



Report compiled by Prof D.B. le Roux  
for Limina Education Services.

## The Association Between the Use of Green Shoots Maths Curriculum Online and Systemics Outcomes

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**Limina Education Services** is a full-service company supporting the education and training sector with innovative, impactful solutions. The company was established in 2017 and now has offices in Cape Town, Johannesburg and Nelson Mandela Bay, South Africa, to provide services to clients across Africa and the Middle East. Our teams provide a) Learning Management Systems and develop training courses for education and training providers, b) conduct research that includes monitoring and evaluations of project implementations, and c) consult on policy development in different sectors. This report was compiled by the Limina Research Team and specifically Prof Daan le Roux, a professor from the University of Stellenbosch, and one of the Limina consultants working on the Monitoring and Evaluation of the MCO project.

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# **The Association Between the Use of Green Shoots Maths Curriculum Online and Systemics Outcomes**

Prof D.B. le Roux

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## Introduction

This report concerns the adoption of the Green Shoots Math Curriculum Online (GSMCO from hereon) in primary school settings. Specifically, it investigates whether there exists an association between GSMCO use at a school and the school's outcomes in the Western Cape Education Department's "Systemics" assessments (referred to as "Systemics" from hereon).

To this end, the analysis reported here utilised two primary data sources. The first is data which describes school-level performance in the WECD Math "Systemics" assessments at the Grade 6 level (pass rate and average). The second describes the usage patterns of Grade 6 learners and teachers in schools that used GSMCO in 2024.

**By combining these two data sources, the report addresses two primary research questions:**

- What forms (or patterns) of GSMCO use by Grade 6 learners and teachers are associated with school-level Systemics outcomes?
- Is the use of GSMCO by schools associated with improved outcomes in Systemics?

The report commences by describing the process that was followed to clean and prepare the data for analysis. During this process, decisions were made in terms of the selection and calculation of particular datapoints. These decisions are discussed, and the relevant calculations are presented. This data processing was conducted using RStudio with R version 4.3.1. Appendix B contains the relevant code and is available upon request.

Thereafter, the results of the various statistical analyses are presented with associated tables and graphs. The analyses were conducted and graphs were produced using Jamovi version 2.3.28.0.





## Data Preparation

A systematic process was followed to clean and combine the various datasets. For each school, the Grade 6 Systemics results for 2023 and 2024 were extracted, including both pass rate (Systemics Pass Rate) and average (Systemics Average).

**To enable meaningful analysis, each school's GSMCO data was used to calculate several key school-level use indicators. These include the following:**

- **Brain Quest Activity:** For each school, the total number of activities performed in each of the four terms was calculated. These term totals were divided by the number of learners at the school, thus producing the number of activities completed per learner per term for each of the four terms. Finally, the four term totals were summed to produce a number which represents the number of activities completed per learner for the full year.
- **Brain Quest Coverage:** A similar approach was followed for Brain Quest Coverage. For each school, the total number of completed brain quests in each of the four terms was calculated. These totals were divided by the number of learners in the school to produce the number of brain quests completed per learner for each term. A final total was calculated by summing these term indicators to produce an overall indicator of brain quest coverage for the school.
- **Badges:** For each school, the numbers for each of the badge types earned at the school were divided by the number of learners to produce a number representing the badge type earned per learner. To produce a single indicator for badges earned, the number of badges earned per learner for each badge type was summed.
- **Tests Completed:** For each school, the number of tests completed in each of the four terms was determined and then divided by the number of learners in the school. The four term indicators were again summed to produce an indicator of the number of tests completed per learner across the full year.
- **Test Averages:** For each school where GSMCO test averages were available, we calculated the school's average across the tests completed. If a school only completed one of the tests, that average would thus be the average.
- **Teacher Events:** To develop an indicator for teachers' use of the GSMCO insights feature, we divided the number of teacher events for each of the four terms by the number of teachers. Again, these per-term indicators were summed to produce a single indicator of teacher events.

The GSMCO data was combined with Systemics data for a total of 487 schools. Additionally, where applicable, GSMCO indicators were also calculated at class level. This included Brain Quest Activities, Brain Quest Coverage, Badges, Tests Completed, and Test Averages. Since class-level Systemics outcomes are not available, inferential analyses cannot be conducted with the class-level use indicators. Nonetheless, descriptive statistics for these indicators are presented in Appendix A.



# Descriptive Statistics for Key Indicators

## Systemics Results

Table 1 presents descriptive statistics for the Systemics results for 2024 for all participating schools, including those that do not use GSMCO. On average, schools displayed a pass rate of 40% and an average of 45%.

**Table 1: 2024 Systemics Results**

	N	Mean	Median	SD	Minimum	Maximum
Pass Rate	989	40.41	32.30	27.62	0.00	100.00
Average	988	45.08	40.70	15.22	18.70	93.80

## GSMCO Use Data

Table 2 presents descriptive statistics for key indicators of GSMCO use patterns. Across participating schools, the average number of Brain Quest Activities completed per learner for the full year is 11.86, with an average of 22.40 Brain Quests completed per learner for the full year. These two indicators are tightly correlated ( $r = 0.92, p < 0.001$ ), which suggests that distinction between them in further analyses would be of limited value. The average number of Badges earned per learner is 0.52, while the average number of Tests completed per learner in the full year is 0.99. The average school score in GSMCO tests is just under 44%, while the number of use events per teacher is 36.86 per year.

**Table 2: Descriptive Statistics for School-Level GSMCO Use Indicators**

	Mean	Median	SD
Brain Quest Activities	11.86	12.32	6.58
Brain Quest Coverage	22.40	22.06	13.47
Badges	0.52	0.10	1.05
Tests Completed	0.99	0.00	1.37
Test Average	43.98	42.25	11.85
Teacher Events	36.86	22.83	47.97



## Correlations Between Systemics Results and GSMCO Use Data

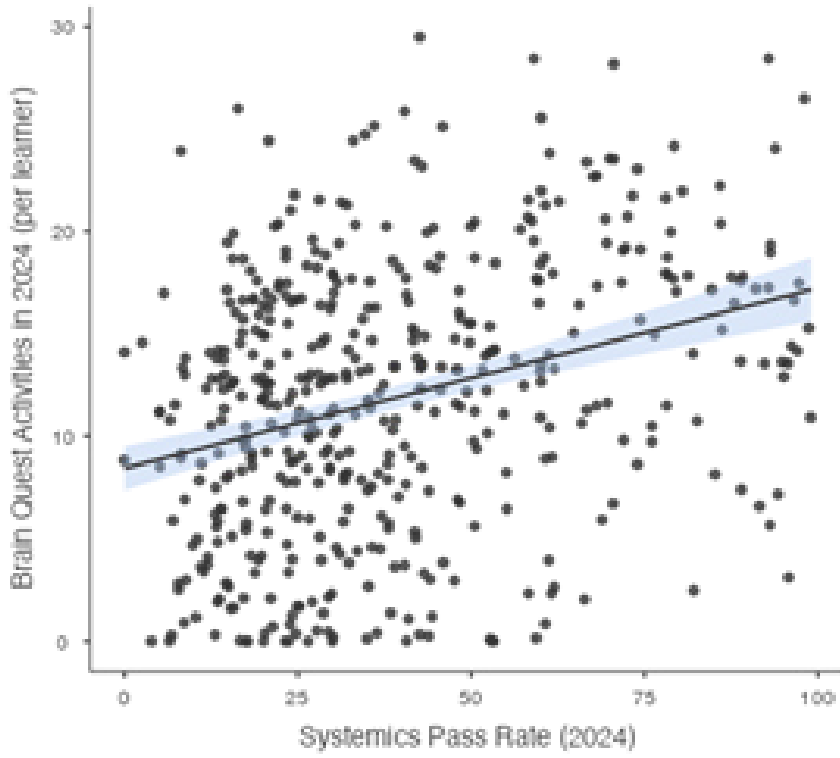
Table 3 presents the bivariate correlations between the Systemics outcomes (pass rate and average) and each of the GSMCO use indicators. Statistically significant positive correlations were observed for all the use indicators with the exception of Teacher Events, which did not correlate with either pass rate or average.

**Table 3: Bivariate Correlations Between Systemics Performance Indicators and GSMCO Use Indicators**

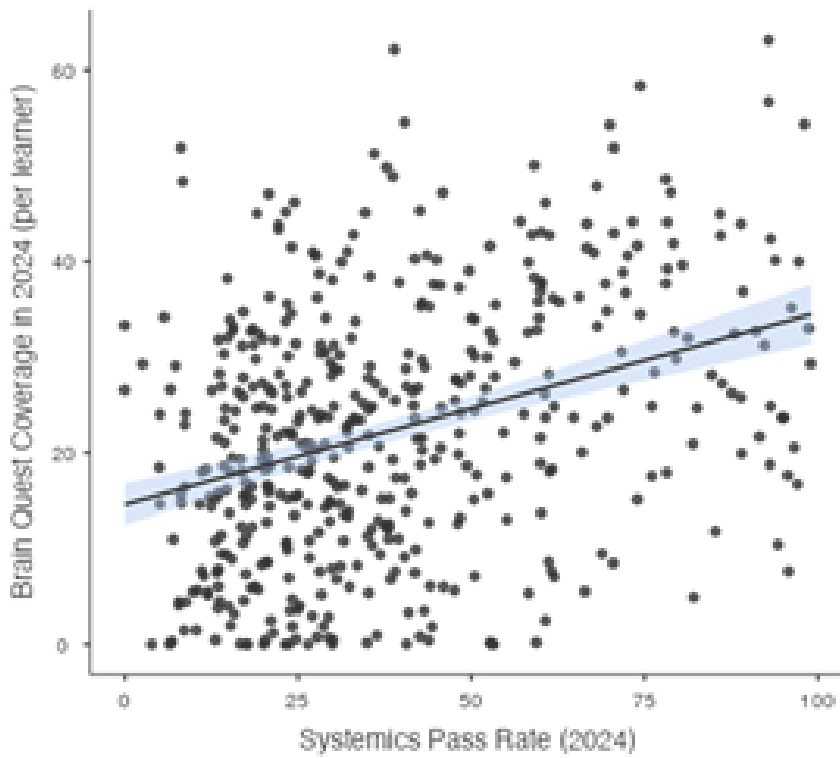
	Systemics Pass Rate		Systemics Average	
	Pearson's <i>r</i>	<i>p</i> -value	Pearson's <i>r</i>	<i>p</i> -value
Brain Quest Activities	0.32	<0.001	0.30	<0.001
Brain Quest Coverage	0.35	<0.001	0.33	<0.001
Badges	0.29	<0.001	0.27	<0.001
Tests Completed	0.17	<0.001	0.16	<0.001
Test Average	0.44	<0.001	0.45	<0.001
Teacher Events	0.00	0.98	0.00	0.97

The graphs in Figures 1-4 visualise the correlations between Systemics Pass Rate and four of the GSMCO use indicators – Brain Quest Activities, Brain Quest Coverage, Badges, and Tests Completed.

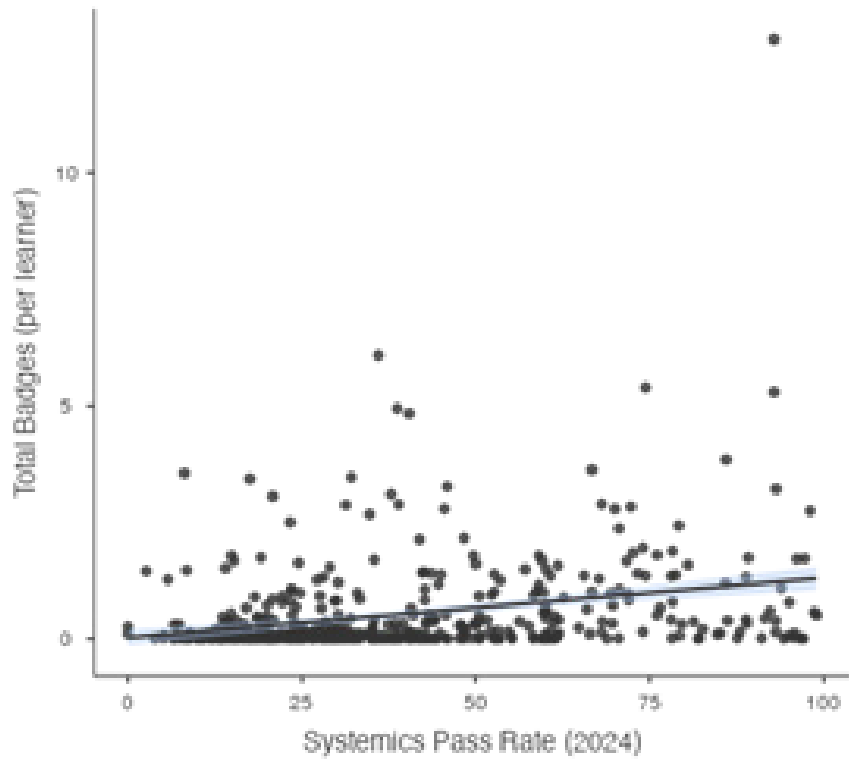




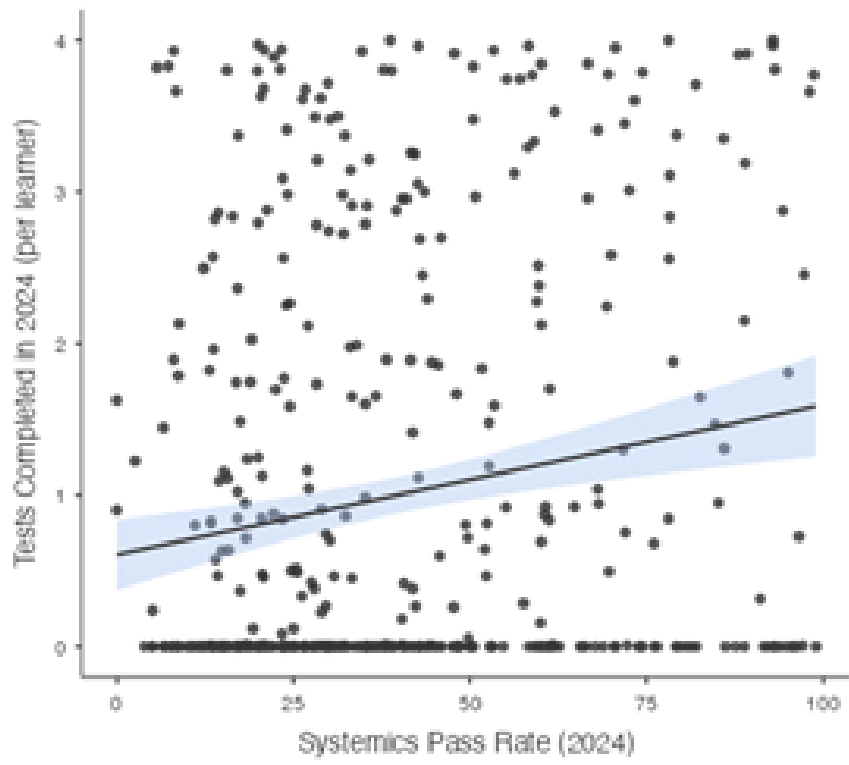
**Figure 1: Brain Quest Activities and Systemics Pass Rate**



**Figure 2: Brain Quest Coverage and Systemics Pass Rate**



**Figure 3: Badges Earned and Systemics Pass Rate**

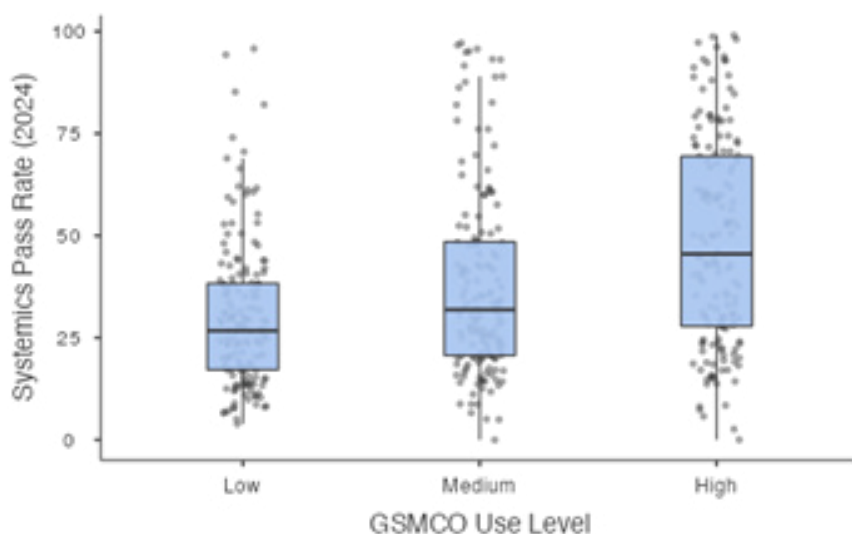


**Figure 4: Tests Completed and Systemics Pass Rate**

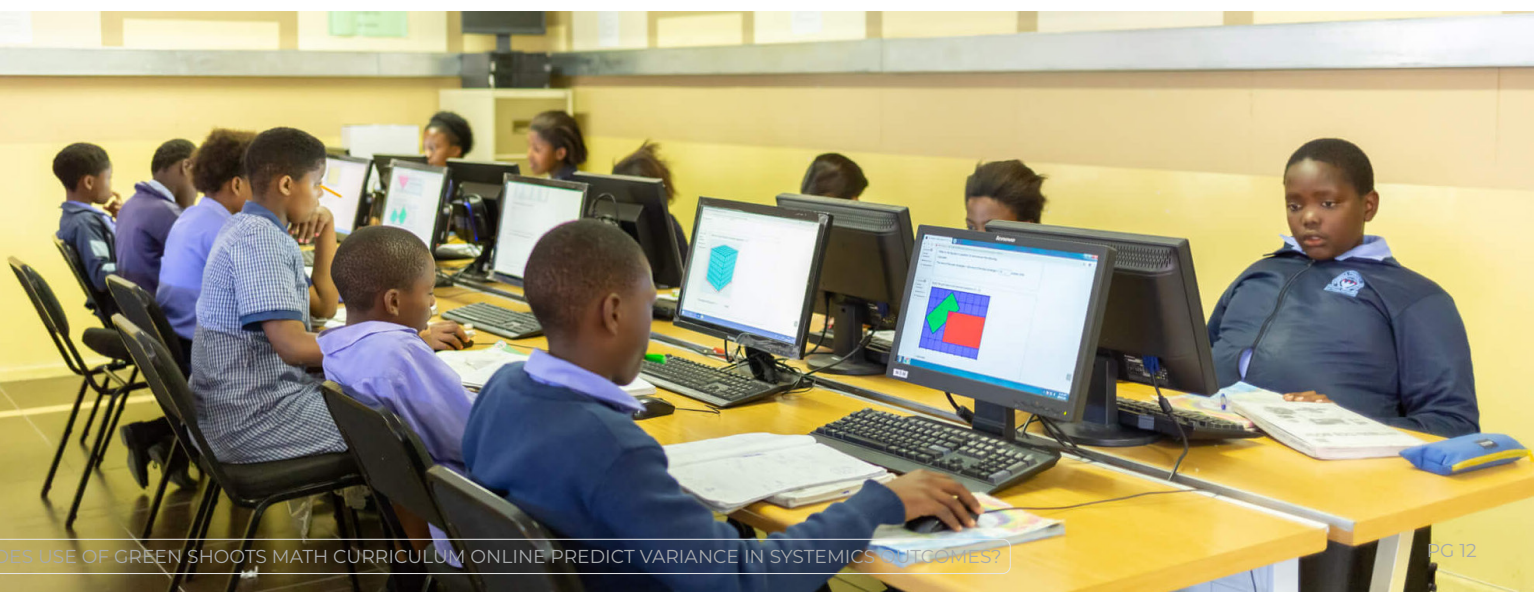
To further describe the nature of this relationship, the sample of schools was divided into three categories based on their per-learner Brain Quest coverage in 2024. Schools categorised as “Low” displayed the lowest level of learner GSMCO use, while those categorised as “High” displayed the highest level. Descriptive statistics for Systemics outcomes for each of the three categories are presented in Table 4 and visualised in Figures 5 and 6. As illustrated, schools in the high-use category performed substantially better than those in the medium and low-use categories.

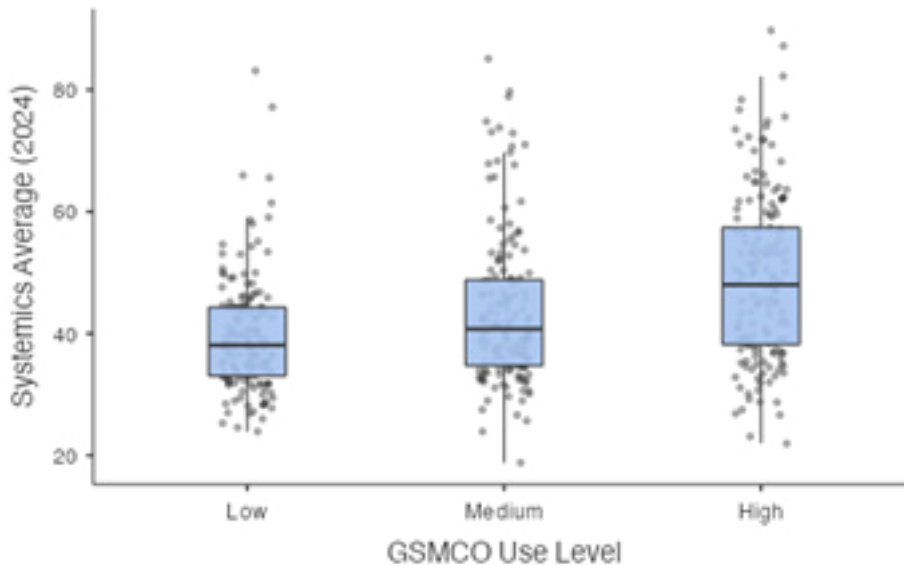
**Table 4: Systemics Outcomes for the Three GSMCO Use Level Categories.**

	GSMCO Use Level	N	Mean	Median	SD
Systemics Pass Rate (2024)	Low	159	30.19	26.70	18.02
	Medium	158	37.81	31.85	23.19
	High	161	48.49	45.50	25.27
Systemics Average (2024)	Low	159	39.60	38.10	9.35
	Medium	158	43.66	40.75	12.26
	High	161	48.92	48.00	13.67



**Figure 5: Systemics Pass Rate and GSMCO Use Levels**





**Figure 6: Systemics Average and GSMCO Use Levels**

## How Big Are the Observed Effects?

The number of Brain Quest activities completed per learner at each school explains 11% of the variance in Systemics Average ( $R^2 = 0.11$ ). The standardised regression coefficient ( $\beta = 0.33$ ) indicates that for each standard deviation increase in Brain Quests completed per learner, a school's Systemics Average increases by 0.33 standard deviations. In real terms, this implies that **for every additional 13.5 Brain Quests completed per learner during the year, a school's Systemics Average increases by just over 5%.**

Following the same procedure for Systemics Pass Rate, it was determined that **for every additional 13.5 Brain Quests completed per learner during the year, a school's Systemics Pass Rate increases by 9.7%.**

## Does GSMCO Use in Different Terms Have Different Effects?

A bivariate correlation analysis (Pearson's  $r$ ) was conducted to examine the relationship between the Brain Quest Coverage in each of the four terms and schools' Systemic Average scores in 2024. The results, presented in Table 5, indicate that all terms were significantly positively correlated with performance. Brain Quest Coverage in Term 1 has the strongest association with a school's Systemics Average ( $r = 0.37, p < 0.001$ ), with the other three terms displaying slightly lower correlations.

**Table 5: Correlations Between Brain Quest Coverage in Different Terms and Systemic Average**






		Systemics Average (2024)
Brain Quest Coverage in Term 1 (per learner)	Pearson's <i>r</i>	0.37
	df	476
	<i>p</i> -value	<.001
Brain Quest Coverage in Term 2 (per learner)	Pearson's <i>r</i>	0.28
	df	476
	<i>p</i> -value	<.001
Brain Quest Coverage in Term 3 (per learner)	Pearson's <i>r</i>	0.28
	df	476
	<i>p</i> -value	<.001
Brain Quest Coverage in Term 4 (per learner)	Pearson's <i>r</i>	0.27
	df	476
	<i>p</i> -value	<.001



## Do Different Badge Types Have Different Effects?

A similar correlation analysis was conducted to examine the relationships between the number of different badge types earned per learner and schools' Systemic Average scores in 2024. The results, presented in Table 6, indicate that all badge types are significantly positively correlated with performance. The strongest associations were observed for Bronze Buffalo badges,  $r = 0.29$ , and Explorer Elephant badges,  $r = .28$ . Silver Springbok badges showed a slightly weaker but still significant correlation, followed by Gold Giraffe badges, and Dancing Dolphin badges.

**Table 6: Correlations Between Badge Types and Systemic Average**

		Systemics Average (2024)
<p>Explorer Elephant Badges (per learner)</p>  <p><b>Explorer Elephant</b> Attempted &amp; submitted all Brain Quests for the term.</p>	<p>Pearson's <math>r</math></p> <p>df</p> <p><math>p</math>-value</p>	<p>0.28</p> <p>476</p> <p>&lt; .001</p>
<p>Bronze Buffalo Badges (per learner)</p>  <p><b>Bronze Buffalo</b> Achieved between 60–74% for all the term's Brain Quests</p>	<p>Pearson's <math>r</math></p> <p>df</p> <p><math>p</math>-value</p>	<p>0.29</p> <p>476</p> <p>&lt; .001</p>
<p>Silver Springbok Badges (per learner)</p>  <p><b>Silver Springbok</b> Achieved between 75–89% for all the term's Brain Quests</p>	<p>Pearson's <math>r</math></p> <p>df</p> <p><math>p</math>-value</p>	<p>0.22</p> <p>476</p> <p>&lt; .001</p>
<p>Gold Giraffe Badges (per learner)</p>  <p><b>Gold Giraffe</b> Achieved +90% for all the term's Brain Quests</p>	<p>Pearson's <math>r</math></p> <p>df</p> <p><math>p</math>-value</p>	<p>0.19</p> <p>476</p> <p>&lt; .001</p>
<p>Dancing Dolphin Badges (per learner)</p>  <p><b>Dancing Dolphin</b> Shows the number of Mastering Maths activities completed at 100%</p>	<p>Pearson's <math>r</math></p> <p>df</p> <p><math>p</math>-value</p>	<p>0.16</p> <p>476</p> <p>&lt; .001</p>

## Change in Systemics Outcomes Among New Adopters

It is important to note that, while the associations between GSMCO use patterns and Systemics outcomes suggest that GSMCO use may indeed be causal of improved math outcome, cross-sectional data limits our ability to make such causal inferences. However, an alternative approach to investigate these relationships is to consider year-on-year changes in Systemics outcomes for schools that are new adopters of GSMCO. In the sample for 2024, 63 of the schools were new adopters (i.e., started using GSMCO in 2024 for the first time).

In Tables 7 and 8, the Systemics pass rates and averages for these schools for both 2023 and 2024 are presented. Additionally, the schools are categorised based on their GSMCO use level (low, medium or high). Of the 63 schools, 43 were low users. Among these schools, the mean pass rate improved from 23.7 to 24.3 over the two years. For medium users ( $n = 13$ ), it increased from 33.1 to 33.6, while for high users ( $n = 7$ ) it increased from 30.1 to 38.5.

A similar pattern is observable for Systemics Average (see Table 8), with low and medium users showing negligible change, while high users show a substantial improvement.

**Table 7: Systemics Pass Rate Changes for New Adopters**

	GSMCO Use Level	N	Mean	SD
Systemics Pass Rate (2023)	Low	43	23.70	10.20
	Medium	13	33.05	13.21
	High	7	30.13	14.09
Systemics Pass Rate (2024)	Low	43	24.32	12.92
	Medium	13	33.64	14.05
	High	7	38.49	30.76

**Table 8: Systemics Average Changes for New Adopters**

	GSMCO Use Level	N	Mean	SD
Systemics Pass Rate (2023)	Low	43	36.33	4.79
	Medium	13	40.89	6.60
	High	7	39.97	7.27
Systemics Pass Rate (2024)	Low	43	36.68	6.81
	Medium	13	41.58	6.55
	High	7	46.16	20.79



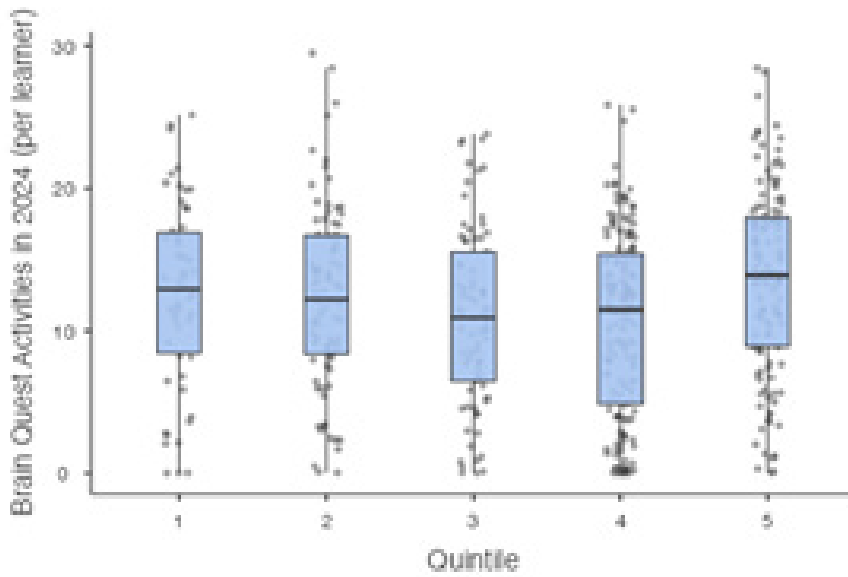
# Additional Analyses

## GSMCO Use Across Quintiles

Table 9 presents the GSMCO use indicators for the different quintiles. In terms of use among learners, it is evident that schools in Quintiles 1 and 5 display the highest number of activities per learner. This is visualised in Figure 7, which contains box plots for Brain Quest Activities completed per learner in 2024.

**Table 9: Descriptive Statistics for GSMCO Use by Quintile**

	Quintile	N	Mean	Median	SD
Brain Quest Activities in 2024 (per learner)	1	54	12.63	12.90	6.55
	2	83	12.31	12.22	6.47
	3	77	10.93	10.92	6.30
	4	146	10.48	11.50	6.49
	5	118	13.51	13.89	6.62
Brain Quest Coverage in 2024 (per learner)	1	54	24.67	25.38	14.27
	2	83	22.15	19.84	12.24
	3	77	19.05	17.98	11.57
	4	146	19.64	20.63	13.00
	5	118	27.15	26.65	14.28
Total Badges (per learner)	1	54	0.61	0.11	1.18
	2	83	0.35	0.06	0.68
	3	77	0.33	0.05	0.70
	4	146	0.35	0.07	0.76
	5	118	0.93	0.40	1.50
Event per Teacher in 2024	1	54	38.12	19.25	48.37
	2	83	44.83	25.33	71.76
	3	77	33.46	23.08	32.12
	4	146	37.57	22.58	45.15
	5	118	32.03	20.65	37.95



**Figure 7: Brain Quest Activities Completed per Learner in 2024 by Quintile**

## Systemics Performance Across Quintiles

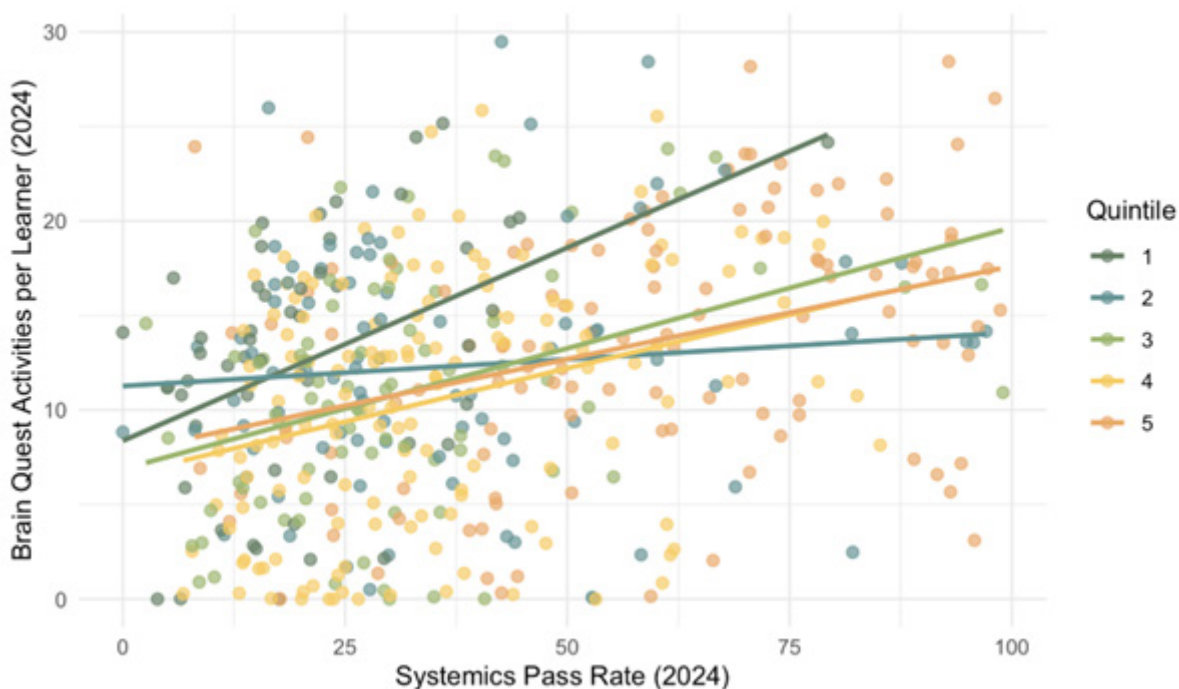
Table 10 provides descriptive statistics for Systemics performance indicators across the five quintiles. While Quintile 5 schools perform better than those in lower quintiles, it is worth noting that Quintile 2 schools outperformed those in Quintiles 3 and 4 in terms of both average and pass rates.

**Table 10: Descriptive Statistics for Systemics Performance**

	Quintile	N	Mean	Median	SD
Systemics Average (2024)	1	54	34.43	34.05	7.51
	2	83	42.86	39.00	11.43
	3	77	40.59	38.70	10.83
	4	146	41.89	40.45	8.73
	5	118	54.36	53.65	13.51
Systemics Pass Rate (2024)	1	54	20.86	18.25	13.89
	2	83	36.78	29.00	22.16
	3	77	31.72	28.30	19.12
	4	146	34.78	31.85	18.02
	5	118	58.32	59.75	24.57

## GSMCO Use and Systemics Performance Across Quintiles

When considering the relationship between GSMCO use and Systemics performance across the different quintiles (see Figure 8), it is evident that the relationship is strongest for the 54 schools in Quintile 1 ( $r = 0.43, p < 0.001$ ). Interestingly, for the 83 schools in quintile 2, the relationship is not statistically significant ( $r = 0.10, p = 0.38$ ). However, for Quintile 3 ( $r = 0.39, p < 0.001$ ), Quintile 4 ( $r = 0.31, p < 0.001$ ) and Quintile 5 ( $r = 0.37, p < 0.001$ ) the correlation is positive and statistically significant.

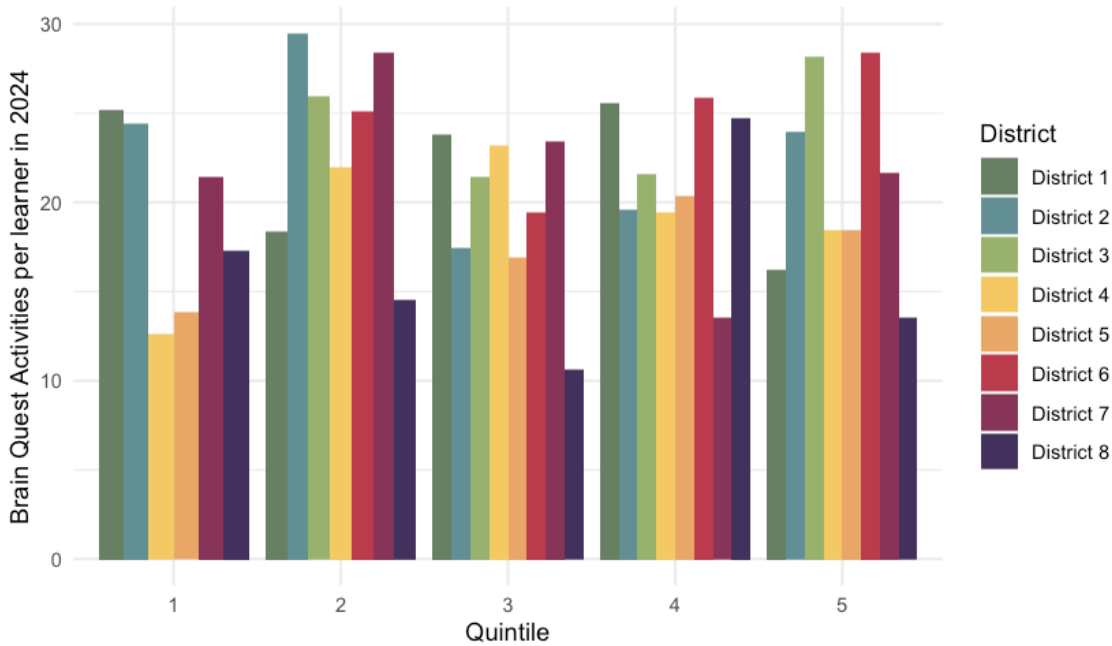


**Figure 8: Brain Quest Activities and Systemics Pass Rate by Quintile**



# GSMCO Use and Systemics Performance Across Quintiles and Districts

Figure 9 visualises the mean amount of Brain Quest Activities completed per learner across the five Quintiles and the eight Districts. The descriptive statistics for these groupings are presented in Table 11.



**Figure 9: Brain Quest Activities Completed per Learner in 2024 by Quintile and District**

**Table 11: Brain Quest Activities Completed per Learner in 2024 by Quintile and District**

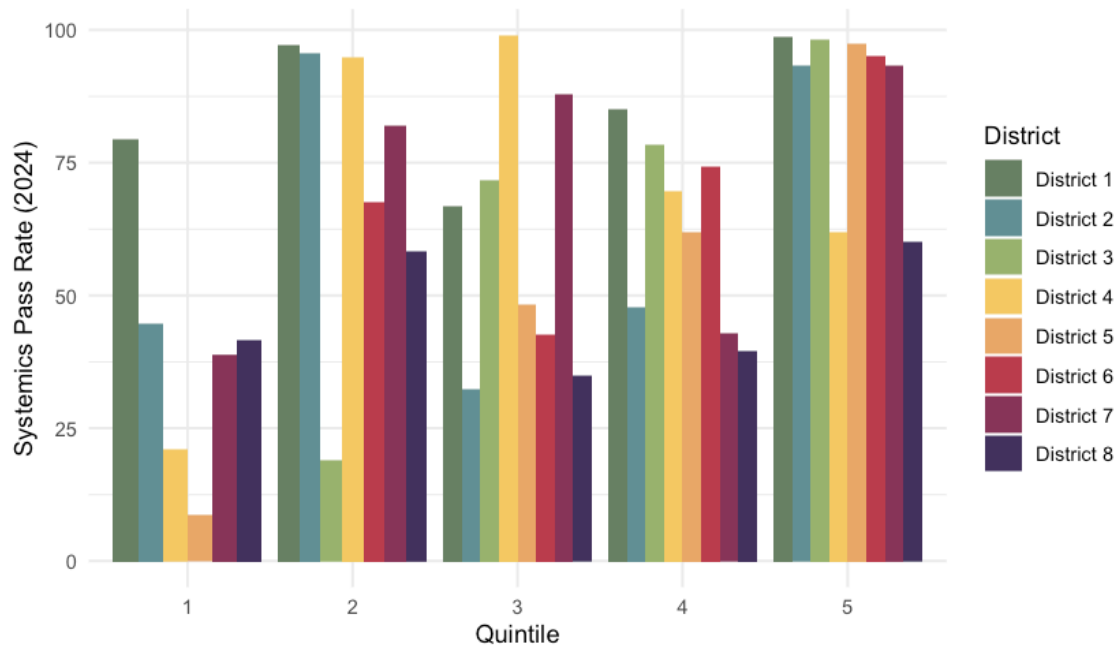
	Quintile	District	N	Mean	Median	SD
Brain Quest Activities in 2024 (per learner)	1	District 1	31	12.66	12.80	6.78
		District 2	7	13.22	11.20	7.01
		District 3	0	-	-	-
		District 4	2	7.35	7.35	7.44
		District 5	1	13.82	13.82	-
		District 6	0	-	-	-
		District 7	6	15.61	17.50	6.93
		District 8	7	10.72	11.17	5.26

**Table 11: Brain Quest Activities Completed per Learner in 2024 by Quintile and District (continued)**

	Quintile	District	N	Mean	Median	SD
Brain Quest Activities in 2024 (per learner)	2	District 1	11	11.76	12.66	5.05
		District 2	15	14.08	13.01	5.53
		District 3	2	21.79	21.79	5.94
		District 4	27	10.84	10.51	5.63
		District 5	0	-	-	-
		District 6	16	11.72	12.01	8.39
		District 7	9	14.38	14.04	7.01
		District 8	3	9.22	10.75	6.26
	3	District 1	9	14.47	16.26	8.65
		District 2	6	10.04	10.04	6.84
		District 3	10	10.18	10.58	6.30
		District 4	20	9.75	10.17	5.71
		District 5	10	8.59	7.90	5.44
		District 6	7	9.76	9.44	5.39
		District 7	13	14.55	14.57	4.68
		District 8	2	5.36	5.36	7.43
	4	District 1	13	11.77	10.75	6.21
		District 2	8	15.03	15.25	3.20
		District 3	22	13.16	13.94	6.41
		District 4	16	11.85	12.58	6.25
		District 5	36	6.32	5.29	5.40
		District 6	39	10.68	11.71	6.26
		District 7	2	10.51	10.51	4.27
		District 8	10	11.33	12.54	8.08
	5	District 1	7	11.10	14.01	4.81
		District 2	2	21.45	21.45	3.51
		District 3	32	15.41	16.18	7.17
		District 4	23	11.49	12.28	4.73
		District 5	6	12.05	10.59	4.84
		District 6	42	13.71	14.99	6.99
		District 7	4	13.50	13.36	8.14
		District 8	2	6.83	6.83	9.45

Figure 10 visualises the Systemics Pass Rate for the five quintiles and the eight districts, with the descriptive statistics for these groupings presented in Table 12.

**Figure 10: Mean Systemics Pass Rate in 2024 by Quintile and District**



**Table 12: Brain Quest Activities Completed per Learner in 2024 by Quintile and District**

	Quintile	District	N	Mean	Median	SD
Systemics Pass Rate (2024)	1	District 1	31	19.30	16.00	14.80
		District 2	7	23.21	19.30	13.79
		District 3	0	-	-	-
		District 4	2	18.30	18.30	3.96
		District 5	1	8.80	8.80	-
		District 6	0	-	-	-
		District 7	6	27.93	27.65	10.01
		District 8	7	21.80	22.20	15.32

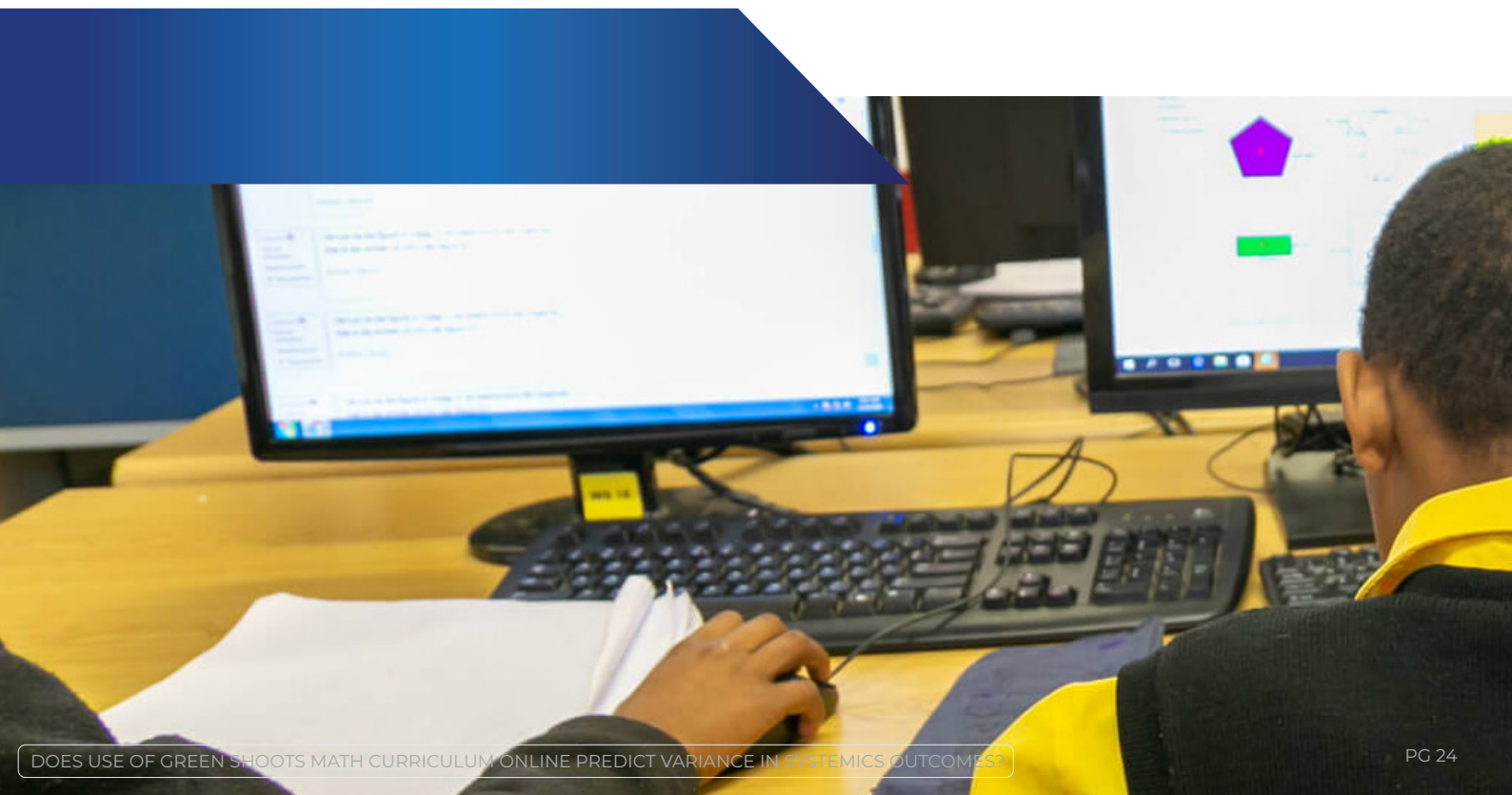
	Quintile	District	N	Mean	Median	SD
Systemics Pass Rate (2024)	2	District 1	11	32.90	26.30	25.36
		District 2	15	29.04	25.50	22.36
		District 3	2	17.75	17.75	1.91
		District 4	27	41.10	35.60	24.76
		District 5	0	-	-	-
		District 6	16	36.96	32.80	15.66
		District 7	9	41.46	29.00	22.58
		District 8	3	48.53	49.80	10.46
	3	District 1	9	37.64	35.10	18.22
		District 2	6	21.78	21.90	9.74
		District 3	10	38.00	33.15	19.39
		District 4	20	35.02	27.90	25.14
		District 5	10	29.18	27.55	8.59
		District 6	7	24.44	20.60	12.75
		District 7	13	28.70	24.50	21.29
		District 8	2	28.10	28.10	9.76
	4	District 1	13	34.67	17.50	30.02
		District 2	8	32.44	32.65	8.20
		District 3	22	45.68	41.30	22.28
		District 4	16	30.61	24.85	17.19
		District 5	36	28.87	25.75	13.25
		District 6	39	39.30	38.10	13.98
		District 7	2	28.05	28.05	21.00
		District 8	10	24.53	20.60	9.49
	5	District 1	7	38.67	23.50	33.05
		District 2	2	50.65	50.65	60.17
		District 3	32	68.10	70.30	19.18
		District 4	23	40.59	42.90	14.08
		District 5	6	70.30	67.00	20.85
		District 6	42	59.57	61.20	24.56
		District 7	4	88.35	91.05	7.11
		District 8	2	59.75	59.75	0.49



## Conclusions

Based on the analysis conducted and presented in this report, several key conclusions can be drawn.

- 1. More intensive use of the GSMCO platform is associated with improved Systemics outcomes.** This conclusion is supported by the positive correlations observed between GSMCO use indicators, including Badges earned, and Systemics performance outcomes. Specifically, schools in which more Brain Quests were completed per learner displayed better Systemics results than those in which fewer Brain Quests were completed per learner. The data indicates that for every additional 13.5 Brain Quests completed per learner during the year, a school's Systemics Average increased by just over 5%; and for every additional 13.5 Brain Quests completed per learner during the year, a school's Systemics Pass Rate increased by 9.7%.
- 2. When schools adopt GSMCO and use it intensively, their Systemics outcomes improve.** The data indicate improvement in Systemics outcomes after schools adopt GSMCO, but only if adoption involves intensive use of the platform. By contrast, schools that display low or moderate use levels display negligible changes in outcomes. This suggests that mere adoption is not sufficient—effective implementation and consistent use are key to realising meaningful academic gains.
- 3. Foundational knowledge may have a larger impact. More detailed analyses of GSMCO activity suggest that Brain Quest coverage during Term 1 explains the greatest variance in Systemics outcomes.** This finding implies that early exposure to foundational content has a lasting impact on learners' ability to perform well in subsequent assessments. Schools may benefit from emphasising structured and rigorous engagement with GSMCO in the early months of the academic year to establish a strong foundation for later success.



- 4. GSMCO tests are good indicators of Systemics performance.** The positive correlation between schools' performance in the GSMCO tests and their performance in Systemics assessments suggests that GSMCO test performance serves as valuable indicators of learners' mastery of the content covered.
- 5. Quantitative indicators of teachers' use of GSMCO do not predict performance.** In contrast to indicators of learner activity on GSMCO, teacher activity does not display any association with schools' Systemics performance outcomes. Various factors may explain this finding. It may be the case that the data fails to capture the value which teachers draw from GSMCO use. The analysis performed here tests the proposition that more teacher events are associated with better learner outcomes. However, it may be the case that it is the quality rather than the quantity of teachers' use of GSMCO which is of consequence in the classroom. Further research is required to test this and similar lines of reasoning.
- 6. Quintile 1 schools display the strongest relationship between GSMCO use and Systemics performance.** While lower quintile schools tend to display lower GSMCO engagement, those that perform well in Systemics tend to show disproportionately higher learner GSMCO engagement. This may suggest that GSMCO plays a more important role in under-resourced schools as a crucial form of additional support. In contrast, well-resourced schools might offer better general academic support, making the relative contribution of GSMCO adoption less pronounced.
- 7. Districts vary in terms of both GSMCO use and Systemics performance.** Across nearly all quintiles, District 1 and District 2 display both high GSMCO use and strong Systemics Pass Rates. District 8 and District 7 generally exhibit lower GSMCO use, particularly in lower quintiles, and they consistently rank among the lowest in Systemics Pass Rates, even in quintiles where other districts perform well. District 4 and District 6 display relatively high GSMCO use across quintiles but variable Systemics outcomes, especially in lower quintiles. Finally, District 3 and District 5 show higher Systemics Pass Rates, particularly in Quintiles 4 and 5.





# Appendix A

**Table 1: Descriptive Statistics for Class-Level GSMCO Use Indicators**

	N	Missing	Mean	Median	SD	Minimum	Maximum
Brain Quest Activities in Term 1 (per learner)	1576	0	2.13	1.60	4.47	0.00	77.00
Brain Quest Activities in Term 2 (per learner)	1576	0	3.78	3.16	9.54	0.00	161.00
Brain Quest Activities in Term 3 (per learner)	1576	0	4.58	3.93	11.51	0.00	197.00
Brain Quest Activities in Term 4 (per learner)	1576	0	3.42	3.05	7.67	0.00	125.00
Number of Learners	1576	0	36.93	38.00	9.38	1	150
Brain Quest Activities in 2024 (per learner)	1576	0	13.91	12.01	32.83	0.02	560.00
Brain Quest Coverage in Term 1 (per learner)	1576	0	4.40	3.44	6.36	0.00	104.00
Brain Quest Coverage in Term 2 (per learner)	1576	0	5.91	4.71	11.54	0.00	194.00
Brain Quest Coverage in Term 3 (per learner)	1576	0	8.75	7.85	17.83	0.00	310.00
Brain Quest Coverage in Term 4 (per learner)	1576	0	5.66	4.85	9.66	0.00	153.00
Brain Quest Coverage in 2024 (per learner)	1576	0	27.82	24.02	65.66	0.04	1120.00
Explorer Elephant Badges (per learner)	1576	0	0.24	0.03	0.44	0.00	3.37
Bronze Buffalo Badges (per learner)	1576	0	0.07	0.00	0.20	0.00	3.03
Silver Springbok Badges (per learner)	1576	0	0.03	0.00	0.13	0.00	2.70
Gold Giraffe Badges (per learner)	1576	0	0.02	0.00	0.08	0.00	1.60
Dancing Dolphin Badges (per learner)	1576	0	0.11	0.00	0.34	0.00	3.55
Total Badges (per learner)	1576	0	0.46	0.05	1.01	0.00	12.87

**Table 1: Descriptive Statistics for Class-Level GSMCO Use Indicators (continued)**

	N	Missing	Mean	Median	SD	Minimum	Maximum
Tests Completed in Term 1 (per learner)	1576	0	0.18	0.00	0.36	0.00	1.00
Tests Completed in Term 2 (per learner)	1576	0	0.24	0.00	0.39	0.00	1.00
Tests Completed in Term 3 (per learner)	1576	0	0.30	0.00	0.78	0.00	19.00
Tests Completed in Term 4 (per learner)	1576	0	0.24	0.00	0.39	0.00	1.00
Tests Completed in 2024 (per learner)	1576	0	0.96	0.00	1.49	0.00	19.00
Test Average in Term 1	369	1207	44.91	44	14.29	0	81
Test Average in Term 2	480	1096	43.65	42.00	13.01	10	92
Test Average in Term 3	516	1060	49.65	49.00	11.95	16	97
Test Average in Term 4	484	1092	43.30	42.50	12.44	2	79
Test Average in 2024	687	889	44.21	42.75	11.99	2.00	92.00





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