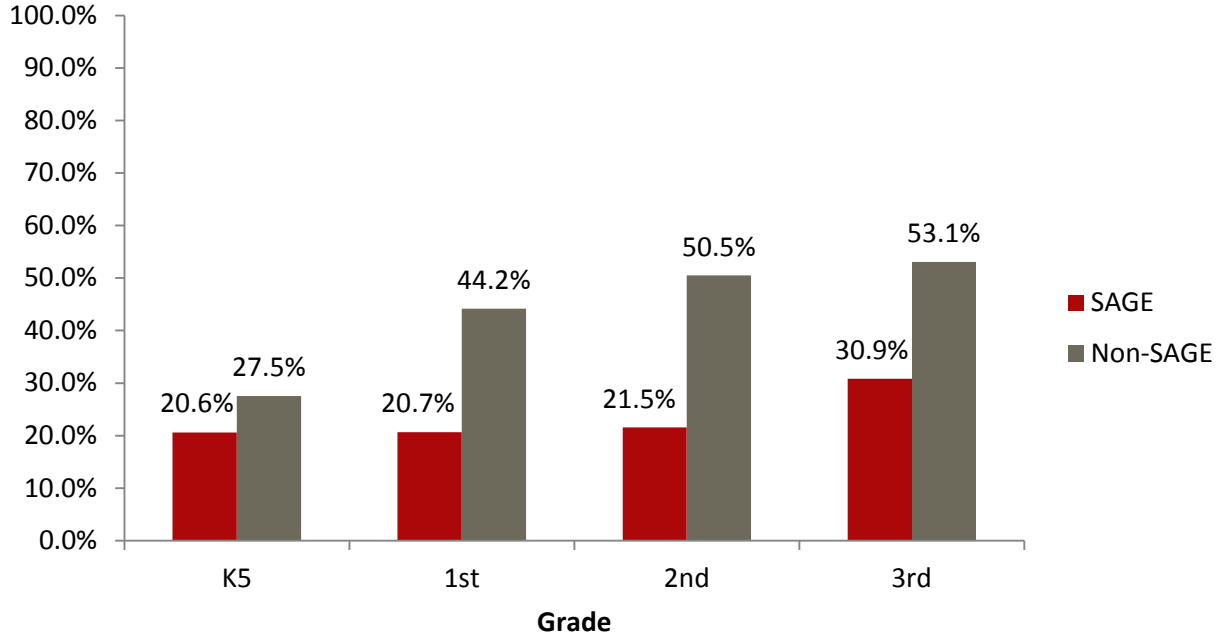
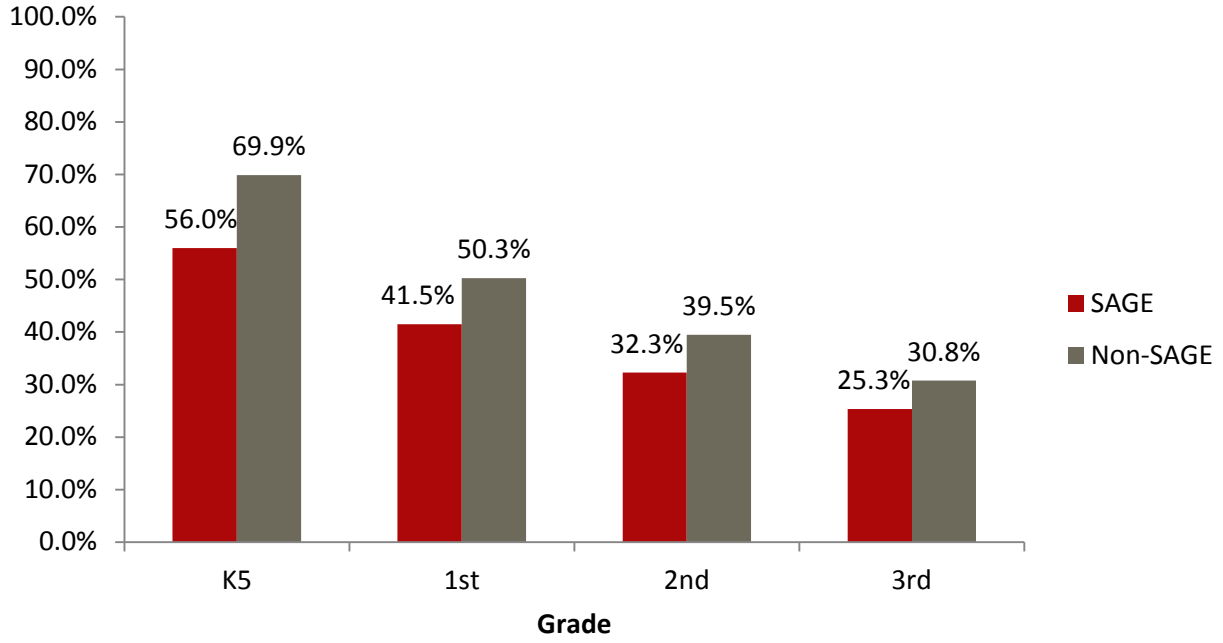


Figure 19: Percent of analysis sample students in Milwaukee by grade and by SAGE participation in 2011-12



Overall, these differences in the sample of SAGE and non-SAGE control students demonstrate the need for a more statistically advanced form of analysis that can account for these differences. As later sections will show, this evaluation will control for each of these factors when attempting to ascertain an effect of the SAGE program on student academic performance.

Unadjusted MAP Results for SAGE and Non-SAGE Schools

Prior to statistically analyzing the difference in academic performance between students in SAGE schools and non-SAGE schools, we examined the unadjusted differences in MAP scores and growth. Results from these base results show that for both reading and mathematics, SAGE students start at a lower average RIT score in the fall than non-SAGE students. By spring, SAGE students have average RIT scores similar to non-SAGE students in kindergarten and first grade, but still lower scores in second and third grade. Figure 20 and Table 6 show the unadjusted results in mathematics and Figure 21 and Table 7 show the unadjusted results in reading.

Figure 20: Average MAP *mathematics* RIT scores for SAGE and Non-SAGE analysis sample students in fall and spring by grade in 2011-12

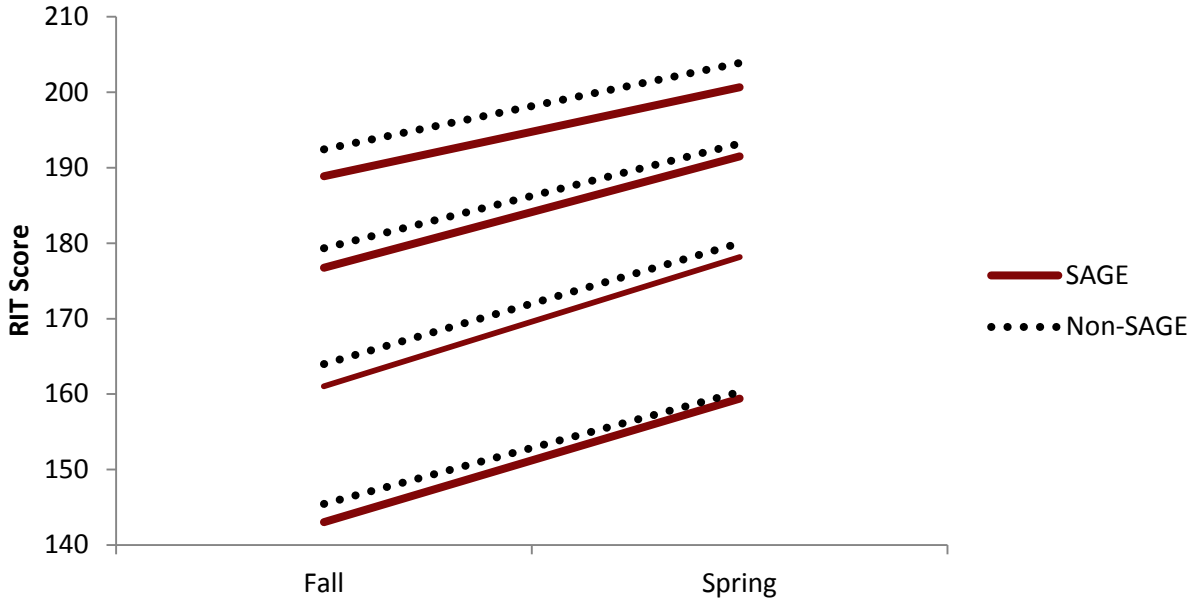


Table 6: Average MAP *mathematics* RIT scores and standard deviations for SAGE and non-SAGE analysis sample students in fall and spring in 2011-12

Grade	SAGE				Non-SAGE			
	Fall RIT	**Std. Dev.**	**Spring RIT**	**Std. Dev.**	**Fall RIT**	**Std. Dev.**	**Spring RIT**	**Std. Dev.**
K5	143.0	10.4	159.4	14.0	145.4	11.2	160.3	14.0
1st	161.1	13.1	178.2	14.5	164.0	13.6	180.0	14.2
2nd	176.7	1301	191.5	13.5	179.3	13.2	193.2	13.7
3rd	188.9	13.6	200.7	13.8	192.4	13.7	203.9	13.8

Figure 21: Average MAP *reading* RIT scores for SAGE and Non-SAGE analysis sample students in fall and spring by grade in 2011-12

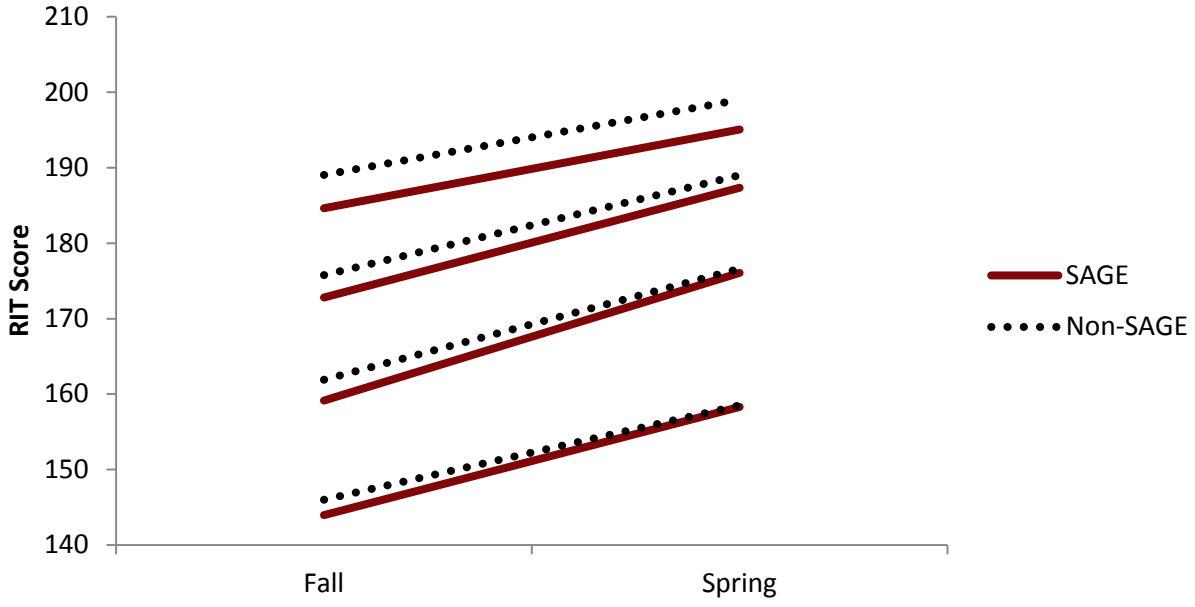


Table 7: Average MAP *reading* RIT scores and standard deviations for SAGE and non-SAGE analysis sample students in fall and spring in 2011-12

Grade	SAGE				Non-SAGE			
	Fall RIT	**Std. Dev.**	**Spring RIT**	**Std. Dev.**	**Fall RIT**	**Std. Dev.**	**Spring RIT**	**Std. Dev.**
K5	144.0	8.8	158.3	13.2	146.0	9.7	158.5	13.2
1st	159.1	12.1	176.1	14.8	161.9	13.0	176.6	14.5
2nd	172.8	15.5	187.4	14.4	175.8	15.8	189.0	14.5
3rd	184.6	16.5	195.1	15.3	189.0	16.2	199.0	14.8

Figure 22 and Figure 23 show the same information converted to MAP growth for mathematics and reading, respectively. These unadjusted results may suggest a positive impact of the SAGE program on student performance in the earlier grades; however, as mentioned earlier, large differences exist between SAGE and non-SAGE students in the analysis sample that may limit the accuracy of these findings. The next section describes the model this evaluation utilized to account for some of these differences.

Figure 22: Average unadjusted MAP *mathematics* RIT score growth for SAGE and Non-SAGE analysis sample students by grade in 2011-12

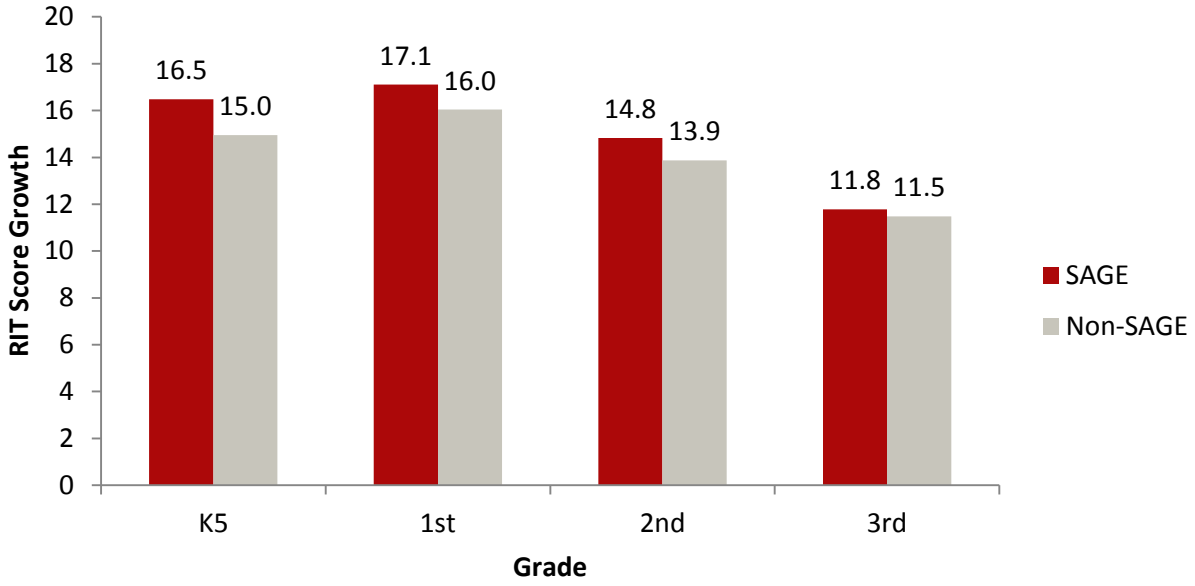
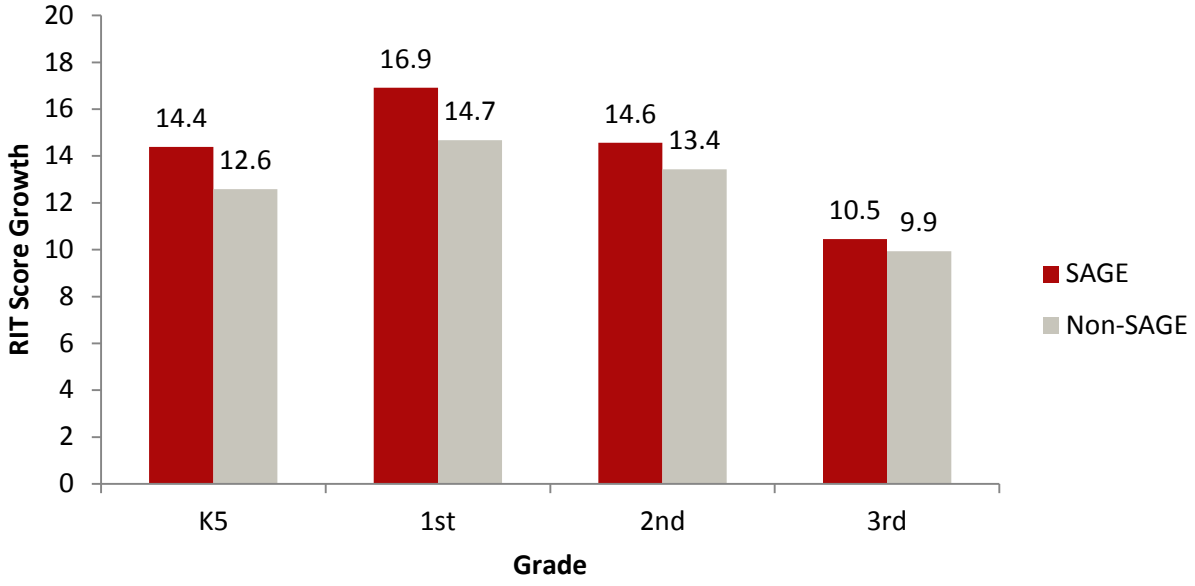


Figure 23: Average unadjusted MAP *reading* RIT score growth for SAGE and Non-SAGE analysis sample students by grade in 2011-12



Analysis Design Model

Since a straight comparison of SAGE to non-SAGE schools is not feasible due to differences in student and school characteristics, this evaluation of the SAGE program uses statistical modeling in an

attempt to detect the impact of the SAGE program on MAP growth in mathematics and reading.[2] The main effect model compares students in SAGE schools to students in non-SAGE schools within the state by utilizing a two-stage regression. The first stage obtains the value-added estimates from student-level information for each school. The second stage obtains the SAGE coefficient, or impact, from the school-level information obtained in the first stage. This model uses the spring MAP RIT score as the outcome variable.

As previously mentioned, this model also uses a variety of controls to account for the differences between SAGE and non-SAGE students and schools. The model uses the following information as explanatory student variables for the first stage of analysis:

- Fall MAP RIT scores (both mathematics and reading),
- Gender,
- Race/ethnicity,
- IEP or disability status,
- Economically disadvantaged status (through free or reduced price lunch indicator), and
- ELL level.

The model also uses explanatory school-level variables for the second stage of the analysis. These include:

- Rural/non-Milwaukee urban/Milwaukee status and
- SAGE status.

In addition, the model for analysis also weights the influence of each school by the population of that school. Thus, schools with a higher number of students will contribute more to the analysis.

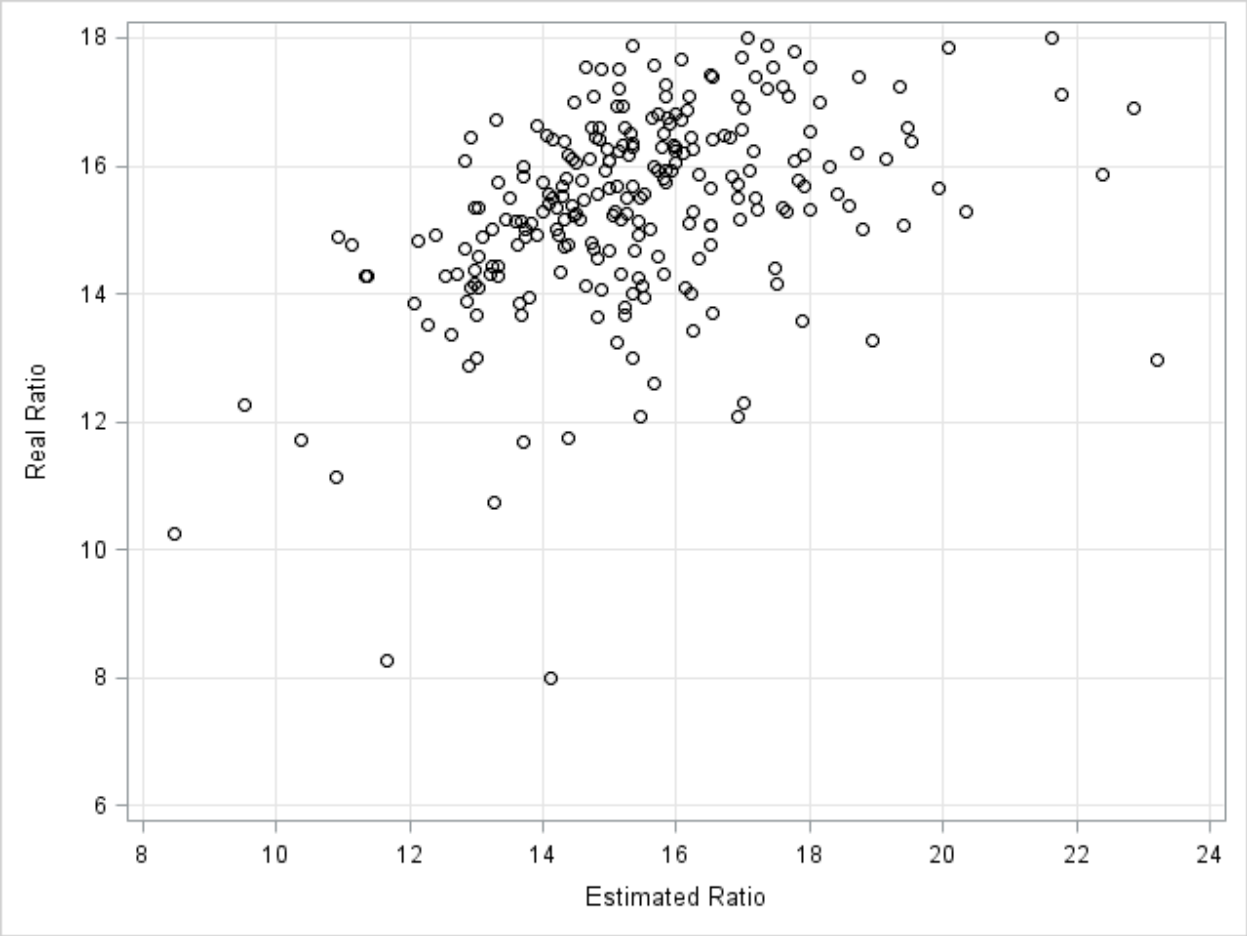
Another important variable to consider in the analysis of the SAGE program is the student-to-teacher ratio. As a large component of the SAGE program is the reduction of class size, controlling for this factor in the evaluation would hopefully lead to a more powerful analysis. Given the constraints of data collection during the 2011-12 school year, however, this evaluation was only able to obtain reliable student-to-teacher ratios for SAGE classrooms. In an attempt to account for the missing information in non-SAGE classrooms, this analysis created an estimated ratio for each school by combining data from different available sources. The two sources used were the public enrollment file and the public staff file available from DPI. The public enrollment file contained grade-level counts of all students throughout the year. The staff file contained a record for every teacher at each school.

To create the estimated student-to-teacher ratio, this evaluation went through several steps. The first step was to isolate teachers in the staff file that taught in kindergarten through third grade in either mathematics or reading. Unfortunately, the staff file did not always specify exact grades or subjects taught, so we utilized a certain amount of educated guessing and averaging to identify the number of mathematics and reading teachers in each grade for each school. To verify the results of our

[2] For a detailed and technical description of the design model, refer to Appendix A.

estimated ratios, we compared them to the real student-to-teacher ratios that SAGE schools directly reported to DPI. Figure 24 shows a scatter plot comparing the estimated ratio to the real ratio of students to teachers within SAGE schools only. With a small but statistically significant correlation between the two ratios of 0.42, we did not feel confident enough in the estimated ratio to include it in this year's analysis.

Figure 24: Comparison of estimated and real student-to-teacher ratios in kindergarten through third grade in SAGE schools in 2011-12



This year's analysis of the SAGE program also includes the differential impacts of SAGE on different types of students and schools. The design model to detect these effects differs slightly from that of the base model described above. To identify the differential effect of the SAGE program for different types of students (such as free or reduced price lunch students or students with limited English proficiency), the model changes to identify the value-added estimates for only these students within the first stage before obtaining the SAGE coefficient in the second stage. For identifying the differential impacts of SAGE upon different types of schools (such as rural or urban), the analysis limits the sample to only include schools of this type and then compares SAGE to non-SAGE with the same controlling factors. Finally, for identifying the differential impacts of SAGE upon different characteristic

demographics within schools, the analysis also uses a model to account for the proportion of students at each school that are eligible for free or reduced price lunch and the proportion of students at each school that are minority students.

Main SAGE Effect

Table 8 and Table 9 show the statistically adjusted MAP RIT score growth differences between the students in SAGE and non-SAGE schools from the main analysis design model presented in the previous section for mathematics and reading, respectively. In each of these tables, and the differential effect results that follow, we provide both the SAGE coefficient in RIT scale scores and the SAGE coefficient in standard deviations of the post-test results. The coefficient in RIT scores shows the estimated impact of the SAGE program for the specific group of students on the number of scale score points of growth. The coefficient in standard deviations represents a normalized approach to interpreting the results. We calculated this by taking the coefficient in RIT scores divided by the standard deviation of the whole sample's spring test results.

As seen in Table 8, we estimated positive and significant effects of the SAGE program on mathematics growth in kindergarten through second grade as compared to students in non-SAGE schools. In third grade, we estimated a small but statistically significant negative effect of the SAGE program on mathematics growth as compared to students in non-SAGE schools. This means that students in SAGE schools grow at a slightly slower rate than students in non-SAGE schools on average in third grade in mathematics and at a higher rate than students in non-SAGE schools on average in kindergarten through second grade in mathematics. These results suggest a positive and significant impact of the SAGE program on improving the mathematics growth of students in earlier SAGE grades.

Table 8: Results of statistical analysis of the SAGE program effect on *mathematics* MAP scale scores by grade in 2011-12

Grade	SAGE Coefficient (in RIT scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	1.954	0.140	0.093	<0.001
1st	0.853	0.059	0.058	<0.001
2nd	0.671	0.049	0.063	<0.001
3rd	-0.247	-0.018	0.044	<0.001

As seen in Table 9, we also estimated positive and significant effects of the SAGE program on reading growth in kindergarten through second grade as compared to students in non-SAGE schools. In third grade, we estimated a small but statistically significant negative effect of the SAGE program on reading growth as compared to students in non-SAGE schools. Similar to the mathematics results, this means that students in SAGE schools grow at a slightly slower rate than students in non-SAGE schools on average in third grade and at a higher rate than students in non-SAGE schools on average in kindergarten through second grade in reading. These results suggest a positive and significant impact of the SAGE program on improving the reading growth of students in earlier SAGE grades.

Table 9: Results of statistical analysis of the SAGE program effect on *reading* MAP scale scores by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	2.148	0.165	0.096	<0.001
1st	1.575	0.107	0.083	<0.001
2nd	0.452	0.031	0.057	<0.001
3rd	-0.319	-0.021	0.037	<0.001

Differential SAGE Effects

Differential Effects by Economic Status

The first differential impact this evaluation examined was the effect of the SAGE program upon students who were economically disadvantaged and not economically disadvantaged based upon their free or reduced price lunch status. Table 10 and Table 11 show the results of our analyses for differential effects of SAGE on economically disadvantaged students for both mathematics and reading. As the SAGE program's initial stated goal is to improve the academic well-being of students from economically disadvantaged backgrounds, this differential impact can shed light on the SAGE program's progress in attaining this goal. As Table 10 and Table 11 illustrate, we estimated positive and significant differential effects of the SAGE program for economically disadvantaged student growth in kindergarten through second grade for both mathematics and reading as compared to economically disadvantaged students in non-SAGE schools. In reading for third grade, we estimated a small but statistically significant negative differential effect of the SAGE program for economically disadvantaged student growth as compared to students in non-SAGE schools but we found no effect in mathematics for third grade.

Table 10: Results of statistical analysis of the SAGE program differential effect on *mathematics* MAP scale scores for *economically disadvantaged* students by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	2.047	0.147	0.129	<0.001
1st	0.942	0.065	0.082	<0.001
2nd	1.307	0.095	0.087	<0.001
3rd	0.103	0.007	0.066	0.119

Table 11: Results of statistical analysis of the SAGE program differential effect on *reading* MAP scale scores for *economically disadvantaged* students by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	2.211	0.169	0.131	<0.001
1st	1.759	0.119	0.097	<0.001
2nd	0.967	0.066	0.084	<0.001
3rd	-0.132	-0.009	0.059	0.025

Table 12 and Table 13 show the results of our analyses for differential effects of SAGE on non-economically disadvantaged students for both mathematics and reading. We estimated a positive and significant differential effect of the SAGE program for non-economically disadvantaged student mathematics growth in kindergarten through third grade and reading growth in kindergarten through second grade. These effects are largest in the earlier grades and diminish by third grade.

Table 12: Results of statistical analysis of the SAGE program differential effect on *mathematics* MAP scale scores for *non-economically disadvantaged* students by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	2.924	0.210	0.178	<0.001
1st	1.616	0.112	0.105	<0.001
2nd	0.791	0.058	0.099	<0.001
3rd	0.206	0.015	0.071	0.004

Table 13: Results of statistical analysis of the SAGE program differential effect on *reading* MAP scale scores for *non-economically disadvantaged* students by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	3.347	0.257	0.183	<0.001
1st	3.497	0.237	0.108	<0.001
2nd	1.176	0.081	0.090	<0.001
3rd	-0.072	-0.005	0.057	0.210

Differential Effects by English Proficiency

Table 14 and Table 15 show the results of our analyses for differential effects of SAGE on students with limited-English proficiency for both mathematics and reading. In mathematics, we estimated a positive and significant impact of the SAGE program on limited-English proficient students in first and second grade and a negative, significant, and small impact in third grade. In reading, we estimate a positive and significant effect in first grade.

Table 14: Results of statistical analysis of the SAGE program differential effect on *mathematics* MAP scale scores for *students with limited-English proficiency* by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	-0.088	-0.006	0.876	0.920
1st	1.460	0.101	0.389	<0.001
2nd	0.708	0.052	0.281	0.013
3rd	-0.445	-0.032	0.210	0.035

Table 15: Results of statistical analysis of the SAGE program differential effect on *reading* MAP scale scores for *students with limited-English proficiency* by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	0.927	0.071	0.744	0.221
1st	4.316	0.292	0.398	<0.001
2nd	0.352	0.024	0.273	0.200
3rd	-0.167	-0.011	0.192	0.385

Table 16 and Table 17 show the results of our analyses for differential effects of SAGE on students with English proficiency for both mathematics and reading. For both mathematics and reading, our estimates of the SAGE program's effect on students who are proficient in English show a positive and significant impact in kindergarten through second grade when compared to English proficient students in non-SAGE schools. In third grade, we estimated a small, negative, and significant effect of the SAGE program on reading performance as compared to non-SAGE students.

Table 16: Results of statistical analysis of the SAGE program differential effect on *mathematics* MAP scale scores for *students with English proficiency* by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	2.155	0.154	0.100	<0.001
1st	0.880	0.061	0.063	<0.001
2nd	0.835	0.061	0.066	<0.001
3rd	0.075	0.005	0.047	0.115

Table 17: Results of statistical analysis of the SAGE program differential effect on *reading* MAP scale scores for *students with English proficiency* by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	2.406	0.184	0.104	<0.001
1st	2.072	0.140	0.071	<0.001
2nd	0.801	0.055	0.062	<0.001
3rd	-0.165	-0.011	0.039	<0.001

Differential Effects by Disability Status

Table 18 and Table 19 show the results of our analyses for differential effects of SAGE on students with disabilities for both mathematics and reading. The estimated impact of the SAGE program on mathematics growth for students with disabilities is positive and significant in kindergarten, second grade, and third grade, with a smaller effect in the later grades. The estimated impact on reading growth is positive and significant in kindergarten and first grade, and negative, small, and significant in third grade.

Table 18: Results of statistical analysis of the SAGE program differential effect on *mathematics* MAP scale scores for *students with disabilities* by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	2.557	0.183	0.374	<0.001
1st	0.451	0.031	0.291	0.122
2nd	1.207	0.088	0.265	<0.001
3rd	0.341	0.025	0.206	0.099

Table 19: Results of statistical analysis of the SAGE program differential effect on *reading* MAP scale scores for *students with disabilities* by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	2.802	0.215	0.359	<0.001
1st	0.851	0.058	0.299	0.005
2nd	0.401	0.027	0.268	0.136
3rd	-0.444	-0.029	0.215	0.040

Table 20 and Table 21 show the results of our analyses for differential effects of SAGE on students without disabilities for both mathematics and reading. In kindergarten through second grade, the SAGE program has an estimated positive and significant effect on both mathematics and reading growth for students without disabilities. In third grade, we estimated a small, negative, and significant effect on reading growth as compared to students without disabilities in non-SAGE schools.

Table 20: Results of statistical analysis of the SAGE program differential effect on *mathematics* MAP scale scores for *students without disabilities* by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	2.047	0.147	0.107	<0.001
1st	0.991	0.069	0.065	<0.001
2nd	0.781	0.057	0.067	<0.001
3rd	-0.018	-0.001	0.048	0.716

Table 21: Results of statistical analysis of the SAGE program differential effect on *reading* MAP scale scores for *students without disabilities* by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	2.317	0.178	0.085	<0.001
1st	2.411	0.163	0.073	<0.001
2nd	0.830	0.057	0.062	<0.001
3rd	-0.118	-0.008	0.038	0.002

Differential Effects by Gender

Table 22 and Table 23 show the results of our analyses for differential effects of SAGE on female students for both mathematics and reading. In both mathematics and reading, we estimated a positive and significant effect of the SAGE program on female student growth in kindergarten through second grade, with the largest effects in the earlier grades. In third grade, we estimated a small, negative, and significant impact on both mathematics and reading growth as compared to female students in non-SAGE schools.

Table 22: Results of statistical analysis of the SAGE program differential effect on *mathematics* MAP scale scores for *female students* by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	1.909	0.137	0.139	<0.001
1st	1.152	0.080	0.083	<0.001
2nd	0.627	0.046	0.090	<0.001
3rd	-0.260	-0.019	0.067	<0.001

Table 23: Results of statistical analysis of the SAGE program differential effect on *reading* MAP scale scores for *female students* by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	2.212	0.170	0.152	<0.001
1st	2.143	0.145	0.098	<0.001
2nd	0.651	0.045	0.083	<0.001
3rd	-0.489	-0.032	0.054	<0.001

Table 24 and Table 25 show the results of our analyses for differential effects of SAGE on male students for both mathematics and reading. We estimated a positive and significant effect of the SAGE program on male student growth in mathematics and reading across all of the SAGE grades. As with many of the prior results, this effect is largest in the earlier grades and diminishes by third grade.

Table 24: Results of statistical analysis of the SAGE program differential effect on *mathematics* MAP scale scores for *male students* by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	2.294	0.164	0.150	<0.001
1st	0.688	0.048	0.100	<0.001
2nd	1.013	0.074	0.096	<0.001
3rd	0.290	0.021	0.068	<0.001

Table 25: Results of statistical analysis of the SAGE program differential effect on *reading* MAP scale scores for *male students* by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	2.528	0.194	0.148	<0.001
1st	2.281	0.154	0.108	<0.001
2nd	0.875	0.060	0.091	<0.001
3rd	0.136	0.009	0.061	0.027

Differential Effects by Race/Ethnicity

Table 26 and Table 27 show the results of our analyses for differential effects of SAGE on African-American students for both mathematics and reading. Like many other subsets of the population of SAGE students, we estimated positive and significant impacts of the program on mathematics and reading growth in kindergarten through second grade, and small, negative, and significant effects in third grade.

Table 26: Results of statistical analysis of the SAGE program differential effect on *mathematics* MAP scale scores for *African-American students* by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	1.341	0.097	0.175	<0.001
1st	0.340	0.024	0.131	0.010
2nd	0.909	0.066	0.150	<0.001
3rd	-0.684	-0.049	0.124	<0.001

Table 27: Results of statistical analysis of the SAGE program differential effect on *reading* MAP scale scores for *African-American students* by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	2.126	0.163	0.178	<0.001
1st	0.573	0.039	0.150	<0.001
2nd	0.630	0.043	0.146	<0.001
3rd	-0.553	-0.036	0.120	<0.001

Table 28 and Table 29 show the results of our analyses for differential effects of SAGE on American Indian students for both mathematics and reading. The estimated impact of the SAGE program on American Indian students differs from that of most subsets of the sample population. The estimated differential effect on mathematics is positive and significant in only second grade, and the effect on reading is positive and significant in first and second grade. All other results are insignificant, which is likely due to the small number of American Indian students in the sample.

Table 28: Results of statistical analysis of the SAGE program differential effect on *mathematics* MAP scale scores for *American Indian students* by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	1.337	0.096	1.439	0.358
1st	0.255	0.018	1.006	0.800
2nd	1.893	0.138	0.852	0.029
3rd	0.524	0.038	0.580	0.379

Table 29: Results of statistical analysis of the SAGE program differential effect on *reading* MAP scale scores for *American Indian students* by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	1.680	0.129	1.011	0.104
1st	3.307	0.224	1.115	0.004
2nd	2.155	0.148	0.932	0.023
3rd	0.557	0.036	0.616	0.369

Table 30 and Table 31 show the results of our analyses for differential effects of SAGE on Asian students for both mathematics and reading. Like American Indian students, we also see a different impact of the SAGE program on Asian student growth as compared to Asian students in non-SAGE schools. In mathematics, we estimated a negative and significant effect on third-grade growth. In reading, we estimated a positive and significant effect in first and second grade, and a negative and significant effect in third grade.

Table 30: Results of statistical analysis of the SAGE program differential effect on *mathematics* MAP scale scores for *Asian students* by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	0.616	0.044	0.509	0.229
1st	-0.087	-0.006	0.455	0.849
2nd	0.333	0.024	0.347	0.339
3rd	-1.403	-0.101	0.265	<0.001

Table 31: Results of statistical analysis of the SAGE program differential effect on *reading* MAP scale scores for *Asian students* by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	-0.806	-0.062	0.463	0.086
1st	2.576	0.174	0.407	<0.001
2nd	0.721	0.049	0.352	0.042
3rd	-0.667	-0.044	0.256	0.010

Table 32 and Table 33 show the results of our analyses for differential effects of SAGE on Hispanic students for both mathematics and reading. With Hispanic students, the SAGE program seems to have a similar impact to many of the other differential effects. We estimated a positive and significant effect on mathematics growth in kindergarten through second grade and on reading growth in kindergarten through third grade.

Table 32: Results of statistical analysis of the SAGE program differential effect on *mathematics* MAP scale scores for *Hispanic students* by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	2.971	0.213	0.323	<0.001
1st	0.712	0.049	0.252	0.006
2nd	2.254	0.164	0.277	<0.001
3rd	0.288	0.021	0.192	0.134

Table 33: Results of statistical analysis of the SAGE program differential effect on *reading* MAP scale scores for *Hispanic students* by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	2.629	0.201	0.317	<0.001
1st	2.868	0.194	0.298	<0.001
2nd	0.741	0.051	0.247	0.003
3rd	0.408	0.027	0.180	0.025

Table 34 and Table 35 show the results of our analyses for differential effects of SAGE on white students for both mathematics and reading. The estimated impact of the SAGE program on white student mathematics growth is positive and significant across kindergarten through third grade with the largest impacts in the earlier grades. We estimated a similar result on reading growth with the exception of third grade, where we estimated a small, negative, and significant effect.

Table 34: Results of statistical analysis of the SAGE program differential effect on *mathematics* MAP scale scores for *white students* by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	2.695	0.193	0.188	<0.001
1st	1.073	0.074	0.102	<0.001
2nd	1.539	0.112	0.105	<0.001
3rd	0.435	0.031	0.072	<0.001

Table 35: Results of statistical analysis of the SAGE program differential effect on *reading* MAP scale scores for *white students* by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	3.058	0.234	0.200	<0.001
1st	2.460	0.166	0.114	<0.001
2nd	1.366	0.094	0.092	<0.001
3rd	-0.195	-0.013	0.057	0.001

Differential Effects by District Setting

Another type of differential impact this evaluation examined was the difference between SAGE and non-SAGE schools by their setting. As previously stated, this analysis divided the sample of districts into three mutually exclusive settings: rural, non-Milwaukee urban, and Milwaukee. Due to the limited number of non-SAGE schools within rural districts, we could not confidently estimate a differential effect for this group of districts.[3] Table 36 and Table 37 show the effects of the SAGE program for non-Milwaukee urban districts. For both mathematics and reading, our analysis estimated a positive and significant effect of the SAGE program on student growth for students in kindergarten through second grade with the largest effects in the earlier grades. In third grade, the effects were significant, negative, and small.

Table 36: Results of statistical analysis of the SAGE program differential effect on *mathematics* MAP scale scores in *non-Milwaukee urban* districts by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	4.750	0.341	0.195	<0.001
1st	2.832	0.196	0.108	<0.001
2nd	1.381	0.101	0.119	<0.001
3rd	-0.403	-0.029	0.073	<0.001

Table 37: Results of statistical analysis of the SAGE program differential effect on *reading* MAP scale scores in *non-Milwaukee urban* districts by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	4.486	0.344	0.214	<0.001
1st	2.679	0.181	0.194	<0.001
2nd	0.802	0.055	0.103	<0.001
3rd	-0.457	-0.030	0.062	<0.001

[3] The analysis sample only contained 3 rural control schools in kindergarten, 6 in first grade, 17 in second grade, and 28 in third grade.

Table 38 and Table 39 show the effects of the SAGE program on students in Milwaukee. The results from our analyses varied from the typical trend for other differential effects. In Milwaukee, we estimated that the SAGE program had small, significant, and positive effects on mathematics growth in kindergarten and second grade, and on reading growth in kindergarten and first grade. We estimated small, significant, and negative effects on mathematics growth in first grade and on reading growth in third grade.

Table 38: Results of statistical analysis of the SAGE program differential effect on *mathematics* MAP scale scores in *Milwaukee* by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	0.942	0.068	0.105	<0.001
1st	-0.421	-0.029	0.070	<0.001
2nd	0.323	0.024	0.085	<0.001
3rd	-0.043	-0.003	0.073	0.558

Table 39: Results of statistical analysis of the SAGE program differential effect on *reading* MAP scale scores in *Milwaukee* by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	1.415	0.108	0.107	<0.001
1st	0.661	0.045	0.086	<0.001
2nd	0.145	0.010	0.077	0.061
3rd	-0.426	-0.028	0.064	<0.001

SAGE Effect Accounting for Peer Characteristics

Our final analyses examined the impact of the SAGE program while accounting for peer characteristics in schools. In this case, we controlled for the proportion of students who were eligible for free or reduced price lunch and the proportion of minority students (students who are African-American, American Indian, Asian, or Hispanic). Table 40 and Table 41 show the results from these analyses for mathematics and reading growth. In mathematics, the SAGE program had an estimated significant and positive impact on student growth with the largest impact in kindergarten. This impact declined through third grade. In reading, we estimated similar results except for a small, negative, and significant effect in third grade.

Table 40: Results of statistical analysis of the SAGE program on *mathematics* MAP scale scores controlling for the proportion of economically disadvantaged and minority students by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	2.604	0.187	0.105	<0.001
1st	1.769	0.123	0.065	<0.001
2nd	1.556	0.113	0.066	<0.001
3rd	0.311	0.022	0.048	<0.001

Table 41: Results of statistical analysis of the SAGE program on *reading* MAP scale scores controlling for the proportion of economically disadvantaged and minority students by grade in 2011-12

Grade	SAGE Coefficient (in RIT Scores)	SAGE Coefficient (in Standard Deviations)	Standard Error	P-Value
K5	2.678	0.205	0.107	<0.001
1st	2.614	0.177	0.077	<0.001
2nd	1.582	0.108	0.058	<0.001
3rd	-0.174	-0.011	0.040	<0.001

Qualitative Analysis

To supplement the quantitative analysis of the SAGE program, VARC added a two-part qualitative study for the year 8 evaluation. A previous qualitative analysis of the SAGE program occurred in 2006-07, just after SAGE schools began implementing the program. That particular study focused on how lower class sizes in SAGE classrooms affected class designs, activities that connected home and school, curriculum instruction, and professional development. This evaluation wanted to revisit some of these same topics and find out how schools adapt to smaller class sizes as well as what strategies they use to maintain the 18:1, 30:2, and 45:3 ratios in SAGE grades.

To guide the qualitative study and analysis, the evaluation focused on four research questions:

1. How has the SAGE program affected teacher recruitment and retention in SAGE schools?
2. What supports for families and communities are SAGE schools providing?
3. What instructional practices do teachers use in SAGE schools?
4. How do schools use SAGE funding, and is it enough to cover the additional expenses of the SAGE program for kindergarten through third grade?

The second and third research questions came from the previous qualitative study. This analysis added the first question to examine how teachers view the SAGE program and whether schools leveraged teacher opinions about the program to attract and keep effective teachers. The fourth question stemmed from concerns about how SAGE schools cover the costs of the SAGE program in a time of budget cuts, when state funding may not cover all of the expenses.

The qualitative study included two components: interviews with principals around the state and questions on the end-of-year SAGE survey fielded by DPI. In spring 2013, we interviewed twelve principals, focusing on a diversity of schools in terms of rural and urban school districts and in terms of value added (high, average, and low). This evaluation used the information from these interviews to develop items for the SAGE EOY survey that all SAGE schools had the opportunity to complete at the end of the school year. The interviews provided in-depth information on the research questions, while the

survey results provided a broader perspective across SAGE schools around Wisconsin on the research questions. The results from the principal interviews and EOY survey results follow.

Principal Interviews

VARC conducted interviews with 12 SAGE school principals in March 2013 to ascertain how the SAGE program works in schools. In addition to overall impressions of the SAGE program, we designed further interview questions to answer the four guiding research questions for the qualitative portion of the evaluation. Utilizing these questions, we designed a total of 31 interview questions for a short interview with principals across a variety of SAGE schools.[4] This section of the report will describe the process for selecting schools for interviewing, the overall impressions of the SAGE program, results for each of the guiding questions, and a summary of results.

Selection Process

To benefit from responses from the full spectrum of SAGE schools, the evaluation broke up the SAGE schools into six different categories in terms of location and estimated student growth. Based on the National Center for Education Statistics' Urban Centric Locale Code, we identified which SAGE schools were urban and which were rural. Based upon 2011-12 Measures of Academic Progress (MAP) assessment results in the fall and spring, we calculated preliminary value-added estimates to determine which SAGE schools had high, average, and low student growth. Combining these metrics allowed separation of the SAGE schools into six different categories: Urban-High Growth, Urban-Average Growth, Urban-Low Growth, Rural-High Growth, Rural-Average Growth, and Rural-Low Growth.

VARC presented a list of schools in each category to DPI so that they could select the schools most likely to agree to an interview. DPI coded two schools from each category as first choices and two schools from each category as second choices. We contacted school principals to set up interviews in March 2013; we completed a total of 12 interviews with SAGE school principals as shown in Table 42.

Table 42: Number of principals interviewed by school category and DPI coding

Category	*First-Choice Schools*	*Second-Choice Schools*
Urban-High Growth	1	1
Urban-Average Growth	2	0
Urban-Low Growth	2	0
Rural-High Growth	1	1
Rural-Average Growth	2	0
Rural-Low Growth	1	1

SAGE Program Overall Effectiveness

To ascertain principal opinions of overall SAGE program effectiveness, we asked three questions related to how the SAGE program was working in their school, what types of students the SAGE program benefits, and how their impression of the SAGE program might have changed from previous years. Overall, all 12 interviewees reported that the SAGE program was working well within their schools. Four

[4] For a full set of interview questions, refer to Appendix B.

principals responded that the SAGE program allows for more one-on-one instruction time for students. Other responses included that the SAGE program leads to better behavior from students (2 responses), helps in building relationships (3 responses), makes it easier for teachers to know families (3 responses), and helps teachers to provide additional support to students (1 response). Table 43 provides a comprehensive list of the responses principals gave when asked about their overall impressions of the SAGE program in their school.

Table 43: Benefits of the SAGE program

Response	*Number Responded*
More one-on-one instruction	4
Better relationship building	3
More opportunities for interventions	3
More time with high-needs students	3
Teachers know students' families better	3
Better behavior from students	2
Additional support opportunity	1
Smaller groups for reading and mathematics	1
More opportunities for multi-age classrooms	1

Principals responded that a variety of different student groups benefited most from the SAGE program. A common theme indicates that those students who need additional help to succeed benefit the most. Answers common with this theme included the neediest students (2 responses), transient students (1 response), students with learning disabilities (1 response), special education students (2 responses), students with autism and ADHD (1 response), English language learners (ELL) (4 responses), and students living in poverty (2 responses).

Two principals responded that students at both ends of the spectrum benefit the most as the small class sizes allowed for extra support. Four other principals responded differently, however. Three of the four thought that the SAGE program benefits all of their students equally. The fourth principal thought that the SAGE program benefits those students in the middle of the spectrum the most.

Five of the twelve principals interviewed felt that the SAGE program this year was reflective of the SAGE program in previous years. Five of the twelve either were not principals at the site for more than one year or did not feel equipped to properly answer this question. One principal thought that with the change in the student-to-teacher ratio from 15:1 to 18:1, their kindergarten class struggles more. Another principal mentioned that the SAGE program had improved through the years as their school decided to keep students in core groups all day instead of taking students out of classrooms for small-group instruction.

Teacher Impact

To answer the question of how the SAGE program affects teachers as well as teacher recruitment and retention, the interviewers asked four questions to principals regarding teachers' overall opinions, the school's ability to recruit and retain effective teachers, the professional development provided to teachers, and if the school provided this professional development with regard to small class size instructional strategies. All 12 principals responded that teachers think the SAGE program is effective. Reasons included that teachers appreciate the low class sizes (4 responses), it is easier to identify student needs (2 responses), it is easier to target interventions (1 response), it is easier to provide differentiated instruction (1 response), and teachers have more time and inclination to use detailed data to hone in on specific skill targets (1 response). Two principals reported that the SAGE program is one of their school's most popular programs among teachers. Another principal stated that even teachers not teaching in SAGE classrooms, such as ELL and fourth- and fifth-grade teachers, like the SAGE program.

Eleven of the twelve principals interviewed responded that having the SAGE program at their school helps them to recruit and retain teachers. One principal responded that potential teachers often ask about the SAGE program during their interviews. Another principal noted that because their district has open enrollment, parents also seek out their school due to the SAGE program. The one principal who did not say that the SAGE program helps with the recruitment and retaining of teachers, responded that their school is effective at recruiting and retaining teachers regardless of the SAGE program.

When asked about professional development provision to teachers, principals gave a variety of answers. The most common answers included professional development focused on literacy (8 responses), mathematics (5 responses), and alignment to the Common Core State Standards (5 responses). Other reported areas of professional development include writing (3 responses), using data (3 responses), classroom management (1 response), professional learning communities (2 responses), and response to intervention (RTI) (3 responses). One principal noted that their professional development differs by grade, another that they target their professional development based on data, and another principal said that professional development is based on teacher requests, which have increased with the SAGE program.

The majority of principals responded that they provide professional development based around small class size instructional strategies or that it is integrated into the professional development they provide about other instructional topics. Of these, one principal stated they "…couldn't make the same professional development choices if it weren't for the SAGE program." Two of the principals interviewed stated that their school already provides the necessary professional development on small class size instruction and it is no longer necessary. One principal stated that they do not really provide any professional development in this area.

Community and Family Support

For the purposes of the interview, we separated community and family support activities into three categories: afterschool, before school, and summer. For each category, principals provided information on what activities the school makes available, if they are available to all students, if families

can participate, and if the school developed the activity to meet SAGE requirements. Principals responded to these questions with a wide variety of extracurricular and community programs that their schools provide. Generally, these activities fit into one of four categories for afterschool and before school: enrichment, partnerships, academic assistance, and family interaction. The one before school activity that did not fit into these categories was a breakfast program that five of the principals reported having.

- **Enrichment Activities:** The enrichment activities provided by the interviewed SAGE schools are open to all students, have some parent interaction if the parents help out with teaching or volunteer, and provide extracurricular support for the students. These activities include community school projects, student council, afterschool clubs, Lego club, book club, mathematics and literacy support, jump rope club, choir, chess club, study centers, and extended learning opportunities.

- **Partnerships:** Partnership afterschool activities utilize support from a community organization. Examples of these activities include partnerships with the YMCA, the 21st Century afterschool program with the Boys & Girls Club, Boy Scouts, and Girl Scouts. These activities are open to all students and parents are free to volunteer as well.

- **Academic Assistance:** Academic assistance takes the form of a targeted program for select students. These activities are not open to all students and are typically invitation-only when a teacher thinks that a student needed additional support. Parents do not generally participate in these activities. Examples of academic assistance activities include Kids Achieve Together, tutoring, mathematics development, and literacy development.

- **Family Interaction Activities:** Family interaction activities are usually once-a-month occurrences where parents, teachers, and students gather for communication and collaboration. Parent support and participation are integral to the functioning of these activities, and all students are welcome to attend. Examples of these activities include family and children nights, Dr. Seuss night, Back-to-School Night, and family SAGE night. One school also provides a family English Language Learner night with translators to aid communication between the principal, teachers, parents, and students.

For summer activities, nine of the twelve principals reported having some version of summer school. Other summer activities, with one principal responding for each, include a take-home book program, a school garden, a school library, Jump Start, one-to-one tutoring, and reading logs. One of the schools reported that they do not have any summer activities.

When asked if they developed their activities as a result of SAGE requirements, principals reported that the vast majority of their programs would exist regardless of whether or not their school had the SAGE program. Four principals reported that they improved at least one already existing program due to the SAGE program. Four principals reported that they developed at least one of their

activities due to SAGE program requirements. One principal said she focused on the SAGE philosophy in their summer school program by keeping class sizes in summer school below the SAGE class size limits.

Instructional Practices

To examine the instructional practices used in SAGE schools, principals answered questions related to what instructional practices their school uses, if there are differences between grades, how their school takes advantage of smaller class sizes in kindergarten through third grade, and what additional activities or support they provide to students through the SAGE program. As with professional development and extracurricular and community programs, principals responded with a wide variety of instructional practices occurring within their schools. Common responses included the "The Daily 5" program (3 responses), using assessment data to drive instruction (5 responses), individualized instruction (3 responses), guided reading (2 responses), and differentiated instruction (2 responses). Table 44 provides a list of instructional practices principals provided for kindergarten through third-grade students.

Table 44: K-3 instructional practices in SAGE schools

Response	Number Responded
Using assessment to drive instruction	5
The Daily 5	3
Differentiated instruction	2
Guided Reading	2
Individualized instruction	3
Hands-on activities in mathematics	1
Instruction beyond the student's grade level	1
Optimal Learning Model	1
Response to intervention (RtI)	1
Peer assistance	1
Small-group instruction	1
Workshop instruction for mathematics	1
Multi-teacher large-group instruction	1
Balanced Literacy	1

Eight out of twelve of the principals interviewed said that there are no differences in instructional practices in kindergarten through third grade, and the same number said that there are no differences in instructional practices once students move to fourth and fifth grade, aside from larger class sizes. The principals that noted differences between grades responded that there is more of a progression between grades, where newer material builds off of material already learned by students, that there is more of a workshop model in older grades, and that there is more group instruction as opposed to one-on-one instruction.

When asked about how their schools utilized small classes in kindergarten through third grade, six out of twelve principals noted that it allows for more one-on-one or individualized instruction. Five principals also stated that small class sizes allow for easier identification and implementation of

interventions for students. Other responses included that smaller classes allow for more student-specific content (1 response), small-group instruction (2 responses), differentiation (1 response), scaffolding (1 response), more time to review student data (3 responses), and strategic placement of students into classrooms and small groups (3 responses).

While the majority of principals (nine of twelve) stated that their school provides no additional activities or support through the SAGE program, three principals noted some form of additional support due to SAGE. One principal each reported that they are able to perform more mathematics intervention for students, provide instructional resource teachers, and support online registration due to the SAGE program.

SAGE Funding

The last focus area for the interviews was to determine how SAGE schools use their SAGE funding. To find out about this topic, principals answered three questions: how their school uses SAGE funding, if the extra funding from SAGE covers the expenses associated with participating in SAGE, and, if SAGE funding does not cover all expenses, how else they might be covering expenses. One principal did not know the answer to these questions as the school district handles the budget. The remaining 11 principals responded that their SAGE funding goes to teacher salaries and benefits. Of these, three responded that they have extra funding left over for other supplies and activities. Each principal said they use their leftover SAGE funds for activities related to SAGE classrooms and programming: SAGE family nights and manipulatives for the students, technology and books for their school, and afterschool programming. One principal was not sure if their SAGE funding covers all of the expense, but she thought that the district also uses SAGE funds to provide professional development.

One of these principals explained that their district has difficulty estimating how much SAGE money they will receive each year because the funding is pro-rated. Although their school usually has a surplus, this principal was concerned that in some years, the school over-estimates the amount of SAGE funding they will receive, forcing the district to make up the difference.

Five of the principals stated that the funding from SAGE covers the expense of participation in the program while five of the principals said that it is not enough. Of the five principals that do not have enough SAGE funding to cover participation, two principals do not know how they cover the rest of the expenditures as the district handles the budget for teacher salaries and benefits, one principal said their school uses Title I funding, another principal said their school uses general funds to cover the expense, and the other principal said that the money comes from their school funds.

Survey Results

In order to understand views about the SAGE program across the state, VARC added items to the SAGE EOY survey that SAGE principals and school administrators complete for DPI. DPI fielded the 2013 survey in May and June. In those couple of months, 424 respondents completed the survey. These respondents came from 424 SAGE schools in 213 districts, covering nearly all of the SAGE schools in the state.

The following section analyzes survey items developed by the evaluation team and by staff at DPI to better understand how SAGE schools implement SAGE, teacher perceptions of the SAGE program, SAGE funding and resources, non-achievement outcomes, classroom designs and instructional practices, and the use of benchmark assessments for SAGE grades.[5] Because these results come from a near census of SAGE schools, the evaluation team is confident that these results reflect the population of SAGE schools across the state.

Expected SAGE Implementation in 2013-14

In order to implement the SAGE program, some SAGE schools use specific classroom designs to maximize resources and keep classroom sizes at or below the 18:1, 30:2, and 45:3 ratios. Table 45 illustrates that more than a quarter of SAGE schools will continue (25.7 percent) or plan to implement (2.4 percent) multi-age classrooms in their schools in 2013-14. Multi-age classrooms often contain students from two adjacent grade levels such as kindergarten and first-grade students or second- and third-grade students. Table 45 does not specify how many classrooms in SAGE schools are multi-age classrooms, so it is possible that in many of these schools, only one classroom is multi-age.

Table 45: Expected operation of multi-age classrooms (DPI question)

	Number of Respondents
Yes, we will continue with and/or add to our current multi-age classrooms.	109 (25.7%)
Yes, we will have new multi-age classrooms for the first time at our school.	10 (2.4%)
No, we will not have any multi-age classrooms.	305 (71.9%)

Table 46 shows that team teaching is equally as popular as multi-age classrooms in SAGE schools. Nearly 25.9 percent of schools will continue to implement team teaching in the 2013-14 school year, while 3.1 percent will start team teaching in 2013-14. Like Table 45, Table 46 does not describe how many classrooms in SAGE schools use team teaching. It is possible that many schools only have one classroom that implements team teaching for student instruction.

Table 46: Expected operation of team-teaching classrooms (DPI question)

	Number of Respondents
Yes, we will continue with and/or add to our current team-teaching classrooms.	110 (25.9%)
Yes, we will have new team-teaching classrooms for the first time at our school.	13 (3.1%)
No, we will not have any team-teaching classrooms.	301 (71.0%)

Table 47 shows how many schools will implement SAGE at different grade levels. A new law in effect allows SAGE schools to opt out of either second grade, third grade, or both second and third grade in 2013-14. Nearly all schools (96.5 percent) will implement SAGE in kindergarten through thrid grade for the 2013-14 school year. About 1.9 percent will only implement SAGE class requirements in

[5] For the full list of survey items, please refer to Appendix C.

kindergarten through second grade, while 1.7 percent will only implement the requirements in kindergarten through first grade.

Table 47: Expected SAGE grades (DPI question)

	Number of Respondents
K-3	409 (96.5%)
K-2	8 (1.9%)
K-1	7 (1.7%)
K-1 and 3	0

For those schools that will not implement SAGE in all grades kindergarten through third, the survey asked why schools choose not to implement SAGE in grades 2 and/or 3. As Table 48 shows, six schools expect to have class sizes too large in grades 2 and/or 3 to maintain required SAGE class size ratios of 18:1, 30:2, or 45:3. The next most common reason is budget, with five schools saying they cannot afford to implement SAGE. Two schools mentioned that the academic needs of students at specific grade levels prevents them from implementing SAGE class size requirements at grades 2 and/or 3, and two other respondents said they have open enrollment and cannot control class sizes for these grades.

The largest response, though, was for "other." Respondents wrote in responses for why they chose other, and overwhelmingly, those who chose "other" most often said that their school does not have grades 2 and/or 3 (seven schools). One respondent noted that it is not feasible for their school to hire new teachers next year to maintain SAGE class size requirements, one respondent noted a lack of space for new teaching staff needed for grades 2 and 3, and another respondent said that their Spanish immersion program prevents their school from implementing SAGE in third grade.

Table 48: Reasons for not implementing SAGE in grades 2 and/or 3 (DPI question)

Reason	Number of Respondents
Projected class sizes too large to maintain 18:1 or 30:2 class size requirement	6 (1.4%)
Budget	5 (1.2%)
Academic needs of students at specific grade levels	2 (0.5%)
Open enrollment	2 (0.5%)
Other	10 (2.4%)

School Administrator and Teacher Perceptions about SAGE

To find out how satisfied school administrators at SAGE schools are with the program, the survey asked about their satisfaction as well as their teachers' satisfaction with SAGE. Of the principals and school administrators who responded to the survey, 78.1 percent said they are extremely satisfied with the SAGE program, 18.4 percent said they are mostly satisfied, 2.8 percent noted they are satisfied, and 0.7 percent responded that they are somewhat satisfied.

Table 49: Satisfaction with SAGE program

	Number of Respondents
Extremely Satisfied	331 (78.1%)
Mostly Satisfied	78 (18.4%)
Satisfied	12 (2.8%)
Somewhat Satisfied	3 (0.7%)
Not Satisfied	0
I Don't Know	0

Another important aspect of SAGE is teacher perceptions about the SAGE program. In interviews with principals earlier in spring 2013, most of the interviewees said the teachers in their school like the SAGE program, even teachers who do not teach SAGE grades in their school. Table 50 illustrates how widespread this feeling is in SAGE schools across the state. The distribution of responses is similar to Table 49, with 78.3 percent of administrators reporting that their teachers are extremely satisfied with the SAGE program, 20.0 percent saying they are mostly satisfied, and 1.7 percent noting that their teachers are satisfied with the program.

Table 50: Satisfaction of teachers with SAGE program

	Number of Respondents
Extremely Satisfied	332 (78.3%)
Mostly Satisfied	85 (20.0%)
Satisfied	7 (1.7%)
Somewhat Satisfied	0
Not Satisfied	0
I Don't Know	0

Likely because of this positive view of the SAGE program, most schools mention SAGE when they recruit teachers. Over 94 percent of administrators said they mention the SAGE program at some point in the teacher recruitment process, with only 3.3 percent noting that they do not mention SAGE at all.

Table 51: Mention SAGE programs in teacher recruitment process

	Number of Respondents
Yes	399 (94.1%)
No	14 (3.3%)
I Don't Know	11 (2.6%)

Most respondents also mentioned that the SAGE program is useful in recruiting effective teachers to their schools. Of the school administrators who responded, 42.0 percent said that the SAGE program is useful to a great extent in recruiting effective teachers, 33.3 percent reported it is useful to a moderate extent, 13.2 percent said to some extent, and 2.6 percent reported to a small extent. Only 3.5

percent of schools reported that the SAGE program is not at all useful in bringing effective teachers to their school.

Table 52: Extent of usefulness of SAGE to recruit effective teachers to respondent's school

	Number of Respondents
To a Great Extent	178 (42.0%)
To a Moderate Extent	141 (33.3%)
To Some Extent	56 (13.2%)
To a Small Extent	11 (2.6%)
Not at All	15 (3.5%)
I Don't Know	23 (5.4%)

Likewise, respondents also said that the SAGE program is useful in retaining effective teachers to their school. More than half (52.4 percent) reported that the program is useful to a great extent, 25.0 percent said to a moderate extent, 10.6 percent reported to some extent, and 4.0 percent said to a small extent. A small fraction of respondents (5.4 percent) said that the SAGE program is not at all useful in retaining effective teachers in their schools.

Table 53: Extent of usefulness of SAGE to retain effective teachers in respondent's school

	Number of Respondents
To a Great Extent	222 (52.4%)
To a Moderate Extent	106 (25.0%)
To Some Extent	45 (10.6%)
To a Small Extent	17 (4.0%)
Not at All	23 (5.4%)
I Don't Know	11 (2.6%)

SAGE Funding and Resources

One concern that principals raised during the qualitative interviews about the SAGE program was that they do not receive enough money from DPI to fully fund the SAGE program within their schools. Table 54 shows what proportion of SAGE program expenses schools reported receiving from the state. Although nearly four of ten schools (39.9 percent) received 76-100 percent of the funding they need for the SAGE program from the state, nearly one-fifth (20.3 percent) only received 51-75 percent of the necessary funding from the state, while 27.1 percent reported only receiving 26-50 percent of the funding they need from the state. More than one out of ten schools (12.7 percent) said they receive less than a quarter of the funding they need from the state to implement the SAGE program.

Table 54: Proportion of school SAGE expenses covered by state funding for 2012-2013

	Number of Respondents
76-100%	169 (39.9%)
51-75%	86 (20.3%)
26-50%	115 (27.1%)
0-25%	54 (12.7%)

The survey also asked respondents how their schools utilize the SAGE funding they receive. Table 55 shows that nearly all of the schools (99.3 percent) use SAGE funding for teacher salaries and benefits. In a distant second are student materials, with 15.6 percent of respondents reporting that they use their SAGE money this way, and 13.4 percent said they use their SAGE funding for teacher materials. Other popular reasons included afterschool and evening programming (9.0 percent), summer programming (2.8 percent), and before school programming (1.4 percent). Ten respondents listed other ways they use SAGE funding, including fieldtrips (three responses), professional development (three responses), technology (one response), and additional help for reading and mathematics interventions (one response).

Table 55: Resources SAGE funding supports in respondent's school

	Number of Respondents
Teacher Salaries and Benefits for SAGE Classrooms	421 (99.3%)
Student Materials	66 (15.6%)
Teacher Materials	57 (13.4%)
Afterschool and Evening Programming	38 (9.0%)
Summer Programming	12 (2.8%)
Before-School Programming	6 (1.4%)
Other	10 (2.4%)

Knowing that having enough resources to implement SAGE may be a struggle for many schools, the evaluation also wanted to know how many schools have problems finding the physical space in their buildings for SAGE classrooms. Table 56a shows that 99.1 percent of schools have no space problems; only one school reported any problems finding space for SAGE classrooms. However, as Table 56b shows, for that school, the physical space restrictions in their building do not restrict decision making around student learning activities. That is, this school does not have to give up or alter student activities because they have problems finding enough space in their building to meet SAGE classroom requirements.

Table 56a: Whether or not respondent's school has enough space to fulfill SAGE classroom requirements

	Number of Respondents
Yes	420 (99.1%)
No	1 (0.2%)
I Don't Know	3 (0.7%)

Table 56b: (If not enough space) Whether or not limited classroom space restricts decisions for student learning activities

	Number of Respondents
Yes	0
No	1 (100%)
I Don't Know	0

Non-Achievement Outcomes

Based on principal interviews in the spring, the evaluation wanted to find out how many schools report non-achievement outcomes because of the SAGE program. Although this evaluation cannot measure these outcomes with current assessments, principals in the qualitative interviews said that many of these outcomes are just as important to student learning. Table 57 shows the number of respondents who saw some of these outcomes from the SAGE program in their schools, including better relationships between teachers and students (99.8 percent), less time lost to classroom management (98.8 percent), and more time for individual interactions (98.8 percent).

Table 57: Outcomes respondents see from SAGE programming in their schools

Outcomes	Number of Respondents
Better relationships between teachers and students	423 (99.8%)
Less time lost to classroom management	419 (98.8%)
More time for individual interactions	419 (98.8%)
Better student attitudes toward school	412 (97.2%)
Reduction in student behavioral problems	411 (96.9%)
More positive interaction between teachers and parents	409 (96.5%)
Increased student achievement	402 (94.8%)
More participation from students in class	402 (94.8%)
Students engage with student-specific interventions	380 (89.6%)
More parent volunteers in classrooms	374 (88.2%)
Better teacher morale	190 (44.8%)
Other	78 (18.4%)

Table 58 includes other outcomes that respondents listed from the SAGE program in their schools. The most popular other outcome is more collaboration among grade-level colleagues as well as all teachers in their school (1.0 percent).

Table 58: Other outcomes respondents listed from SAGE programming in their schools

Other Outcomes	Number of Respondents
More collaboration among grade-level colleagues and among teachers in general	5 (1.0%)
Attracts open enrollment Better coordination of interventions for Response to Intervention Increased differentiation More technology in school More one-on-one instruction and interventions Increased parent confidence and satisfaction in school Stronger teacher teams More individualized interventions Teachers know their students better and earlier in the school year Time for additional social and/or emotional supports for students	2 (0.4%)
Better communication with parents More professional growth among teachers Better student foundation for continued achievement Better student morale Better understanding with families Building instructional knowledge of staff Community building More choices for opportunities during lunch recess and afterschool More focus on small groups More individual attention for families Increased literacy achievement Increased positive self-concept of students More staff development opportunities Increased behavior intervention opportunities Helps parents understand importance of education at primary level Less grade retention More time to reteach and provide effective interventions More options to separate students with behavior problems More positive interaction between students More space in classrooms More teacher attention to individual needs Closing the achievement gap Improved school climate Increased teacher job satisfaction More resources for interventions Quicker response to student needs Students feel connected to adults in schools Students familiar with all staff at school Students know themselves better as learners and individuals Stronger teacher-student connections	1 (0.2%)

Classroom Design and Instructional Strategies

The survey asked about classroom designs and instructional strategies that schools may implement because of the smaller class sizes in kindergarten through third grade. Table 59 shows the variety of instructional strategies SAGE schools implement. The most popular is one-on-one time with teachers (62.5 percent), followed by small-group instruction (55.4 percent), strategic placement of students in groups (53.1 percent), and differentiation of instruction (51.4 percent). Fourteen respondents included other strategies they use such as flexible and dynamic grouping; guided reading with rich texts; individual student plans; response to intervention time; single-gender classrooms; and support from special education, speech and language, and ESL staff. Only one respondent listed each of these other strategies.

We should note that because of this question's wording on the survey, it is not clear that these responses reflect instructional strategies the schools implement regardless of smaller class sizes or that schools use these designs and strategies in SAGE grades.

Table 59: Instructional strategies teachers use with students in respondent's school

Instructional Strategy	Number of Respondents
One-on-one time with teachers	265 (62.5%)
Small-group instruction	235 (55.4%)
Strategic placement of students in groups	225 (53.1%)
Differentiation of Instruction	218 (51.4%)
Strategic placement of students in classrooms	184 (43.4%)
Scaffolding	139 (32.8%)
Instructional resource support	135 (31.8%)
Student-specific content	132 (31.1%)
Clustering	112 (26.4%)
Tutoring	74 (17.5%)
Parent interactions with students in the classroom	57 (13.4%)
We don't use any specific instructional strategies because of smaller class sizes	114 (26.9%)
Other	14 (3.3%)

Table 60 shows the variety of classroom designs SAGE schools implement. Over half (56.1 percent) of schools implement small groups across classrooms, though the survey did not inquire for which subjects. About 20.8 percent of respondents said their school does not use any specific classroom design because of smaller class sizes. Over five percent of respondents noted that their school implements other strategies that the survey did not ask about, as seen in Table 61. Most of the classroom designs in Table 61 reflect instructional strategies listed in Table 59.

Table 60: Smaller class size classroom designs in respondent's school

Classroom Design	Number of Respondents
Small groups across classrooms	238 (56.1%)
Team teaching	133 (31.4%)
Multi-grade classrooms	91 (21.5%)
We don't use any specific classroom designs because of smaller class sizes	88 (20.8%)
Other	23 (5.4%)

Table 61: Other smaller class size classroom designs in respondent's school

Other Classroom Design	Number of Respondents
One-on-one instruction	4 (0.8%)
Daily 5	3 (0.6%)
Intervention/enrichment blog English/bilingual collaboration	2 (0.4%)
Co-teaching with ELL and Special education teachers Intervention time across classes Support grouping among classrooms Individual student plans Student-led conferences Multi-class grouping Leveled ability instruction Added additional reading time	1 (0.2%)

Benchmark Assessments

Because of the limited number of schools using the MAP test in kindergarten through third grade, the survey asked how many schools use assessments for benchmark purposes in SAGE grades. Nearly all respondents noted they use benchmark assessments, ranging from 98.6 percent in first grade to 98.1 percent in third grade, as seen in Table 62. We should note that the survey item did not ask about the type of assessments used, so Table 62 may reflect standardized assessments or school- or teacher-created assessments used for benchmark purposes.

Table 62: Grades in which students take assessments for benchmarking purposes

	Number of Respondents
Kindergarten	417 (98.3%)
1st Grade	418 (98.6%)
2nd Grade	417 (98.3%)
3rd Grade	416 (98.1%)

Conclusions

This report encapsulates the evaluation work completed by VARC to understand the impact and outcomes of the SAGE program throughout Wisconsin. At the outset of this year 8 evaluation of the SAGE program, our goal was to answer several quantitative and qualitative research questions. This section of the report summarizes the results from our quantitative statistical analysis, our interviews with principals, and the results from the EOY survey in an attempt to answer these questions. Following this, we examine the limitations of our analyses and how we can improve our work for future evaluations of the SAGE program.

Summary of Results

Summary of Quantitative Findings

This evaluation utilized results from the 2011-12 MAP assessment along with demographic data to analyze the impact of the SAGE program on improving student growth in both mathematics and reading. Because not all students throughout the state take the MAP assessment, and the data limited our sample to only SAGE districts, we first examined how our sample compared to the general population of SAGE and non-SAGE students throughout the state. We found larger proportions of African-American and economically disadvantaged students and fewer proportions of white students in our sample than in the general population. These differences were larger in the earlier grades and diminished by third grade. This indicates a possible limited generalization of our evaluation's results to the larger population of all SAGE students, especially in the earlier grades. We did not dismiss our evaluation's results outright, though, as the sample represents over one-third of the entire population of SAGE and non-SAGE students in SAGE districts.

By examining the variance in characteristics between SAGE and non-SAGE schools and students within our sample, we also noticed other differences. SAGE schools in our sample had a higher proportion of African-American students, a higher proportion of economically disadvantaged students, a higher proportion of students residing in rural districts, and a lower proportion of white students. Given these differences, the analysis uses a two-stage statistical model to evaluate the differences between SAGE and non-SAGE student growth on average while controlling for many of these characteristics.

General results from the analysis found a trend of positive and significant effects of the SAGE program on mathematics and reading growth in kindergarten, a slightly smaller effect in first grade, a small effect in second grade, and a near zero effect in third grade as compared to students in non-SAGE schools. To determine if any difference in impact existed for a particular subset of the sample, we also examined differential effects. Overall, results from the differential effects analysis followed the general trend closely with little variation for economically disadvantaged students, non-economically disadvantaged students, students with English proficiency, females, males, African-American students, Hispanic students, white students, students residing in non-Milwaukee urban districts, and for all students given that we control for peer characteristics.

A few differential effects for subsets of the sample deviated from this trend, however. The SAGE program has little estimated impact on limited-English proficient students and American Indian students on mathematics and reading growth in kindergarten. While we estimated results close to the trend for Asian students in reading, we only estimated a negative and significant impact of the SAGE program on mathematics growth for Asian students in third grade with no significant impact in kindergarten through second grade. This suggests that the SAGE program may not benefit Asian students in mathematics; however, our sample contained very few Asian students, which may have impacted these results. In Milwaukee, we also found different results of the SAGE program on mathematics growth with only small, positive, and significant impacts in kindergarten and second grade. In first grade, we found small, negative, and significant impacts on mathematics growth. Overall, these results suggest that while the SAGE program may not have a universal impact on all types of students, in general, the SAGE program may have a positive impact on student growth in the earlier grades.

Summary of Interview Findings

Through interviewing principals at SAGE schools, this evaluation collected information about how schools implement the SAGE program. We focused the interview questions on four areas: teacher impact, student and community programming, instructional practices, and funding. All of the principals interviewed responded that the SAGE program worked well within their school and that teachers found the program to be useful. The vast majority also felt that having the SAGE program in their school helped to recruit and retain effective teachers. While principals reported a variety of professional development used at their schools, the majority integrated some form of professional development around small class size instructional strategies to make better use of the SAGE program.

Principals responded with a wide range of afterschool and before school activities available to students and families as well. These activities fit into four broad types: enrichment, partnerships, academic assistance, and family interaction. In addition to these themes the most common before school activity was a breakfast program. In terms of summer activities, the majority of principals reported having some form of summer school. While principals reported that their schools did not develop the majority of these programs specifically for SAGE requirements, some noted that having these requirements helped them to improve their community-oriented programming.

As with professional development and community support programs, principals also responded with a large variety of instructional practices occurring in kindergarten through third grade. The majority of principals noted that between kindergarten and third grade, they saw few differences in instructional practices. Fewer principals thought the same in the transition to fourth and fifth grade, where larger class sizes existed. To take advantage of the small class sizes in their schools, principals commonly reported that teachers used more one-on-one instruction and could more easily identify and implement interventions.

Nearly all of the principals reported that their SAGE funding went toward teacher salaries and benefits, with a minority stating that they had leftover funds for additional materials or programming. Just more than half thought that the SAGE funding was sufficient to cover the expense of participating in

SAGE. Those schools that did not receive enough funding to cover the expense of participation supplemented these funds with Title I or general funding.

Summary of Survey Results

This evaluation shows that overall, school administrators are satisfied with the SAGE program and use program funds for a variety of purposes in their school. About a quarter of SAGE schools will implement team teaching and multi-age classrooms in SAGE grades, and nearly all SAGE classrooms implement instructional strategies that may be enhanced by the small class sizes required by SAGE. Principals and school administrators also perceive many positive outcomes for both teachers and students because of the SAGE program, such as the need for less classroom management and more time for individualized instruction and interventions for students.

However, many schools report that the funding they receive from the state for SAGE, which the state bases on the number of students in their school in SAGE grades who are eligible for free or reduced price lunch, do not fully cover the expenses of implementing the SAGE program. These expenses include teacher salaries and benefits for SAGE classrooms, afterschool and summer programming, and student and teacher materials. But the fact that schools continue to implement SAGE year after year despite these funding shortfalls shows how much these schools value the SAGE program for both their teachers and students.

Limitations and Future Analyses

While this evaluation of the SAGE program held high standards for analysis, it was not without limitations. This section provides an overview of many of the major limitations to this evaluation and how we will strive to reduce these limitations in future analyses.

In an idealized approach to the quantitative evaluation, our analysis would have randomly assigned SAGE funding and requirements to schools throughout Wisconsin. The schools receiving SAGE would then be the treatment group while the remaining schools would be the control group. All students would take the same test and we could compare the outcomes and provide efficient and unbiased estimates of the SAGE effects. For obvious reasons, this approach is not feasible; however, each year, VARC and DPI have collaboratively worked together to find ways to improve the quality of the data and the statistical method in order to provide the most accurate evaluation results. Despite this, sources of bias still remain and we still strive to lessen their impact.

VARC identified two sources of potential downward biases of the estimates of the SAGE program effects which we can improve upon. The first is the presence of small class sizes in non-SAGE schools and the second is the non-random selection in to the SAGE program.

Small Class Sizes in Non-SAGE Schools

By design, SAGE is an initiative reducing class size for schools with large proportions of lower income students. The current data availability only allows for a comparison in performance between schools receiving SAGE funding and the ones not receiving SAGE funding without controlling for class size. In reality, some schools categorized as non-SAGE can meet the SAGE class size requirements or

even exceed overall per pupil funding. This can result from such schools receiving other sources of funding or making class size reduction a priority when allocating their funds. The presence of these low-class size schools leads to a contamination of our control group and a likely downward bias of the estimate of SAGE effects. VARC will continue to look for ways to reliably measure class sizes in non-SAGE schools as well as possibly examining the impact of funding differences between SAGE and non-SAGE schools.

Non-Random Selection

The selection process for schools to receive SAGE funding is by design nonrandom. To qualify under the majority of entry years, schools had to have a minimum level of poverty. VARC will continue to ameliorate the statistical methods we use to control for this selection. One possible future improvement is the use of propensity matching models to compare like students or schools based on their similar characteristics.

Limited Rural Control Group

The differential effects of SAGE on subpopulations of student estimates suffer from similar biases to the ones presented above. Moreover, the 2011-2012 school year had insufficient data on rural schools due to a limited number of rural schools in the non-SAGE rural control group taking the MAP assessment. Hence, VARC was not able to estimate differential effects using the rural category. Unless MAP is not widely used in rural districts in 2012-2013, the availability of MAP data for all schools administering the test in Wisconsin should allow VARC to estimate differential SAGE effects for rural populations in the coming years.

Non-Academic Outcomes

Another major limitation is our reliance upon the MAP assessment for an outcome. At this point of the SAGE program, we can only measure the effects of class size reduction on test scores. However, there is evidence in the literature that greater quality classrooms and, in particular, small class sizes have positive impacts on non-cognitive untested skills, which in turn have large impacts on life outcomes. Chetty, Friedman, Hilger, Saez, Schanzenbach, and Yagan (2011)[6] found that students in small class sizes were more likely to enroll in college by the age of 20. Additionally, students in small classes exhibit statistically significant improvements on a summary index of home ownership, 401(k) savings, mobility rates, percent college graduates in ZIP code, and marital status. Finn Gerber and Boyd-Zaharias (2005)[7] showed that students in small class sizes are more likely to complete high school, and Krueger and Whitmore (2001)[8] showed that authorities are less likely to arrest these students for crime. In general, Chetty *et. al.* (2011) show that a better classroom environment from ages 5 to 8 has substantial

[6] Chetty, R., Friedman, J., Hilger, N., Saez, E., Schanzenbach, D., & Yagan, D. (2011). How Does Your Kindergarten Classroom Affect Your Earnings? Evidence from Project STAR. *Quarterly Journal of Economics, 126* (4), 1593-1660.

[7] Finn, J. D., Gerber, S. B., & Boyd-Zaharais, J. (2005). Small Classes in the Early Grades, Academic Achievement, and Graduating from High School. *Journal of Educational Psychology, 97* (2), 214-223.

[8] Krueger, A. B. & Whitmore, D. M. (2001). The Effects of Attending a Small Class in the Early Grades on College-Test Taking and Middle School Test Results: Evidence from Project STAR. *The Economic Journal, 111*, 1-28.

long-term benefits even without intervention at earlier ages. The authors also document the fade-out and re-emergence effects and the potential role of non- cognitive skills in explaining this pattern.

The qualitative work on the evaluation this year identified some of these non-achievement outcomes of the SAGE program in SAGE schools. Although these outcomes were more short-term and school-related than the research cited above, many principals and school administrators saw positive impacts of the SAGE program on teacher recruitment and retention, classroom management, and teacher relationships with students and parents. The principal interviews and surveys did not measure these intangible impacts, so it is not clear from the results if these impacts are felt across SAGE classrooms or even school-wide. The qualitative work also did not measure these impacts for intensity, so it may be that principals see these impacts for some students and classrooms but not for others. Further, the survey asked about these impacts due to "small class sizes" instead of for "SAGE programming" specifically which limits the validity of these findings. For next year's SAGE EOY survey, questions will better specify the impacts of the SAGE program more specifically rather than small class sizes in general.

Respondents' Imperfect Knowledge

Another problem VARC encountered in the principal interviews and the survey was how much information principals had about the SAGE program in their schools. Many principals currently in SAGE schools were not in their schools when the SAGE program began many years ago, so many were unable to describe how the school changed with the implementation of SAGE. Additionally, we discovered that many principals do not know what proportion of their school funding comes from state SAGE funds nor necessarily how much of their budget covers teacher salaries and benefits, materials, and activities related to the SAGE program. Some principals told us during interviews that their district determined the school budget, and a few principals marked "I don't know" on funding questions on the survey. Next year's survey will better differentiate between teacher salaries and benefits and other materials and activities for the SAGE program. Because nearly all schools reported using SAGE funding for teacher salaries and benefits, by separating these out from expenses related to SAGE programming materials and activities, principals may be able to more accurately report how much SAGE funding covers each of these expenses.

Overall, it is difficult to estimate the effect of the SAGE program given the fact that SAGE schools receive funding because they are facing adverse conditions that comparison schools do not. While VARC uses a variety of methods to alleviate some of these concerns and finds positive effects or small differences showing the success of the initiative on improving test scores, given the SAGE schools' circumstances in terms of high levels of poverty, ultimately we could see larger differences in achievement if SAGE was not available to them. Thus, we will continue to collaborate with DPI to improve our methods in future evaluations.

Appendix A: Technical Specifications

This appendix describes the statistical methods and data used by VARC to provide DPI with an estimate of how the SAGE program affected students' academic performance during the 2011-2012 school year.

For each district having at least one school receiving SAGE funding, DPI provided VARC with data describing students, schools, and student MAP test scores. Conceptually, the analysis uses statistical techniques to isolate the component of measured student knowledge that is attributable to the SAGE program from other factors such as prior knowledge and student characteristics.

Analysis Data Set

In a given school year, VARC created an analysis data set for each grade and subject. Since the SAGE program is for K-3 students, in any given year, eight different data sets are constructed. Each analysis data set must include for each student: a grade level, a pretest and a posttest, a value for each of the control variables used in the model, the ID of the school attended, and whether the school received SAGE funding. For each pretest, a measure of the standard error of measurement is also required.

Pretest and Posttest Scores

For each grade in both reading and mathematics, the fall MAP score in RIT scale points is the student's pretest score or the measure of the student's level of academic knowledge before they receive instruction from their teacher and school that year. Likewise, for each grade in both reading and mathematics, the spring MAP score in RIT scale points is the student's posttest or the measure of the student's level of academic knowledge after they received instruction from their teacher and school that year. The data on test scores are the most restrictive because the MAP assessment is not mandatory in Wisconsin, and in 2011-2012, only MAP scores from SAGE districts were available. Moreover, VARC can only utilize MAP data when schools administer the test to 75 percent or more of their students. Because value-added estimation requires a pretest and posttest score from each student, VARC dropped students missing a pretest or a posttest from the analysis.

Standard Errors of Measurement of Pretest Scores

VARC included standard errors of measurement (SEMs) to correct for measurement error associated with each pretest. NWEA provides these SEMs; each score in the same grade and subject has an associated SEM. Estimating the measured student achievement without controlling for pretest measurement error yields biased estimates of all parameters, including the SAGE effect coefficient. Estimating the desired parameters can be consistent if external information is available on the variance

of measurement error for prior achievement; Fuller's (1987) *Measurement Error Models*[9] describes approaches for consistent estimation in the presence of measurement error.

Biographical Student Variables

Gender, race, free and reduced price lunch status, and disability status come from the biographical dataset. Gender categories are male and female. Race categories are Asian, African-American, Hispanic, American Indian, and white. If a student has a disability, VARC assigned the disability status dummy variable a value of one; it is zero otherwise. Likewise, if a student was eligible to receive free or reduced price lunch, VARC assigned the poverty dummy variable a value of one, zero otherwise. Finally, if a student is qualified as being an English language learner, VARC assigned the ELL dummy variable a value of one, zero otherwise. VARC dropped students missing a value for one of these variables from the analysis.

The Statistical Method

Once VARC constructed the analysis datasets, the estimation of the SAGE effect occurs in three stages. The first two steps estimate the value-added coefficients for each school and each grade for both reading and mathematics.

Stage One Regressions

First, we need to estimate the value-added coefficients of all the schools in our sample. For this, we proceed to an O.L.S. estimation with measurement error correction. Formally, we can write the equation as

$$Y_2 = \lambda Y_1 + \mathrm{X}\beta' + S\alpha' + e \qquad (0.1)$$

Where,

- Y_2 is a vector of posttest scores. For each subject and grade, the spring MAP assessment is used.
- Y_1 is a vector of pretest scores. For each subject and grade, the fall MAP assessment is used.
- X is a matrix of student characteristics. It includes gender, race, English language learners, free or reduced price lunch, and disability.
- S is a vector of school dummy variables. Each line represents a student observation and each column a school. If student *i* is in school *k*, then the dummy equals to 1, and 0 otherwise.
- *e* is the error term.

We run a total of eight regressions, one for each grade and subject. From each regression, we obtain a vector of $\hat{\alpha}$ providing an estimation of each school's performance measured in test score gains in reading and mathematics, at each grade. Hence, each school has eight scores.

[9] Fuller, W. A. (1987). Measurement Error Models. *Wiley Series in Probability and Statistics.*

The estimated coefficient $\hat{\alpha}_{kg}$ for each school k and each grade g are then centered so that the estimates have a dose-weighted mean of zero. Formally,

$$\hat{\alpha}_{kg}^{centered} = \hat{\alpha}_{kg}^{c} = \hat{\alpha}_{kg} - \frac{\sum n_{kg}.\hat{\alpha}_{kg}}{\sum n_{kg}} \tag{0.2}$$

To simplify notation, we will further refer to the centered estimate as $\hat{\alpha}_{kg}$.

Stage Two Regressions

Once we obtain $\hat{\alpha}_{kg}$ for each school, subject, and grade, we use them as our dependent variable to estimate the effect of the SAGE program.

$$\hat{\alpha}_{kg} = \gamma + \xi.SAGE_k + \varepsilon \tag{0.3}$$

Where,

- γ is the intercept term
- $SAGE_k$ is a dummy variable equal to one if school *k* is receiving SAGE funding.
- ε is the error term

Thus we obtain eight values of $\hat{\xi}$, one for each grade and subject. Each indicates how the academic knowledge growth of students in SAGE and non-SAGE schools compare.

Differential Effects

In order to know how the SAGE program affects students in different categories of a given indicator variable *x* (where *x* refers to free and reduced lunch, gender, ELL, or disability status), we calculate a school by school O.L.S. regression to obtain the coefficients b_k:

$$\hat{\alpha}_{kg}^{c} + r_{ikg} = \delta + b_k.\left(x_{ikg} - \overline{x}_{kg}\right) + u_{ig} \tag{0.4}$$

Where,

- r_{ikg} are student *i*'s residuals obtained from the stage one constant effects value-added regression (equation 1.1).
- x_{ikg} is student *i*'s value for the categorical variable of interest (free and reduced lunch status).
- $\overline{x}_{kg}$ is the proportion of students in school *k* and grade *g* with *x* =1.
- u_{ig} is the error term.

Define,

$$\text{If } x = 1 \text{ then } \hat{\alpha}_{k,x=1} \equiv \hat{\alpha}_k + \hat{b}_k\left(1-\overline{x}\right)$$
$$\text{If } x = 0 \text{ then } \hat{\alpha}_{k,x=0} \equiv \hat{\alpha}_k + \hat{b}_k\left(-\overline{x}\right)$$

Finally, we run an O.L.S. regression of *x* variable differential effects on the SAGE indicator variable. Formally,

$$\begin{aligned} \hat{\alpha}_{x=1} &= a + \hat{\gamma}_{x=1}.SAGE_{kg} + e \\ \hat{\alpha}_{x=0} &= a + \hat{\gamma}_{x=0}.SAGE_{kg} + e \end{aligned} \tag{0.5}$$

Thus we obtain eight values of $\hat{\gamma}_{x=1}$, one for each grade and subject. Each indicates how the academic knowledge growth of students with a value of $x = 1$ in SAGE and non-SAGE schools compare. Likewise, we obtain eight values of $\hat{\gamma}_{x=0}$, one for each grade and subject. Each indicates how the academic knowledge growth of students with a value of $x = 0$ in SAGE and non-SAGE schools compare.

Appendix B: SAGE Principal Interview Protocol

Thank you for agreeing to talk to me today. I am part of a group working with DPI to study the SAGE program in schools in Wisconsin. We would like to understand how schools implement SAGE and what impact SAGE has had on K-3 students.

To get some context, I have a few questions about you and your school.

1. Tell me a little about yourself. What is your background?
    a. How long have you been a principal at this school?
2. How would you describe your school?
3. How would you describe the community you serve? How would you describe the families?

SAGE Program Overall Effectiveness

To begin the interview, I'd like to hear what you think about SAGE in your school.

1. In your opinion, how is the SAGE program working in your school?
    a. Who benefits the most from SAGE in your school? Does it benefit particular students more than others?
    b. How reflective is this year of your overall experience with the SAGE program in your school?

Professional Development and Teacher Opinions about the SAGE Program

We are interested in teacher opinions about how SAGE works in their schools.

2. What do teachers think of the SAGE program in your school?
    a. In your opinion, has SAGE affected your school's ability to recruit and retain teachers?
3. What sort of professional development are you providing to your teachers?
    a. Do you provide professional development around small class size instructional strategies?

Extracurricular and Community Programs

The SAGE program law requires schools to connect to families and the local community through programs outside of the school day. I'd like to know more about the programming offered at your school.

4. What kinds of afterschool activities and programs do you offer students?
    a. Are these programs available to all students?
    b. Do families participate in these activities?
    c. Was this program developed to meet SAGE program requirements?
5. What kinds of before-school activities and programs do you offer students?
    a. Are these programs available to all students?
    b. Do families participate in these activities?

    c. Was this program developed to meet SAGE program requirements?
6. What kinds of summer activities and programs do you offer students?
    a. Are these programs available to all students?
    b. Do families participate in these activities?
    c. Was this program developed to meet SAGE program requirements?

K-3 Curricula and Instructional Practices

The smaller class sizes required by SAGE often affect instructional practices in SAGE schools. We would like to know more about your teachers' instruction In K-3 and beyond.

7. How would you describe the instructional practices in K-3?
    a. Are they different for each grade? If so, how?
    b. Are they different from the instructional practices in grades 4 and 5?
8. How is your school taking advantage of the smaller class sizes in K-3?
9. What additional activities and support, if any, is your school providing through the SAGE program?

SAGE Funding

In our study of SAGE schools, some schools have told us they have money left over from SAGE to spend on other programs and projects in their schools. Other schools say that they do not have enough money to implement SAGE-related initiatives.

10. To implement the SAGE program, how does your school use the money provided by SAGE funds?
    a. Does the extra funding you receive through the SAGE program cover the expenses of participating in SAGE?
    b. If not, how else are you covering the expenses?

Those are all of the questions I have for you today. Is there anything else you would like to add about the SAGE program that you think would be useful to know? Thank you for your time today.

Appendix C: SAGE End-of-Year Report Survey

Section 1: School Information

District Name: _____

School Name: _____

Name of person completing this report: _____

Title of person completing this report: _____

Phone number of person completing this report: _____

E-mail address of person completing this report: _____

Section 2: Planning for Next Year

1. Will this school continue to participate in the SAGE program next year?
    a. Yes
    b. No

2. Will your school operate any multi-age classrooms next year?
    a. Yes, we will continue with add/or add to our current multi-age classrooms
    b. Yes, we will have new multi-age classrooms for the first time at our school
    c. No, we will not have any multi-age classrooms
3. Will your school operate any team-teaching classrooms next year?
    a. Yes, we will continue with add/or add to our current team-teaching classrooms
    b. Yes, we will have new team-teaching classrooms for the first time at our school
    c. No, we will not have any team-teaching classrooms

4. This school plans to implement SAGE in grades:
    a. K-3
    b. K-2
    c. K-1
    d. K-1 and 3

5. If your school is not planning to implement SAGE in grade 2 and/or grade 3 which of the following factors will contribute to this decision? *Please choose all that apply*.
    a. Budget
    b. Projected class sizes too large to maintain 18:1 or 30:2 class size requirement
    c. Academic needs of students at specific grade levels
    d. Open enrollment
    e. Other (*please specify)*

Section 3: Teacher Perceptions

6. How satisfied are you with SAGE in your school?
    a. Extremely satisfied
    b. Mostly satisfied
    c. Satisfied
    d. Somewhat satisfied
    e. Not satisfied
    f. I don't know

7. Overall, how satisfied do you think your teachers are with SAGE in your school?
    a. Extremely satisfied
    b. Mostly satisfied
    c. Satisfied
    d. Somewhat satisfied
    e. Not satisfied
    f. I don't know

8. Do you mention the SAGE program to teachers in your recruitment process?
    a. Yes
    b. No
    c. I don't know

9. How much do you think that the SAGE program has affected your ability to recruit effective teachers to your school?
    a. To a great extent
    b. To a moderate extent
    c. To some extent
    d. To a small extent
    e. Not at all
    f. I don't know

10. Do you think that the SAGE program has affected your ability to retain effective teachers in your school?
    a. To a great extent
    b. To a moderate extent
    c. To some extent
    d. To a small extent
    e. Not at all
    f. I don't know

Section 4: Funding/Resources

11. How much of the SAGE program expenses in your school did the state funding provided for the SAGE program cover in the 2012-2013 school year?
    a. 76-100%
    b. 51-75%
    c. 26-50%
    d. 0-25%

12. What does the SAGE funding contribute to in your school? *Please select all that apply.*
    a. Teacher salaries and benefits for SAGE classrooms
    b. Afterschool and evening programming
    c. Before-school programming
    d. Summer programming
    e. Student materials
    f. Teacher materials
    g. Other (*please specify)*

13. Does your school have enough classrooms to allow you to maintain the SAGE class size requirements?
    a. Yes
    b. No
    c. I don't know

14. If not, does the limited number of classrooms in your school restrict your decisions for student learning activities?
    a. Yes
    b. No
    c. I don't know

Section 5: Non-Achievement Outcomes

15. Which of the following benefits does the SAGE program provide for your school?

Yes	No	
		Increased student achievement
		Reduction in student behavioral problems
		Less time lost to classroom management
		Better relationships between teachers and students
		More time for individual interactions
		Students engage with student-specific interventions
		Better student attitudes toward school
		More participation from students in class
		Better teacher morale
		More parent volunteers in classrooms
		More positive interaction between teachers and parents
		Other *(please specify)*

Section 6: Classroom Designs and Instructional Strategies

16. Because of smaller class sizes, what instructional strategies are teachers using with students? Please exclude instructional strategies that teachers would use regardless of their class sizes. *Please select all that apply.*
    a. We don't use any specific instructional strategies because of smaller class sizes
    b. Small-group instruction
    c. One-on-one time with teachers
    d. Differentiation of instruction
    e. Clustering
    f. Parent interactions with students in the classroom
    g. Instructional resource support
    h. Tutoring
    i. Student-specific content
    j. Scaffolding
    k. Strategic placement of students in groups
    l. Strategic placement of students in classrooms
    m. Other *(please specify)*

17. Because of smaller class sizes, what classroom designs are teachers using with students? Please exclude instructional strategies that teachers would use regardless of their class sizes. *Please select all that apply.*
    a. We don't use any specific classroom designs because of smaller class sizes
    b. Small groups across classrooms
    c. Multi-grade classrooms
    d. Team teaching

e. Other *(please specify)*

Section 7: Benchmark Assessments

18. Do students take assessments for benchmarking purposes in the following grades:

Yes	No	
		Kindergarten
		1st grade
		2nd grade
		3rd grade

Section 8: SAGE Program Feedback

19. Have phone calls or e-mails to DPI been answered promptly?
    a. Yes
    b. No
    c. Not applicable

20. Have you found DPI's SAGE web site useful?
    a. Yes
    b. No
    c. Not applicable

21. Use the space provided below for any general comments or suggestions for improvement.