TIMSS 2023

SOUTH AFRICA:

HIGHLIGHTS

REPORT

basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

IEA
TIMSS
2023

Read to Lead

A Reading Nation is a Leading Nation

30 YEARS OF FREEDOM
South Africa 1994 - 2024

NDP 2030

Acknowledgements

A special word of appreciation is extended to everyone who contributed to the successful implementation of the 2023 TIMSS. Several teams of people needed to be acknowledged for their valuable contributions to this report. These include:

- Principals, teachers, parents and learners who participated in the study.

- The DBE National Assessment Unit, the Provincial Assessment Committee members and test administrators who were responsible for coordinating the entire TIMSS 2023 study as well as completing the data collection.

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- The Evaluation of Educational Achievement (IEA) team and Boston College for providing guidance and advice as well as technical support for the instrument development, data entry, cleaning and analysis as well as the reporting for the TIMSS 2023 study.

Readers Guide

Overview of TIMSS

The Trends in International Mathematics and Science Study, popularly known as TIMSS, is an international assessment programme that has reported on mathematics and science achievement of Grades 4 and 8 learners since 1995.

Purpose of TIMSS

Conducted every four years by International Association for the Evaluation of Educational Achievement (IEA), the primary purpose of TIMSS is to provide comparative data for use by participating countries to evaluate and improve teaching and learning. Using complex sampling designs as well as advanced statistical techniques, the results of TIMSS reported on the different content mathematics and science domains. In addition, questionnaires for learners, parents, teachers and principals are also administered to provide information on factors that may influence teaching and learning.

TIMSS in South Africa

South Africa has participated in TIMSS since 1995. The 2023 TIMSS was conducted by the Department of Basic Education with technical support and guidance provided by the IEA. The sample in South Africa comprised Grades 5 and 9 learners as well as their parents, teachers and principals, selected from all provinces.

South African Highlights report

This report presents highlights of 2023 TIMSS results released by IEA. The information was drawn from results provided by the IEA and adapted to the South African context. Thus, this report only includes selected findings that have been made available by the IEA.

A more detailed national report will be produced by the Department of Basic Education (DBE) that will provide comprehensive information on the achievement of South African learners as well as additional details on the complex relationship between the specific contexts and factors that impact on learning and teaching in South African schools.

As you read through this report, keep in mind that: (i) the complex design used for TIMSS only allows for reporting results at the sub-group level, e.g., provinces or language; (ii) the interpretation of the learner results must take into account the context within which learning and teaching takes place: and (iii) the specific concerns raised by the IEA regarding the reliability of the South African data. Note also that the DBE has released the results of the national Systemic Evaluation Study that also provides learner achievement results for Grades 3, 6 and 9 mathematics and reading.

Ultimately, the value of these results is to obtain relevant evidence for use in supporting decision-making at the system and school levels for improving learning for ALL our learners, especially learners from poor and marginalised backgrounds.

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1. Background to the TIMSS

1.1 What is the TIMSS?

The Trends in International Mathematics and Science Study (TIMSS) is an international comparative study of learner achievement in mathematics and science. This study has been implemented since 1995, conducted every four years, under the auspices of the International Association for the Evaluation of Educational Achievement (IEA).

The primary purpose of TIMSS is to provide comparative information about educational achievement across countries for use in supporting effective decision-making aimed at improving teaching and learning in mathematics and science.

The study is based on a research framework that uses the curriculum as its foundation, while considering the broader educational and social context in which learning occurs. While TIMSS traditionally assesses learners at Year 4 (Grade 4) and Year 8 (Grade 8), some countries, including South Africa, participate at Grades 5 and 9 to better align with their educational context.

Beyond assessing learner achievement, TIMSS gathers contextual information through questionnaires completed by learners, parents, teachers, and school principals. This additional information is intended for use in identifying the factors that influence learning outcomes, such as school resources, home environment, teaching practices, and curriculum implementation.

1.2 What does TIMSS assess?

TIMSS assesses two domains of learning: mathematics and science. The assessment is carefully structured to evaluate both content knowledge and cognitive skills, providing a comprehensive picture of learner levels of achievement capabilities in these subject areas.

The TIMSS 2023 mathematics and science assessments are based on frameworks developed collaboratively with participating countries and content area experts. The TIMSS 2023 Mathematics Framework and TIMSS 2023 Science Framework each describe achievement in relation to subject-specific content and cross-cutting cognitive domains. The content domains covered by the assessments are presented in the table below. All TIMSS assessments address three cognitive domains: knowing, applying, and reasoning.

Grade 4 Mathematics Content Domains	Grade 8 Mathematics Content Domains	Grade 4 Science Content Domains	Grade 8 Science Content Domains
Number	Number	Life Science	Biology
Measurement and Geometry	Algebra	Physical Science	Chemistry
Data	Geometry and Measurement	Earth Science	Physics
	Data and Probability		Earth Science

Figure 1.1: TIMSS 2023 content domains assessed

1.3 Who participated in TIMSS 2023?

In the 2023 TIMSS, 59 countries and six benchmarking entities participated in Grade 4, while 44 countries and three benchmarking entities participated in Grade 8. Côte d'Ivoire, Morocco, and South Africa are the only African countries that participated in TIMSS 2023.

Comprehensive view of educational environments across participating systems.

Albania	Iran, Islamic Rep. of*	Portugal
Armenia	Iraq*	Qatar
Australia	Ireland	Romania
Austria	Israel	Saudi Arabia
Azerbaijan	Italy	Serbia
Bahrain	Japan	Singapore
Belgium (Flemish)	Jordan	Slovak Republic
Belgium (French)	Kazakhstan	Slovenia
Bosnia & Herzegovina	Korea, Rep. of	South Africa*
Brazil	Kosovo	Spain
Bulgaria*	Kuwait*	Sweden
Canada	Latvia	Türkiye
Chile	Lithuania	United Arab Emirates
Chinese Taipei	Macao SAR	United States
Côte d'Ivoire*	Malaysia	Uzbekistan
Cyprus*	Malta	
Czech Republic	Montenegro	**Benchmarking Participants**
Denmark	Morocco*	Ontario, Canada
England	Netherlands	Quebec, Canada
Finland	New Zealand	Kurdistan Region of Iraq*
France	North Macedonia	Abu Dhabi, UAE
Georgia	Norway	Dubai, UAE
Germany	Oman	Sharjah, UAE
Hong Kong SAR	Palestinian Nat'l Auth.	
Hungary	Poland	

Figure 1.2: Countries participating in TIMSS 2023

2. TIMSS 2023 methodology

This section provides a brief explanation of the South African sample, instruments used, analysis undertaken, and results reported.

2.1   Sample

TIMSS implements a sophisticated two-stage stratified cluster sampling design. In the first stage, schools are selected using probability proportional to size sampling, with stratification accounting for geographic region, school type (public/private), socioeconomic indicators, and urban/rural location.

The second stage involves the random selection of one or more intact classes from each participating school, with all learners in selected classes participating except for defined exclusions. The study maintains rigorous participation requirements, including minimum rates of 85% for selected schools and selected learners within participating schools, with an overall participation threshold of 75% of the selected learner population.

The sample of schools for Grades 5 and 9, and distribution of these schools across the provinces is noted in Figures 2.1 and 2.2 respectively.

Distribution of Grade 5 TIMSS 2024 Sampled Schools

Provinces	Sampled schools
Eastern Cape	35
Free State	20
Gauteng	40
KwaZulu-Natal	54
Limpopo	34
Mpumalanga	32
North West	31
Northern Cape	31
Western Cape	33
South Africa	303
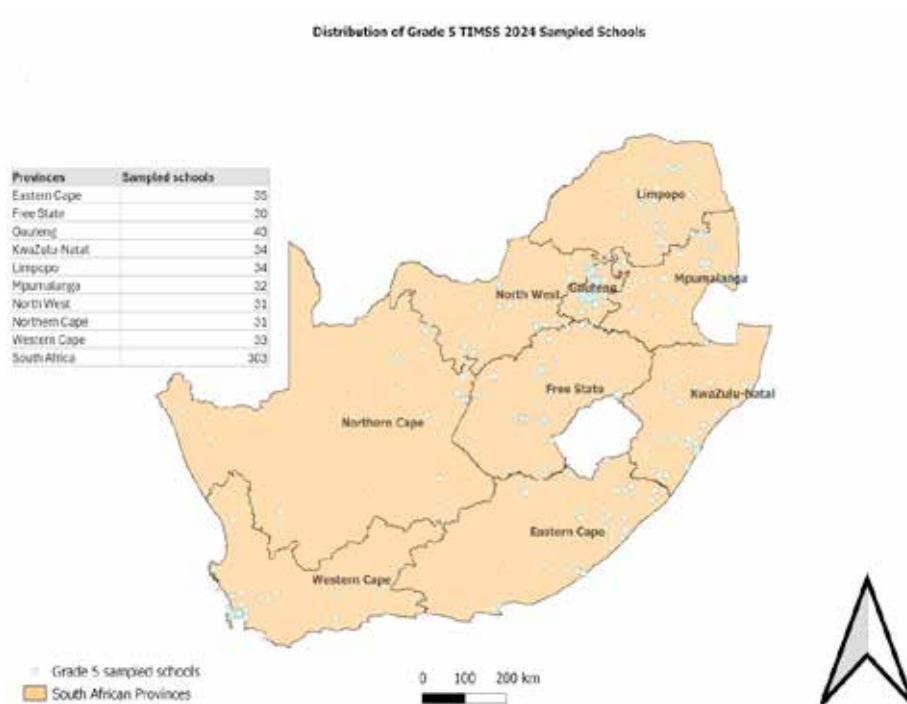
Figure 2.1: Grade 5 school sample

Distribution of Grade 9 TIMSS 2024 Sampled Schools

Provinces	Sampled schools
Eastern Cape	33
Free State	30
Gauteng	45
KwaZulu-Natal	33
Limpopo	33
Mpumalanga	31
North West	31
Northern Cape	30
Western Cape	34
South Africa	300
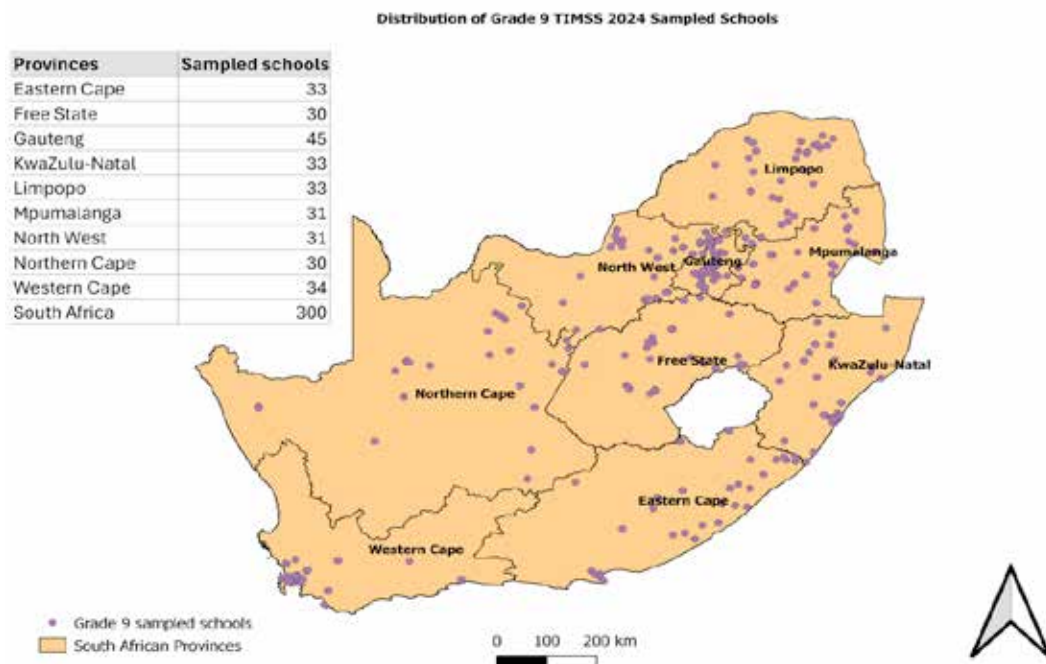
Figure 2.2: Grade 9 sample of schools

2.2   Instruments

The assessment instruments for TIMSS are designed using a matrix sampling approach, where the complete item pool is distributed across multiple test booklets. This allows TIMSS to cover a broad range of topics while keeping the testing time manageable for individual learners. Thus, each learner completes only one booklet, but through statistical procedures (using item response theory), this information can provide reliable estimates of achievement for the entire learner population.

In addition, background questionnaires were administered to learners and their parents as well as teachers and school principals to collect additional information on the learning environment, attitudes, home resources as well as early learning experiences and home support, teaching practices, professional development, and classroom resources, school characteristics, resources, and policies.

2.3   Data collection

TIMSS maintains high levels of quality control in its data collection through the standardisation of administration procedures applied. Test administrators and school coordinators undergo comprehensive training, while quality control is ensured through both International and National Quality Control Monitors.

Countries participating in TIMSS 2023 administered the assessment at different times of the year based on their school calendars. Northern Hemisphere countries typically had testing windows from March to June of 2023 and Southern Hemisphere countries typically had testing windows from August to November of 2023.

2.4   Data cleaning and entry

Quality assurance in data processing involves double data entry for a minimum of five percent of responses, coupled with systematic data cleaning procedures. These procedures encompass the identification of outliers and inconsistencies, cross-validation of learner, teacher, and school data, and verification of sampling weights and participation rates. The process includes standardised scoring guides for constructed response items, with inter-rater reliability studies requiring a minimum 90% agreement. Missing data protocols, coding systems and

documentation of national adaptations ensure data integrity throughout the process. South Africa received an approved dataset from the IEA following compliance to all the required data cleaning requirements.

2.5   Data analysis

Given the complex design used for TIMSS, Item Response Theory (IRT) is used to analyse the data. The use of IRT accounts for the difficulty of each test item and the ability of each learner, creating a common scale even though individual learners only complete a subset of all possible test items. TIMSS generates five "plausible values" for each learner to account for the uncertainty in measuring learner ability from a limited number of test items. The scaling process incorporates conditioning variables from background questionnaires to improve the precision of achievement estimates.

Data from the questionnaires is analysed based on the TIMSS conceptual framework that represents key factors associated with learners' mathematics and science achievement, focusing on three main environments: home, school and classroom.

2.6   Reporting and Interpretation of results

The results of TIMSS are reported using IRT scale scores and international benchmarks.

2.6.1 IRT Scale Scores

The IRT scale used in TIMSS is centered at 500 points with a standard deviation of 100 points. For 2023 TIMSS results, the IEA reported specific concerns regarding the reliability of the IRT scale scores estimated for South African learners (von Davier et al, 2024):

- Grade 5 Science (Exhibit 2.1.1)

    "Average achievement not reliably measured because the percentage of students with achievement too low for estimation exceeds 25%" (p. 2).

- Grade 9 Mathematics (Exhibit 2.1.1)

    "Reservations about reliability because the percentage of students with achievement too low for estimation exceeds 15% but does not exceed 25%" (p. 2).

- Grade 9 Science (Exhibit 2.1.1)

    "Reservations about reliability because the percentage of students with achievement too low for estimation exceeds 15% but does not exceed 25%" (p. 2).

2.6.2 International Benchmarks

In addition to IRT scale scores, TIMSS also presents international benchmarks. These benchmarks differ from regular scale scores in that they provide qualitative descriptions of what learners can typically do at various levels of achievement, rather than just a numerical value on a scale. While scale scores give a general indication of a learner's achievement by placing them on a continuous scale, benchmarks translate these scores into meaningful categories that indicate the level at which learners were functioning.

For the 2023 TIMSS, the following benchmarks are used:

- Low International Benchmark (400 scale score points),
- Intermediate International Benchmark (475),
- High International Benchmark (550), and
- Advanced International Benchmark (625).

2.6.3 Accounting for the COVID-19 pandemic

Given the unprecedented global and national impact of the COVID-19 pandemic, any analysis of the 2023 TIMSS results must take this reality into account. While further analysis is possible using TIMSS results to discern the possible impact of COVID-19 on learner achievement, it is important to know that TIMSS was not designed for this purpose.

Acknowledging this reality, the IEA notes the following in its international report:

> "as a cross-sectional observational study, TIMSS is not an experiment or a pre/post-test design and does not re-test learners. Therefore, TIMSS is not designed to provide estimates of the causal effects of the pandemic on learner learning outcomes" (von Davier, et al, 2024, p. 4).

As reported by school principals in 2020, there were 46% of schools that were closed for a period of one to three months, while 20% were closed for four to six months, and 14% were closed for less than one month. A smaller percentage of schools experienced longer closures, with 4% closed for more than six months. Only 16% of schools did not fully close.

In 2021, more than half of the schools (57%) did not fully close. The percentage of schools that were closed for less than one month increased to 23%, while those closed for one to three months decreased to 15%. Only 3% of schools were closed for four to six months, and a mere 1% experienced closures longer than six months.

Despite the positive trend in 2021, the impact of the closures in both years cannot be overlooked. Even short-term closures can have detrimental effects on learning outcomes, particularly for disadvantaged learners who may lack access to remote learning resources and support.
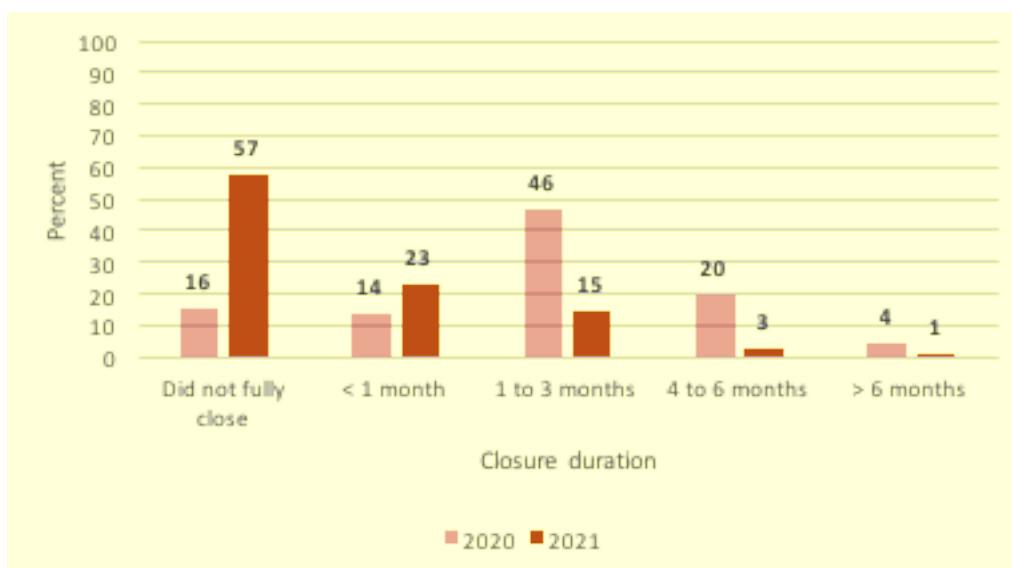
Figure 2.3: Duration and percentage school closure

Moreover, substantial revisions were implemented to the curriculum during and after the COVID-19 pandemic. According to the Department of Basic Education's guidelines outlined in circulars S2 and S13 of 2020, the Grade R-11 curriculum underwent a process of trimming and reorganisation that also affected the Mathematics and the Natural Sciences and Technology curricula. For example, specific content domain areas were trimmed, and in some instances, specific topics within the content domains were removed. The impact of these revisions on schools and subsequently on the achievement of learners in the TIMSS 2023 results still needs to be addressed.

3. Grade 5 learner achievement: International Comparisons

This section provides an overview of South African Grade 5 learners achievement compared to the international sample.

3.1 Grade 5 Scale Scores: Mathematics and Science

At the fourth grade, 59 countries and six benchmarking entities participated in TIMSS 2023 (von Davier, et. al, 2024). Figures 3.1 present the average achievement for Year 4 mathematics (Grade 5 SA) for participating countries. Similar to the previous cycle, the highest performing learners in mathematics were from Singapore (615), Chinese Taipei (607), Hong Kong (594) and the Republic of Korea (594). In sharp contrast, the lowest performing learners in mathematics were from Saudi Arabia (420), Brazil (400), Morocco (393), Kuwait (382), and South Africa (362).

Figure 3.1: Grade 4 Average Mathematics Achievement by Country

The results in science (Figure 3.2) reveal similar trends. Learners from Singapore (607), the Republic of Korea (583), Chinese Taipei (573), Turkey (570) and England (556) were among the high performing group. Learners from Uzbekistan (412), Kosovo (403), Morocco (390), Kuwait (373), and South Africa (308) were amongst the lowest performing group.

Singapore Korea, Rep. of Chinese Taipei Türkiye (5) England
607   583   573   570   556

Japan Poland Australia Hong Kong SAR Finland Lithuania
555   550   550   545   542   537

Macao SAR Sweden Ireland United States Norway (5)
536   533   532   532   530

Bulgaria Romania Czech Republic Slovenia Latvia
530   526   526   526   526

Hungary Denmark Canada Slovak Republic New Zealand
524   522   521   521   517

Netherlands Germany Portugal Italy Serbia Spain
517   515   511   511   510   504

United Arab Emirates Albania Belgium (Flemish) France
495   491   488   488

Cyprus Belgium (French) Chile Bahrain Qatar
487   481   479   475   472

Kazakhstan Georgia Montenegro Armenia
467   465   461   457

Bosnia & Herzegovina North Macedonia Oman
448   439   433

Iran, Islamic Rep. of Saudi Arabia Brazil Azerbaijan
432   428   425   422

Jordan Uzbekistan Kosovo Morocco Kuwait
418   412   403   390   373

South Africa (5)
308

Benchmarking Participants

Dubai, UAE Ontario, Canada Quebec, Canada
562   525   508

Sharjah, UAE Abu Dhabi, UAE
503   446

Figure 3.2 : Grade 4 Average Science Achievement by Country[1]

3.2   Grade 5 Benchmarks: Mathematics and Science

The percentage of South African Grade 5 learners attaining the International benchmark is presented in Figure 3.3. The mathematics results reveal a similar pattern, with 2% learners functioning at the Advanced Level, 6% at the High Level, 17% at the Intermediate Level, 35% at the Low Level, while 40% were functioning below the Low Benchmark Level. In science, 2% of learners functioning at the Advanced Level, 7% at the High Level, 16% at the Intermediate Level, and 28% at the Low level. Of concern is the 47% of learners who were functioning below the Low Benchmark Level

While the overwhelming majority of learners function at or below the Low benchmark level, there is some reason for optimism. The small but notable percentage of learners functioning at the Advanced and High benchmark levels can provide valuable insights to enhance the learning experiences and outcomes for all learners.

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1   Average achievement for South African Grade 5 science learners not reliably measured because the percentage of learners with achievement too low for estimation exceeds 25% (von Davier et al, 2024)

Mathematics				Ψ Science[2]	
Learners can select and relate information to implement appropriate operations to solve problems.	2%	**Advanced Benchmark (625)**	2%	Learners show, apply, and communicate their knowledge of life, physical, and earth sciences, and engage in multiple scientific inquiry practices	
Learners relate concepts or representations in extended contexts	6%	**High Benchmark (550)**	7%	Learners show and apply knowledge of life, physical, and earth science, and engage in scientific inquiry practices	
Learners demonstrate mathematical knowledge in simple situations and relate representations	17%	**Intermediate Benchmark (475)**	16%	Learners show and apply knowledge of some scientific concepts	
Learners demonstrate basic mathematical understanding	35%	**Low Benchmark (400)**	28%	Learners show knowledge of some science facts	

Figure 3.3: Grade 4 Mathematics and Science Benchmarks[2]

2   Average achievement for South African Grade 5 science learners not reliably measured because the percentage of learners with achievement too low for estimation exceeds 25% (von Davier et al, 2024)

4. Grade 5 learner achievement trends: 2015-2023

Grade 5 learners in South Africa first participated in the Trends in International Mathematics and Science Study (TIMSS) in 2015, only completing the mathematics assessment. In the subsequent 2019 and 2023 cycles, Grade 5 learners were assessed in both mathematics and science.

For Grade 5 learners, the mathematics score remained constant from 376 in 2015 to 374 in 2019. For 2023, the score declines to 362, indicating a small but notable difference of 12 points. The average science achievement scores also showed a slight but notable decline, with the average score decreasing from 324 in 2019 to 308 in 2023.
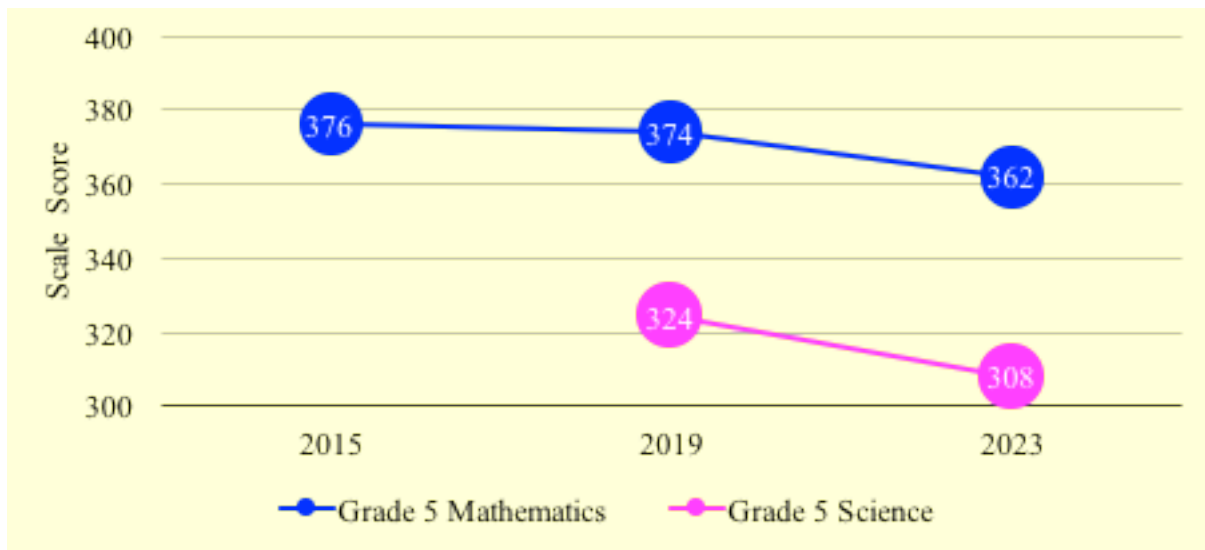

Figure 4.1: Grade 5 Mathematics and Science trends

5. Grade 5 Learner achievement: National Comparisons

This section presents national results of Grade 5 learners disaggregated by province, school quintile category, gender, language of learning and teaching as well as language spoken at home.

5.1   Grade 5 achievement by Province

The findings presented in Figure 5.1 reveal substantial disparities among provinces for both mathematics and science. The Western Cape and Gauteng stand out with average scores of 406 and 404 in mathematics, exceeding the national average. In stark contrast, average mathematics score for North West and Limpopo is 309 and 316, reflecting achievement gap of 97 points The remaining provinces show mixed results, with scores ranging from slightly below to slightly above the national average.

Science achievement follows a similar pattern to mathematics, but with a lower national average score of 308. Here too, the Western Cape and Gauteng reveal the highest average science scores of 369 and 376 respectively, exceeding the national average. The average mathematics score for North West and Limpopo is 234 and 241, reflecting an achievement gas of 142 points.
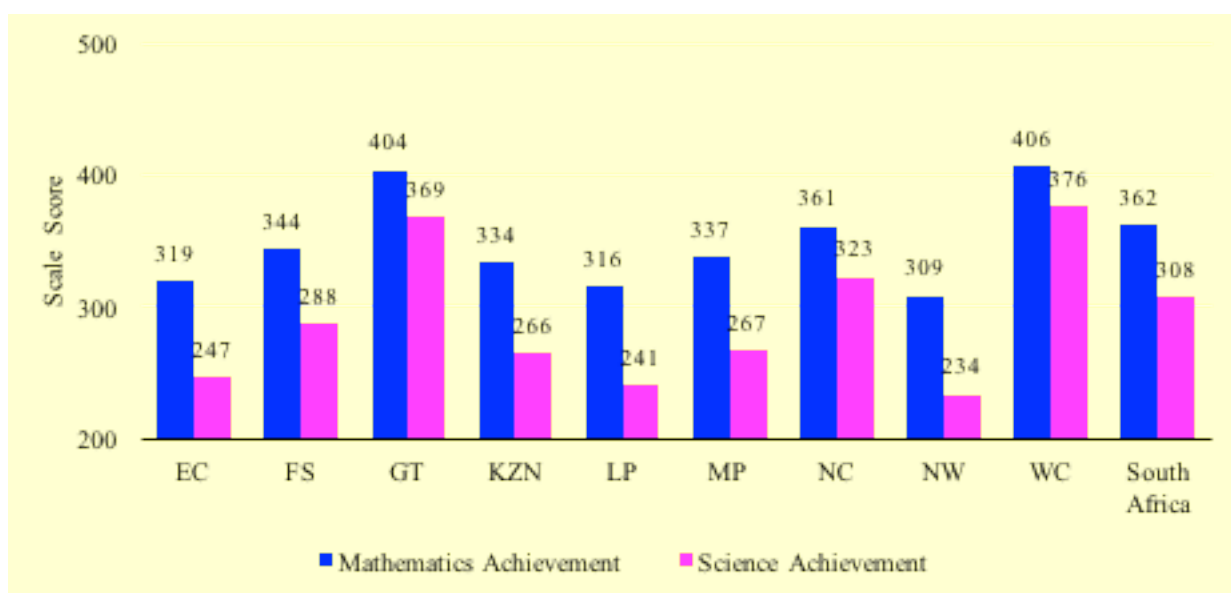

Figure 5.1: Grade 5 Mathematics and Science achievement by Province

5.2   Grade 5 achievement by School Quintile

The TIMSS 2023 Grade 5 results, disaggregated by school quintile category[3], reveals a clear and consistent trend: as the quintile level increases, representing schools with higher socioeconomic status, the average achievement scores in both mathematics and science also increases. Moreover, there is a substantial achievement gap between learners in the lowest and highest quintiles.

In mathematics, learners in Quintile 1schools have the lowest average score of 307, with Quintile 5 achieving the highest average of 492. The average scores of learners in Quintile 1 and Quintile 5 in mathematics reveals a substantial difference of 185 points. Science achievement follows a similar trend. Learners in Quintile 1 have the lowest average science score at 227, while learners in Quintile 5 schools had the highest at 493, revealing a massive achievement gap of 266 points.
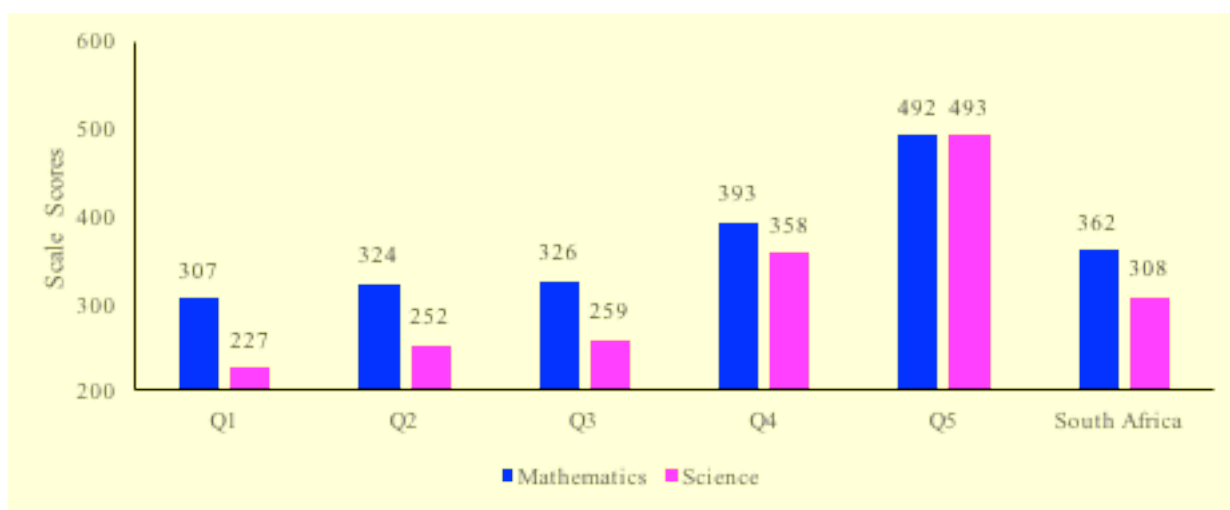

Figure 5.2: Grade 5 Mathematics and Science achievement by quintile category[4]

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3   School quintiles are a way of grouping schools based on their socioeconomic status, with Quintile 1 representing the most disadvantaged schools and Quintile 5 representing the most affluent.

4   Results of Independent schools not included.

5.3   Grade 5 achievement by Gender

The Grade 5 results disaggregated by gender reveal notable differences in mathematics and science achievement between boys and girls. In mathematics, boys achieved an average score of 348, while girls scored notably higher with an average of 376. This difference of 28 points in favour of girls suggests a significant gender gap in average mathematics achievement. Similarly, in science, girls outperformed boys, with an average score of 328 compared to 289 for boys, resulting in a substantial difference of 39 points.
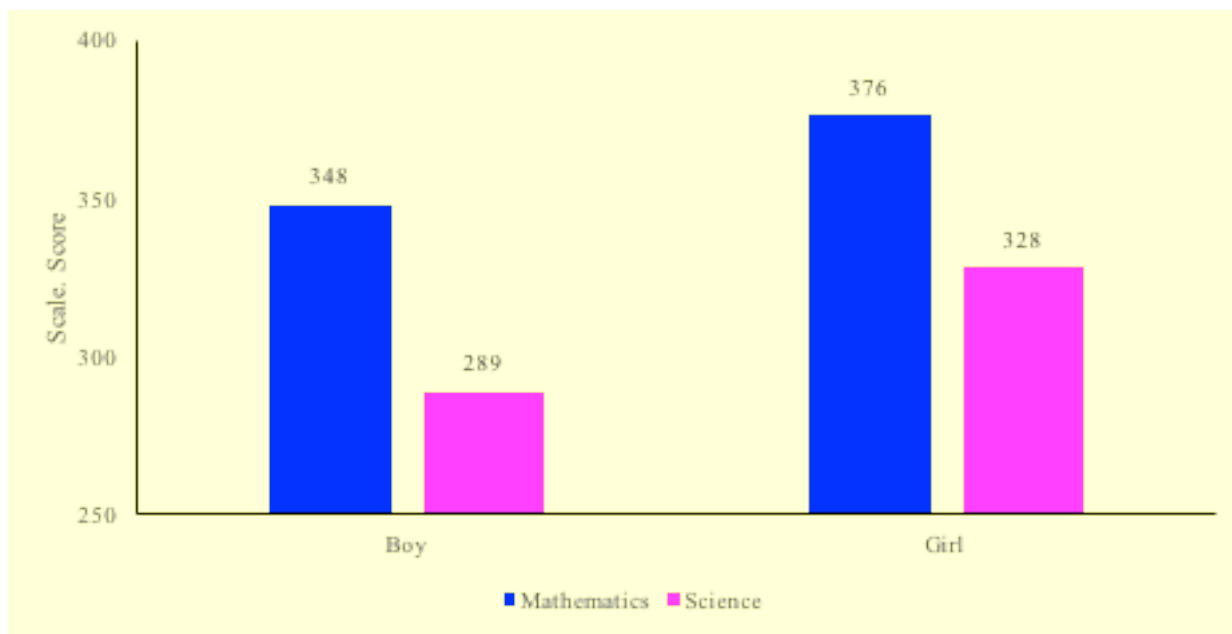
Figure 5.3: Grade 5 Mathematics and Science achievement by Gender

A review of the trends in the differences between girls and boys reveal similar substantial differences in achievement scores, with girls obtaining higher scores for both mathematics and science. In mathematics, the difference in favour of girls was 16* points in the 2015 TIMSS cycle, increasing to 20* in the 2019 cycle and 28 in the 2023 cycle. Similarly, in science, the difference in favour of girls was 21* points in the 2019 cycle, increasing to 39* in the 2023 TIMSS cycle.
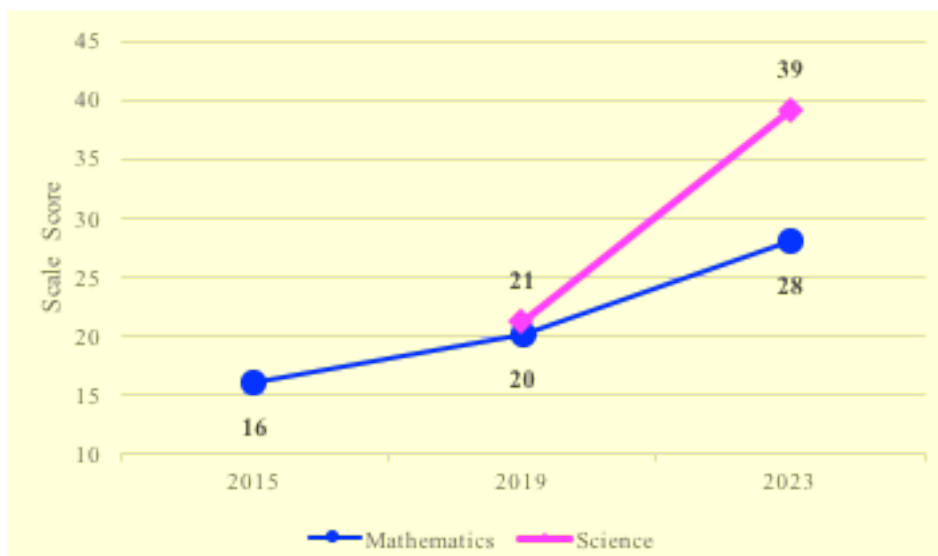
Figure 5.4: Grade 5 Trends in Gender differences in achievement

5.4   Grade 5 achievement by Language

The most common official language of learning and teaching (LOLT) in South African schools is English and Afrikaans. The majority of learners attendings schools that offer Afrikaans as the language of learning, teaching and assessment (LOLTA) also have Afrikaans as their home language. In contrast, the majority of learners attending English medium schools are second language English speakers.

As noted in Figure 5.5, learners in Afrikaans medium schools demonstrated the highest achievement in both mathematics and science. In mathematics, Afrikaans learners achieve an average score of 397, surpassing the national average of 362. Similarly, in science, Afrikaans learners attain an average score of 373, considerably higher than the national average of 308.

In contrast, learners attending English medium schools had an average score of 341 in mathematics and 276 in science, both below the respective national averages. The achievement gap between Afrikaans and English learners is substantial, with a difference of 56 points in mathematics and 97 points in science.

Figure 5.5: Grade 5 Mathematics and Science achievement by LOLT

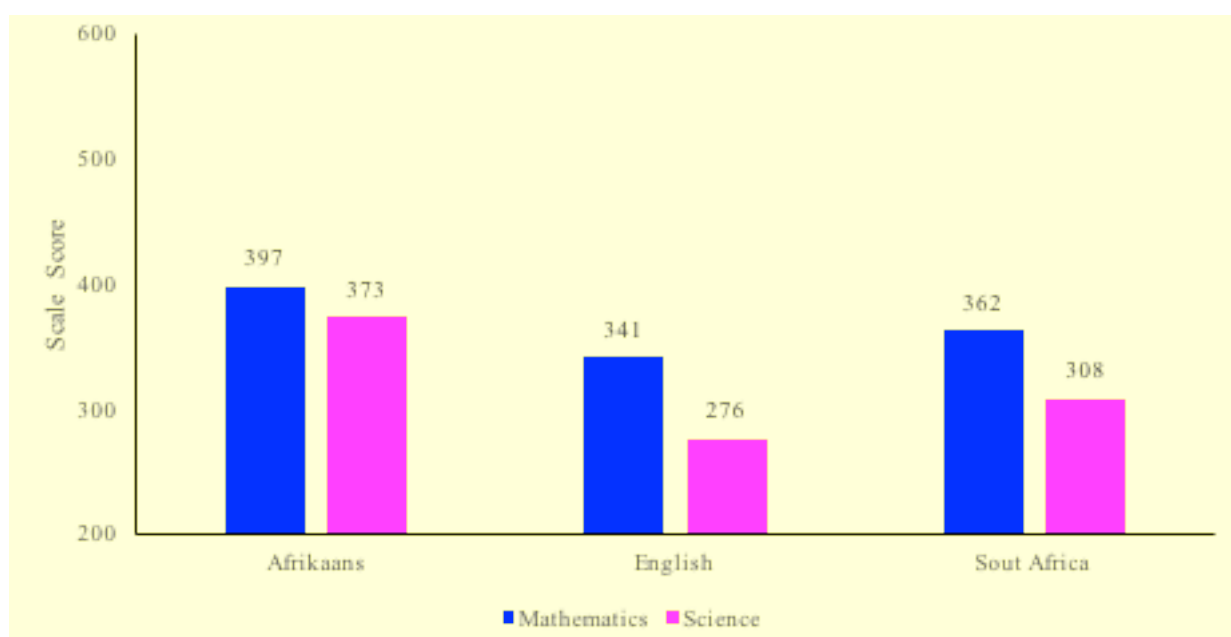Additional analysis was conducted based on the reported frequency of LOLT usage at home by learners. As noted in Figure 5.5, one-fifth of learners reported that they "always" spoke the LOLT at home, 15% reported "almost always", 51% reported "sometimes", and 13% "never".

The results reveal a clear positive correlation between the learners' reported frequency of LOLT usage at home and academic achievement in both mathematics and science. Learners who "Always" speak the LOLT at home demonstrate the highest achievement levels, with scores of 405 in mathematics and 376 in science.

Similar levels of achievement were noted for the second-highest performing group, learners who "Almost always" or "Sometimes" speak the LOLT at home. The most striking result is observed in the group of learners that reported they "Never" speak the LOLT at home. These learners show dramatically lower achievement, levels with scores of 294 in mathematics and 214 in science.

The difference in achievement between the highest and lowest performing groups is substantial. In mathematics, there is a 111-point gap between those who "Always" speak the LOLT at home (405) and those who "Never" do (294). Interestingly, the gap in science is smaller but still significant at 162 points (376 for "Always" vs 214 for "Never").
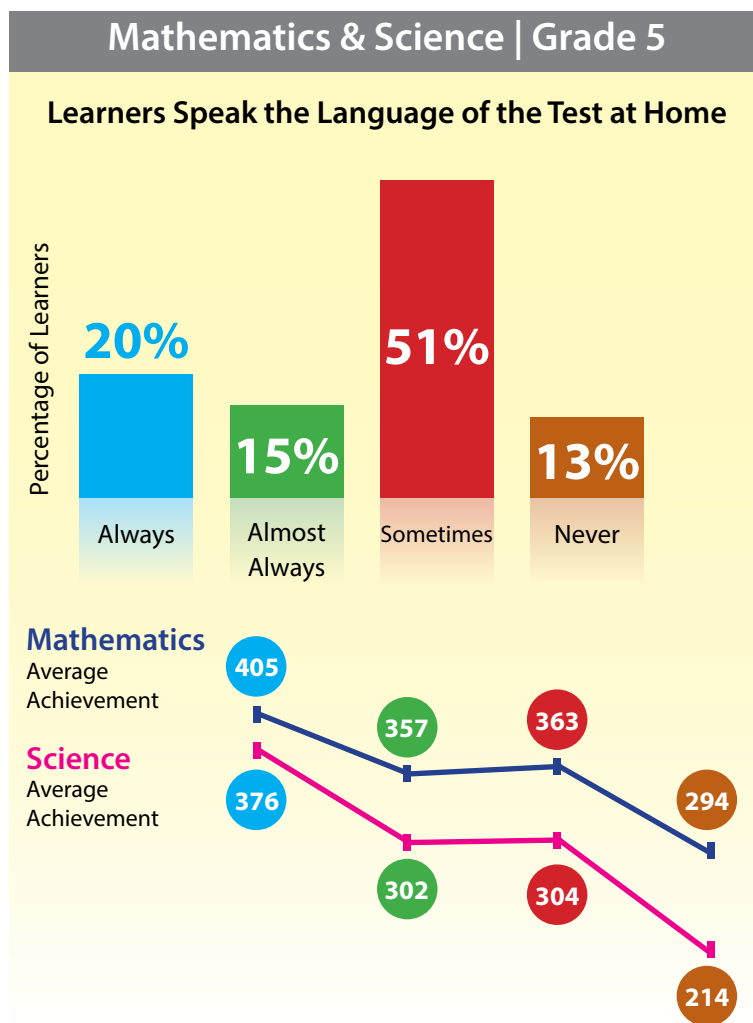
Figure 5.6: Grade 5 Achievement by Language of test spoken at home

6. Context of Grade 5 Mathematics and Science achievement

The results presented in this section were drawn from the Exhibits provided by the IEA for the 2023 TIMSS results. These findings highlight the relationship between the specific context within which learning and teaching takes place and learner levels of achievement. A key point to note is that additional analysis is required to determine and identify the specific factors that explain these relationships.

6.1 Grade 5 learner contexts

This section presents results regarding the selected learner variable factors that impact the average achievement levels of Grade 5 learners.

6.1.1 Socioeconomic Status

The TIMSS 2023 Home Socioeconomic Status scale is based on parents' reports about the number of books and children's books in the home, as well as self-reported parental education level and occupation. On average, 6% of learners were classified in the "higher" home socioeconomic status category, 42% were classified in the "middle" home socioeconomic status category, and 53% were classified in the "lower" home socioeconomic status category.

As noted in Figure 6.1, the higher the socio-economic status (SES) of learners, the higher their average achievement score. In mathematics, learners classified as "middle" home socioeconomic status had an average achievement of 390, and learners classified as "lower" home socioeconomic status had an average achievement of 334. The pattern is similar in science achievement, learners classified as "middle" home socioeconomic status had an average achievement of 344, and learners classified as "lower" home socioeconomic status had an average achievement of 272. The gap in achievement between higher and lower SES is massive, at 173 points in mathematics and 221 points in science.
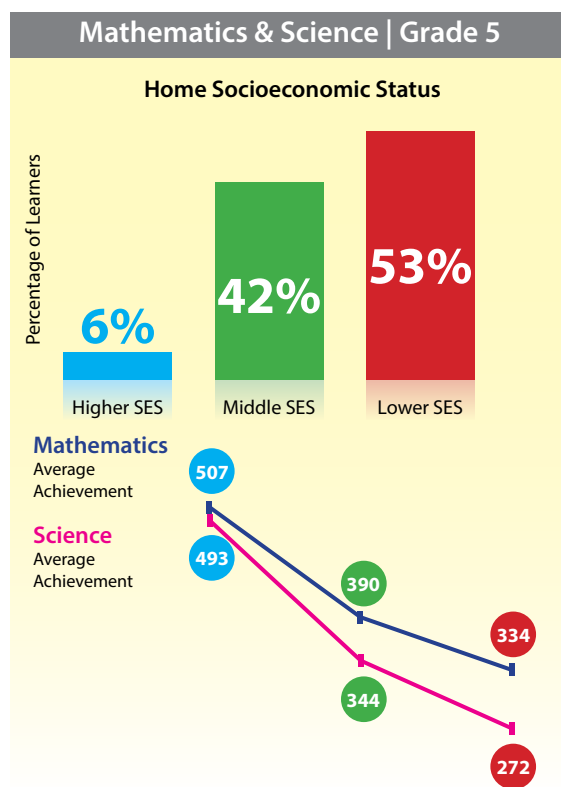
Figure 6.1: Grade 5 Achievement by Home Socioeconomic status

6.1.2 Home Early Literacy and Numeracy Activities

The TIMSS 2023 Early Literacy and Numeracy Activities scale is based on parents' reports about how often they engaged with their children in literacy and numeracy activities before their child began primary school. Figure 6.2 reveals that 11% of learners' parents reported that they engaged their child in these activities "very often," 48% reported "often" and 41% reported "sometimes". In both subjects, the higher the parents' reported level of engagement, the higher the average level of achievement.

In mathematics, the average achievement score increases from 339 (sometimes), to 381 (often) and 426 (very often). Similarly, in science, the average achievement scores increase from 277 (sometimes) to 332 (often) and 395 (very often). The gap in average achievement between those reporting "sometime" compare to "very often" is 87 points in mathematics and 118 points in science.
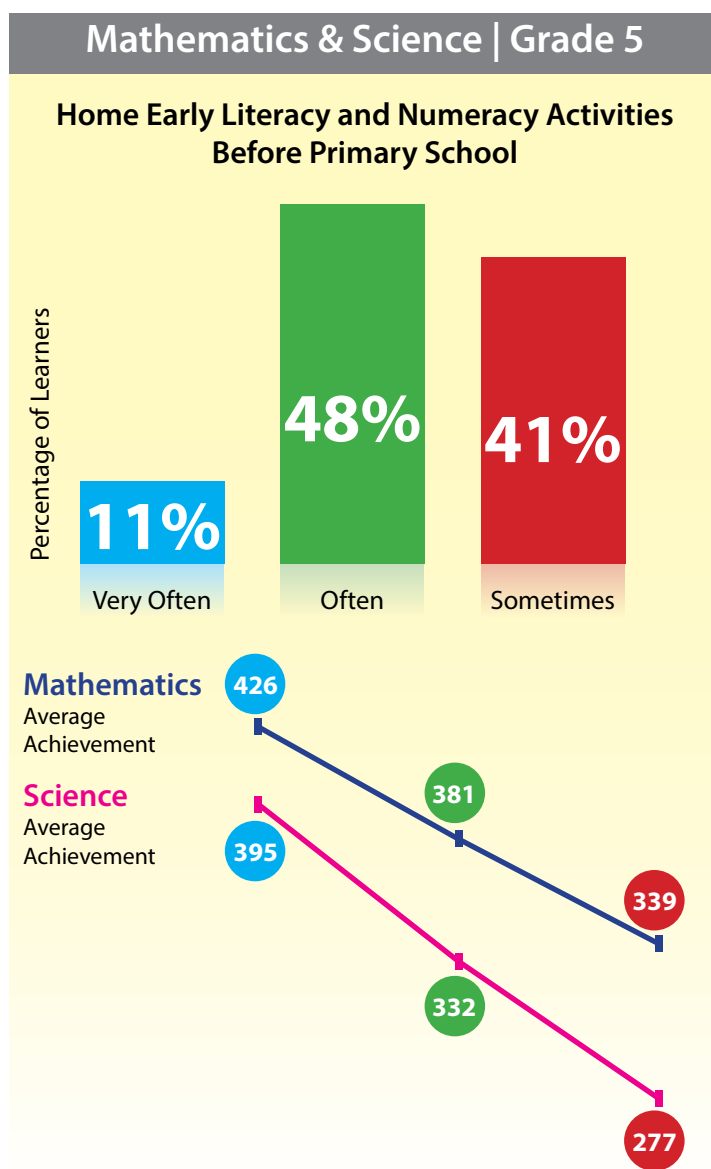
Figure 6.2: Grade 5 Achievement by home activities

6.1.3 Learner attitude towards Mathematics and Science

The Learners Like Learning Mathematics and Like Learning Sciences scale was based on learner responses regarding their agreement with specific questions about their attitudes toward mathematics and science, respectively. In mathematics (Figure 6.3), 53% of learners indicated "very much", 35% reported "somewhat" and 12% indicated that they "do not like" learning mathematics.

For both mathematics (380) and science (328), learners who indicated "very much" got higher scores. In mathematics, similar scores were noted for those learners who indicated "somewhat" (341) and those learners who indicated "do not like" learning mathematics (345). However, different average levels of achievement were noted for Grade 5 science learners who indicated "somewhat like" it (286) and those who indicated "do not like" it (261).
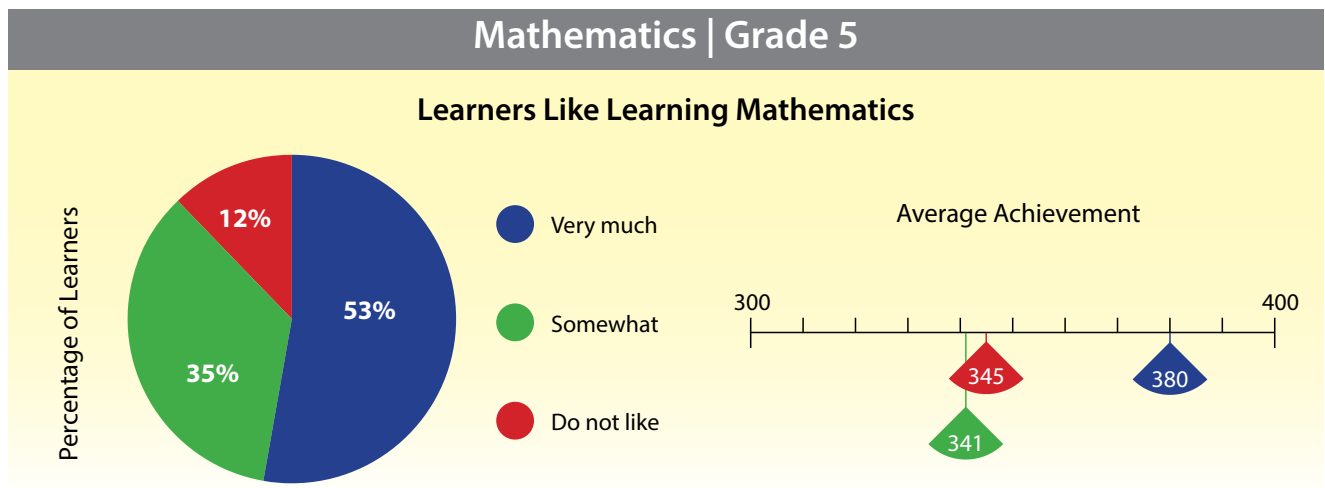
Figure 6.3: Grade 5 Achievement by learners attitude to Mathematics
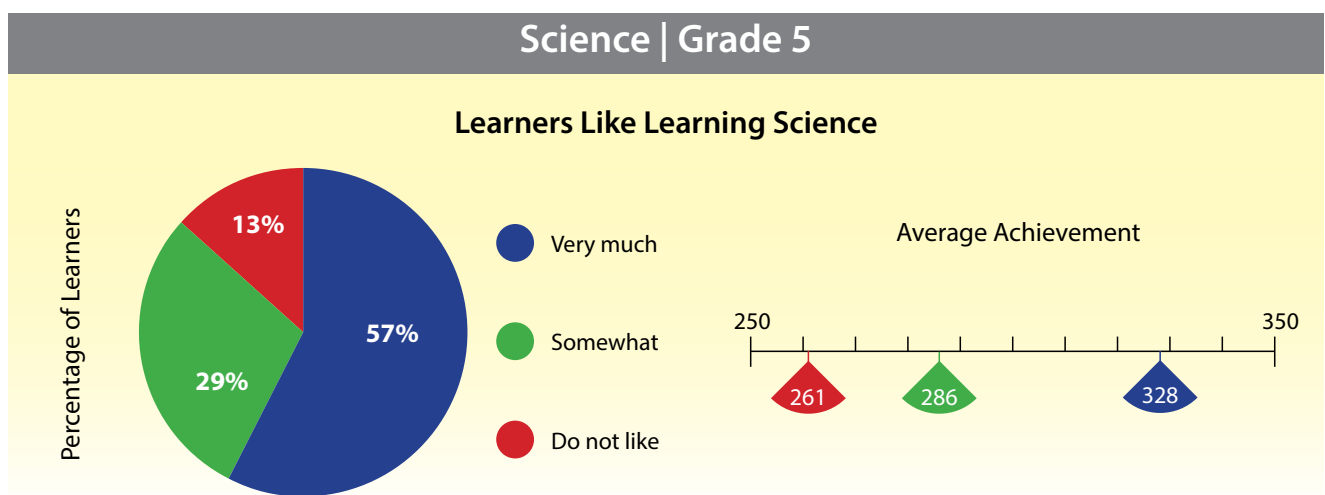
Figure 6.4: Grade 5 Achievement by learners attitude to Science

6.1.4 Learners' Digital Self-Efficacy

The TIMSS 2023 Digital Self-Efficacy scale is based on learners' agreement with statements about confidence in using digital devices in different ways, such as writing text or creating presentations. As noted in Figure 6.5, less than a fifth (19%) of Grade 5 learners were classified as having "high" digital self-efficacy, 51% were classified as having "medium" digital self-efficacy and the remaining 30% of learners were classified as having "low" digital self-efficacy.

For both mathematics and science, learners classified as having greater digital self-efficacy demonstrated substantially higher average mathematics and science achievement. Learners categorised as having "high" digital self-efficacy had an average achievement of 419 in mathematics and 386 in science. Learners classified as having "medium" digital self-efficacy had an average achievement of 361 in mathematics and 305 in science. Average achievement for learners with "low" digital self-efficacy was 328 in mathematics and 260 in science.
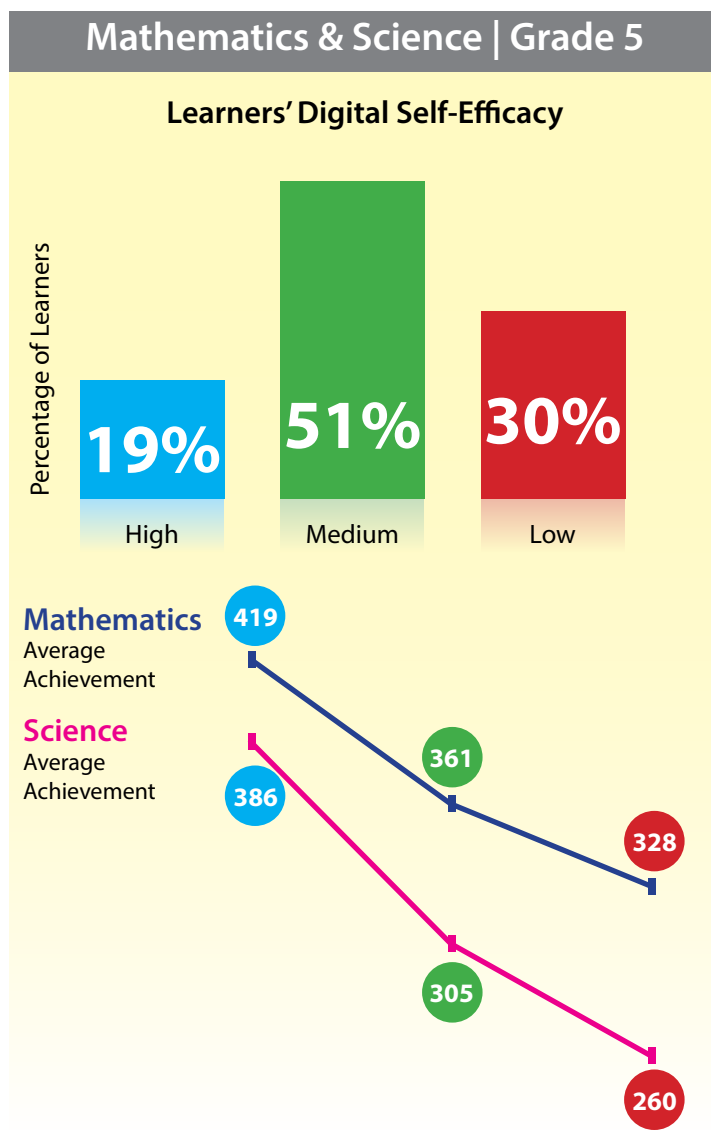
Figure 6.5: Grade 5 Achievement by learners' digital self-efficacy

6.2 Grade 5 School Contexts

This section presents results regarding the schools' context within which learning and teaching in mathematics and science took place and the relationship of these contexts with average achievement levels of Grade 5 learners.

6.2.1 Teachers' Formal Education

Information obtained from teachers regarding their formal education was reported in four categories as noted in Figure 6.6. On average, 18% of mathematics and science learners had science teachers with a postgraduate university degree, 40% vs 38% had teachers with a Bachelor's degree, 27% and 28% had teachers with some post-secondary education, while 15% and 16%, respectively had mathematics and science teachers who only completed upper-secondary education.
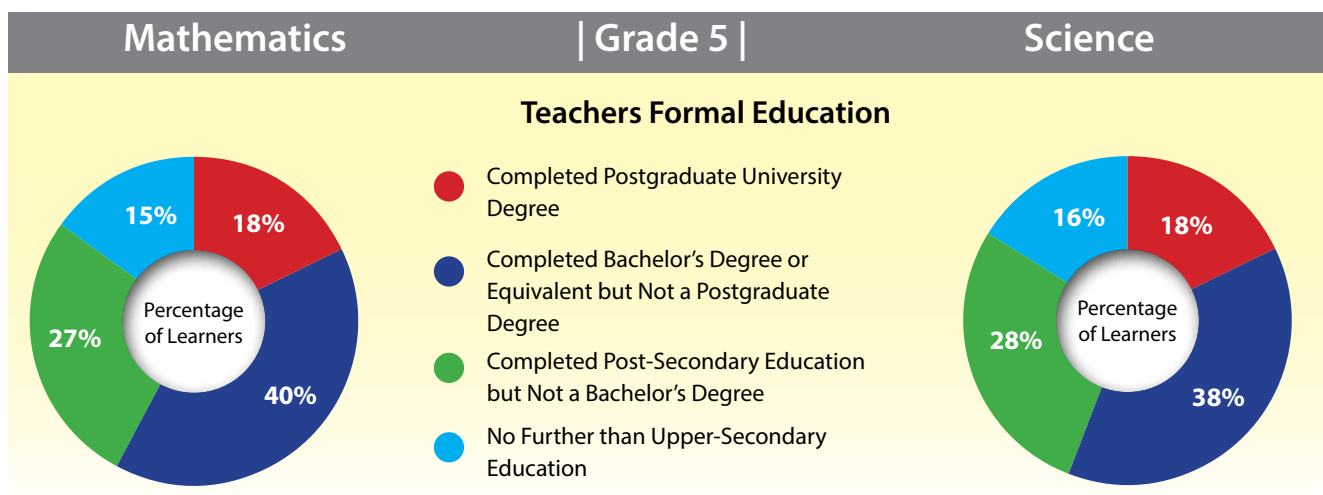
Figure 6.6: Formal education of Grade 5 teachers

6.2.2 School affluence level

The TIMSS 2023 index for school affluence is defined by socio economic background of the learners attending the school. The "more affluent" schools are classified as having more than 25% of learners from economically affluent homes and not more than 25% percent from economically disadvantaged homes, while "more disadvantaged" schools have more than 25% of learners from disadvantaged homes and not more than 25% from affluent homes. All other combinations are considered to be "neither more affluent nor more disadvantaged."

As noted in Figure 6.7, a positive correlation was found between affluence of the school and average achievement in both mathematics and science. The 9% of Grade 5 learners who attended schools categorised as "more affluent" obtained an average mathematics achievement of 490 in mathematics and 486 in science.

For the 73% of learners who attended schools categorised as "more disadvantaged", the average achievement was 337 in mathematics and 274 in science. The learners who attended schools categorised as "neither more affluent nor more disadvantaged" (17%) obtained an average of 386 in mathematics and 340 in science.
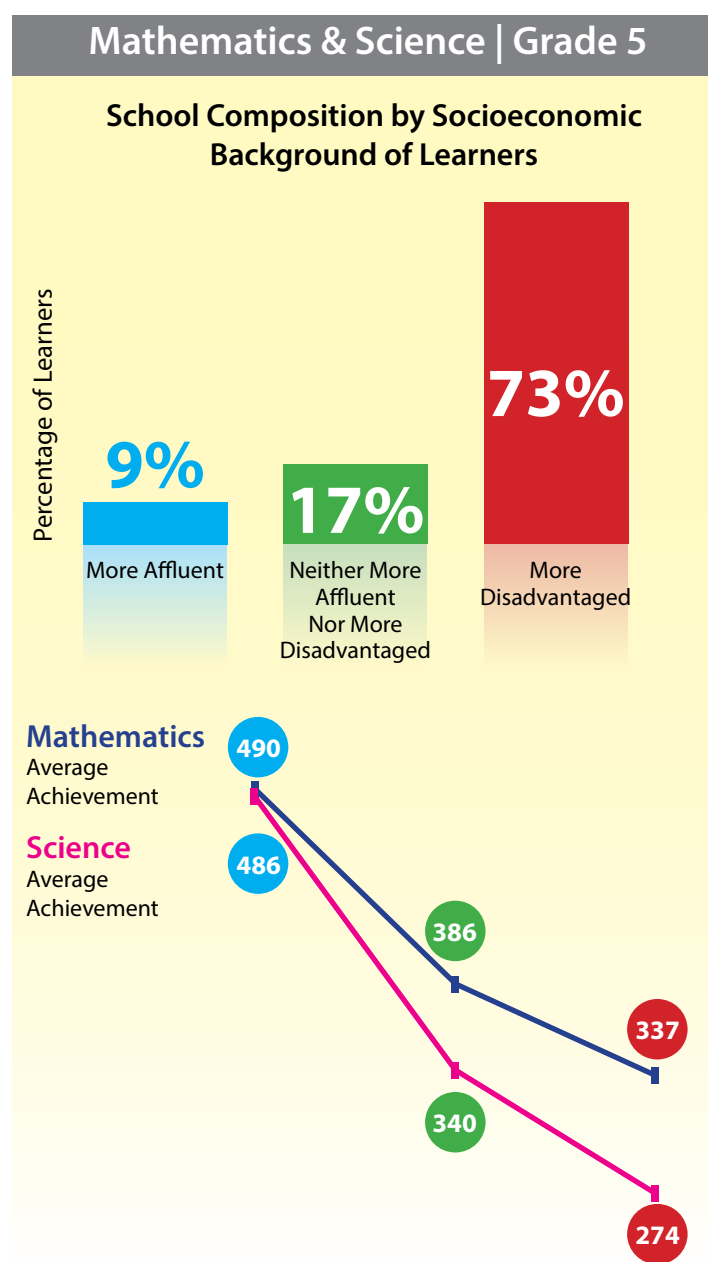
Figure 6.7: Grade 5 Achievement by school affluence

6.2.3 School Emphasis on Academic Success

The School Emphasis on Academic Success scale includes items that asked school principals about their perceptions of how different school community members exhibit support for academic achievement.

Figure 6.8 indicates that only 2% of learners attended schools that placed a "very high emphasis" on academic success, while 37% attended schools with a "high emphasis" and 61% attended schools with a "medium emphasis" on academic success.

In mathematics, learners in schools with "high emphasis" on academic success had an average achievement of 376, and learners in schools with "medium emphasis" had an average achievement of 344. The results in science were similar, with an average achievement of 326 for learners in schools with "high emphasis" and 285 for those in schools with "medium emphasis".
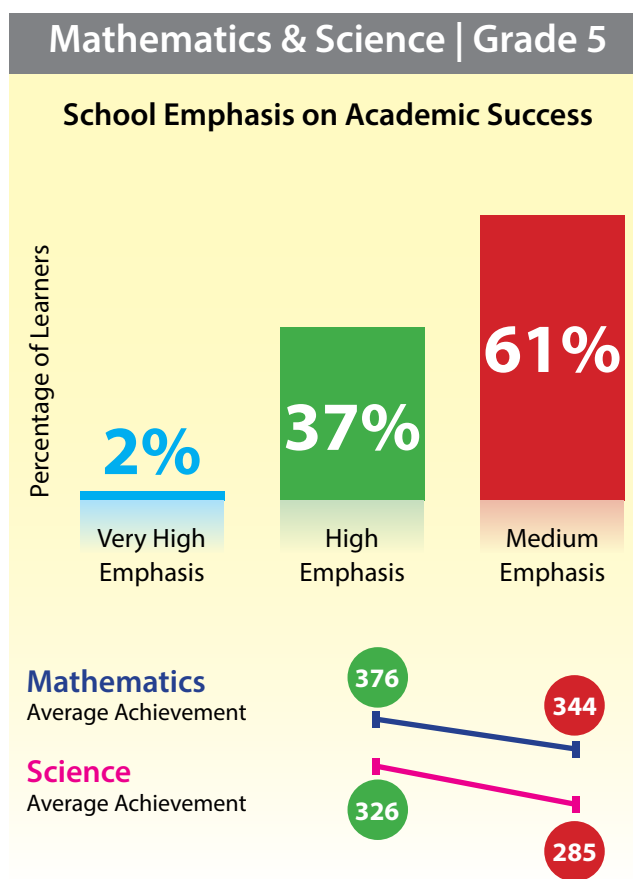
Figure 6.8: Grade 5 Achievement by School emphasis on academic success[5]

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5   Insufficient data to report at the very high emphasis level

6.2.4 Safe and Orderly School

The Safe and Orderly School scale was based on teachers' responses regarding the degree to which they agreed with statements regarding safety and discipline within the school.

Figure 6.9 indicates that a similar percentage of mathematics (41%) and science (39%) learners noted that their schools were "very safe and orderly," 50% vs 53% noted "somewhat safe and orderly" and 9% (for both mathematics and science) schools noted as "less than safe and orderly".

Learners in schools where teachers perceived the school environment as "very safe and orderly" showed slightly higher average achievement in mathematics and science compared to those in the other two categories.

On average, learners attending schools described as "very safe and orderly" by their teachers achieved an average mathematics achievement of 383 and an average science achievement of 338. Learners in schools identified as "less than safe and orderly" had an average achievement of 354 in mathematics and a particularly low average achievement of 259 in science.
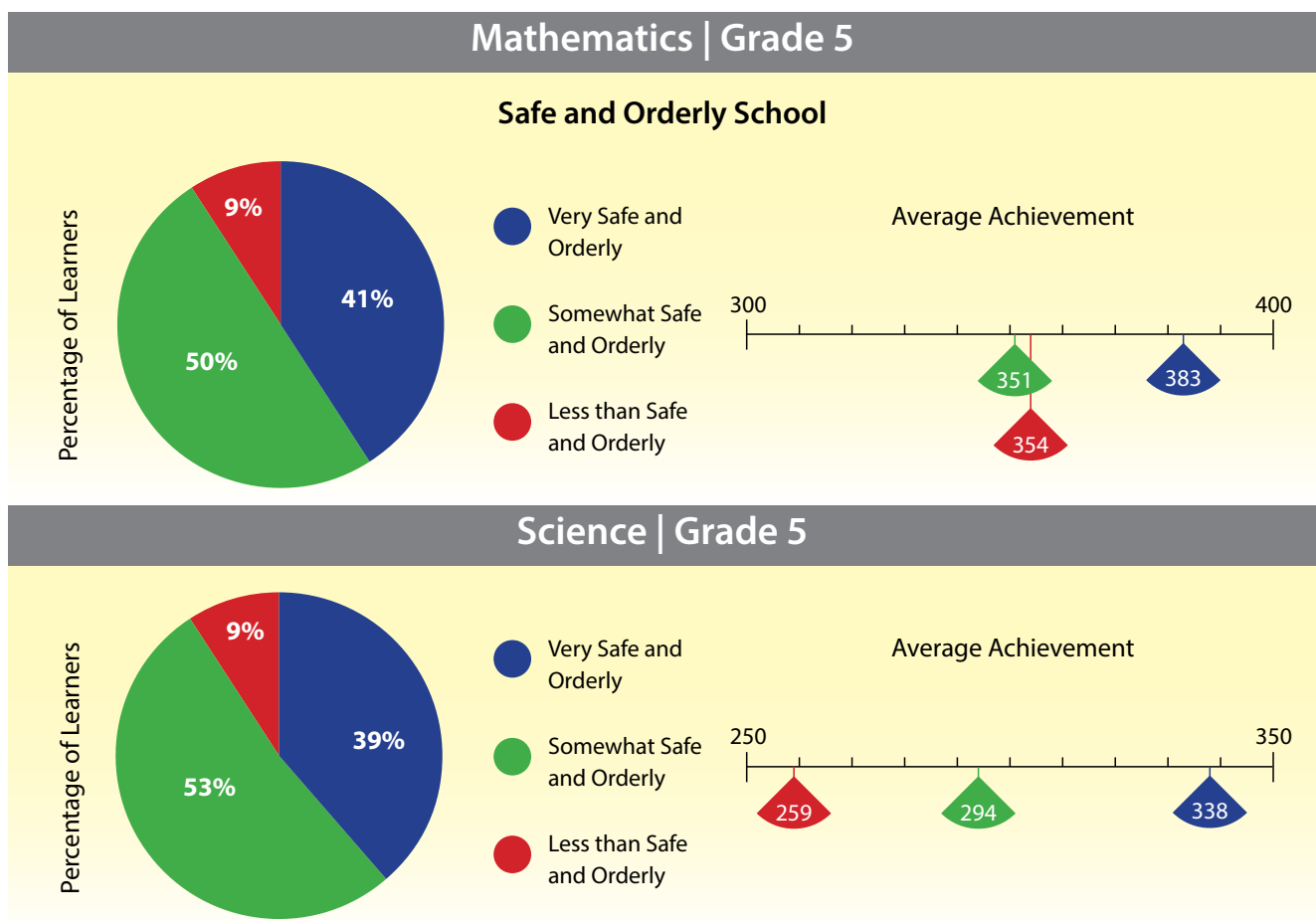
Figure 6.9: Grade 5 Achievement by School Safety

7. Grade 9 learner achievement: International Comparisons

This section presents results of South African Grade 9 learners' achievement in mathematics and science disaggregated by province, quintile category, gender and language of learning and teaching.

7.1 Grade 9 Scale Scores

At the eighth-grade level, 44 countries and three benchmarking entities participated in TIMSS 2023 (von Davier, et. al, 2024). As noted in Figure 7.1, the results for Year 8 Mathematics (Grade 9 for SA) revealed that the highest performing learners in mathematics were from Singapore (605), Chinese Taipei (602), and the Republic of Korea (596), Japan (595) and Hong Kong SAR (575). The lowest performing mathematics learners were from South Africa (397), Jordan (388), Palestine (382), Brazil (378) and Morocco (378).

Figure 7.1: Grade 8 Average Mathematics Achievement by Country[6]

For Year 8 Science (Figure 7.2), similar trends were noted. The highest performing learners were from Singapore (606), Chinese Taipei (572), Japan (557) , the Republic of Korea (545), and England (531). Learners from Azerbaijan (411), Uzbekistan (396), Kosovo (403), Palestine (393), South Africa (362) and Morocco (327) were amongst the lowest performing group.

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6   Ψ Reservations noted about reliability of the South African Grade 8 Mathematics results because the percentage of learners with achievement too low for estimation exceeds 15% but does not exceed 25%

Singapore **606** | Chinese Taipei **572** | Japan **557** | Korea, Rep. of **545** | England **531**
Finland **531** | Türkiye **530** | Hong Kong SAR **528** | Czech Republic **527** | Ireland **525**
Hungary **522** | Sweden **521** | Australia **520** | Lithuania **519** | United States **513**
Austria **512** | Portugal **506** | Malta **501** | Italy **501** | Norway (9) **488**
United Arab Emirates **486** | France **486** | Qatar **481** | Israel **481** | Romania **466**
Cyprus **464** | Oman **456** | Chile **455** | Bahrain **452** | Georgia **448** | Kazakhstan **443**
Malaysia **426** | Brazil **420** | Kuwait **420** | Saudi Arabia **419** | Iran, Islamic Rep. of **419**
Jordan **413** | Azerbaijan **411** | Uzbekistan **396** | Palestinian Nat'l Auth. **393**
South Africa (9) **362** | Morocco **327**

New Zealand **502** | Côte d'Ivoire **183**

Benchmark Participants
Dubai, UAE **547** | Sharjah, UAE **499** | Abu Dhabi, UAE **443**

Figure 7.2: Grade 8 Average Science Achievement by Country[7]

7.2   Grade 9 Benchmarks

Figure 7.3 presents the percentages of South African Grade 9 learners attaining the International benchmark. In mathematics, 1% of learners were functioning at the Advanced Level, 4% were functioning at the High Level, 15% at the Intermediate Level, and 45% at the Low Level. However, 35% are functioning below the Low Benchmark Level.

The science results reveal a similar trend. One percent (1%) of learners were functioning at the Advanced Level, 5% at the High Level, 14% at the Intermediate Level, 33% at the Low Level, while 47% were functioning below the Low Benchmark Level.

Of note is the percentage of learners functioning at the Advanced and High benchmark levels. The ability of these learners to function at the higher benchmark levels provides some reason for optimism, given the valuable insights to be gained in improving the learning experiences and outcomes for all learners.

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7   Ψ Reservations noted about the reliability of the South African Grade 8 Science results because the percentage of learners with achievement too low for estimation exceeds 15% but does not exceed 25% (von Davier et al, 2024)

Mathematics			Science[8]		
Learners can extend their understanding beyond working with integers alone to solve a variety of problems in novel contexts	1%	**Advanced Benchmark (625)**	1%		Learners can show, apply, and reason with knowledge of concepts related to biology, chemistry, physics, and earth science in various contexts, and they can engage in more complex scientific practices
Learners can apply their conceptual understanding in a variety of relatively complex situations	4%	**High Benchmark (550)**	5%		Learners show and apply knowledge of concepts from biology, chemistry, physics, and earth science, and they engage in multiple scientific practices
Learners can apply mathematical knowledge in a variety of situations	15%	**Intermediate Benchmark (475)**	14%		Learners can apply understanding of some concepts from biology, chemistry, physics, and earth science, and they engage in some scientific practices
Learners have knowledge of integers, basic shapes, and visual representations	45%	**Low Benchmark (400)**	33%		Learners show and apply knowledge of some science facts

Figure 7.3: South Africa Grade 9 Mathematics and Science Scale benchmarks[8]

Obtained from IEA Exhibit 1.2.3 and 2.2.3

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8 Ψ Reservations about reliability of Grade 8 Mathematics and Science results because the percentage of learners with achievement too low for estimation exceeds 15% but does not exceed 25%.

8. Grade 9 Learner Achievement Trends: 2011–2023

Grade 9 learners in South Africa participated in the Trends in International Mathematics and Science Study (TIMSS) since 2011, in both mathematics and science. Trend results over this period (Figure 8.1) for both Grade 9 mathematics and science indicate a substantial improvement in the average achievement levels from 2011 to 2015 and from 2015 to 2019.

From 2019 to 2023, the mathematics scores increased from 389 to 397. In science, the average scores declined from 370 to 362 from 2019 to 2023. However, these improvements for both mathematics and science were not statistically significant, indicating that achievement levels have remained relatively stable between these two cycles, contrary to expectations of a significant decline given the negative impact of the COVID-19 pandemic as well as the substantial curriculum revisions effected during and after COVID. While specific reasons explaining the stable results from 2019 to 2023 have yet to be identified, this finding reflects some resilience within the education system that bodes well for addressing some of the challenges identified from the TIMSS 2023 results.
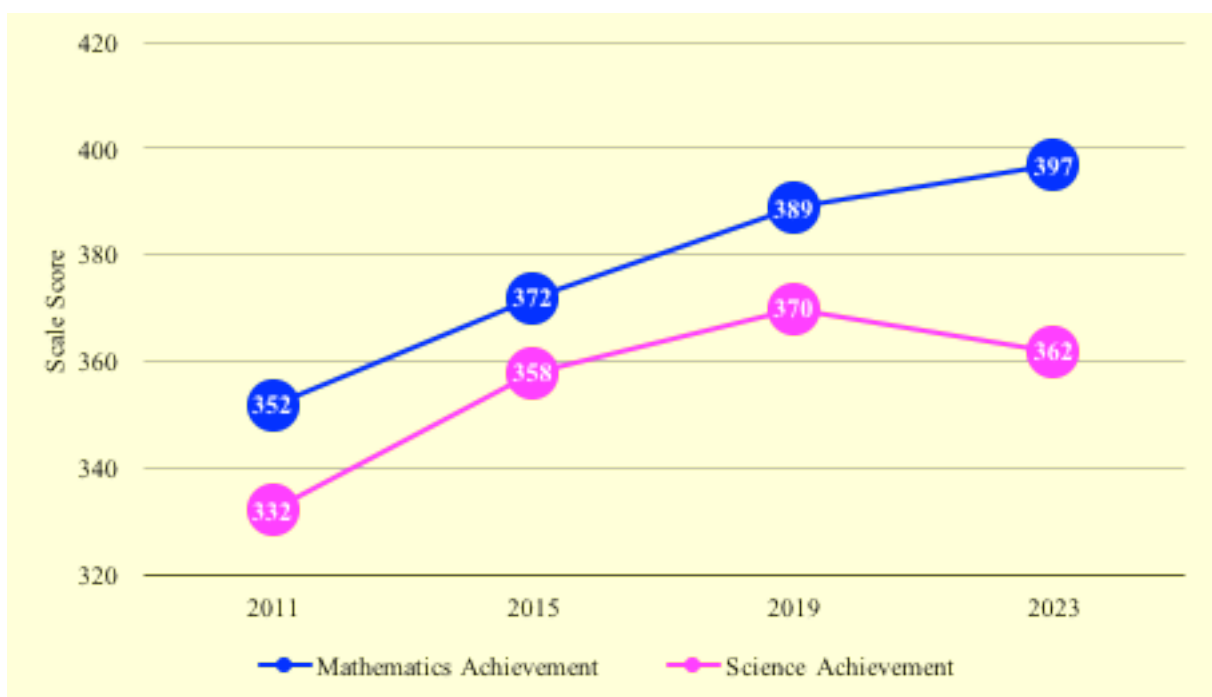

Figure 8.1: Grade 9 Mathematics and Science trends

9.   Grade 9 Achievement: National Comparisons

This section presents the national TIMSS 2023 results of Grade 9 learners disaggregated by province, school quintile category, gender, language of learning and teaching as well as language spoken at home.

9.1   Grade 9 achievement by Province

Similar to the Grade 5 results, the findings for Grade 9 mathematics and science (Figure 9.1) reveals substantial disparities in learner levels of achievement across the different provinces. In mathematics, learners from Gauteng (412) and the Western Cape (424) obtained the highest average achievement. On the other hand, the average achievement for learners from Limpopo (374) and the Eastern Cape (368) was low. The difference in average achievement scores of learners in between the highest and lowest performing provinces is 56 points.

In science, learners in the same two provinces obtained the highest average achievement scores, with scores of 381 and 416, respectively for Gauteng and the Western Cape. Similar to mathematics, the average achievement scores of learners in Limpopo and the Eastern Cape, were 327 and 322, respectively. The score difference between the Western Cape and Eastern Cape is 94 points.
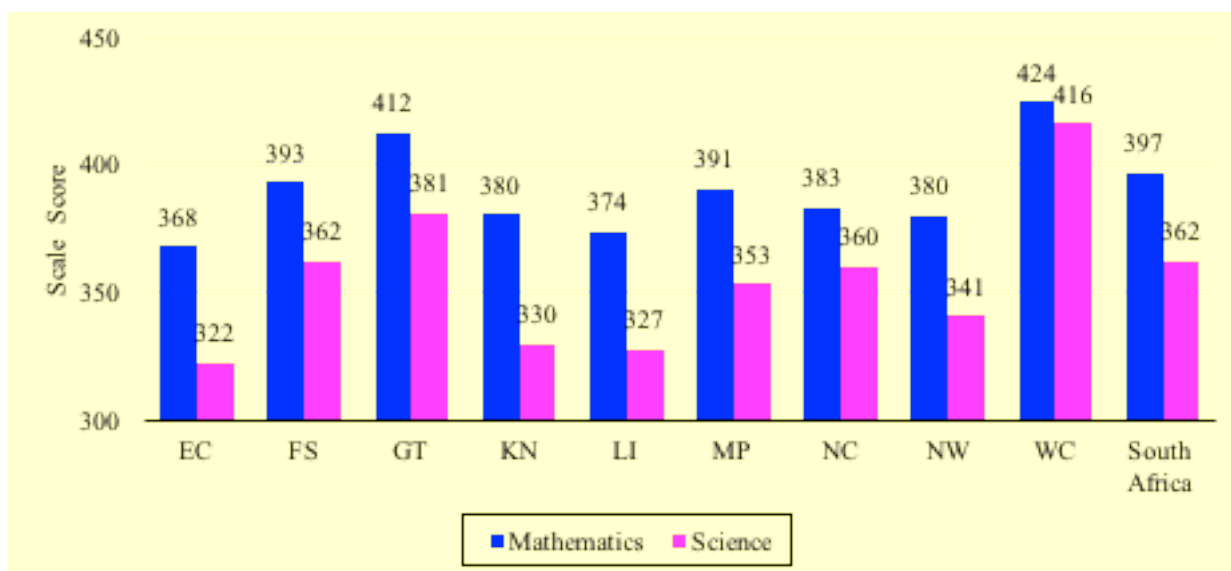

Figure 9.1: Grade 9 Mathematics and Science achievement by Province

9.2 Grade 9 achievement by School Quintile

Figure 9.2 presents the average achievement scores in mathematics and science for Grade 9 learners, disaggregated by school quintile. In mathematics, learners from Quintile 5 schools have the highest average achievement score (470). In contrast, learners from Quintile 1 schools, the most disadvantaged, have the lowest average score of 319. The difference in mathematics scores between Quintile 5 and Quintile 1 is substantial, at 100 points, highlighting the significant impact of socioeconomic factors on educational outcomes.

In science, the pattern is similar. Quintile 5 schools have the highest average achievement score of (471), while Quintile 1 schools have the lowest score (319). The difference in science scores between the top and bottom quintiles is 152 points, further emphasising the disparities in educational opportunities and outcomes, based on socioeconomic status.
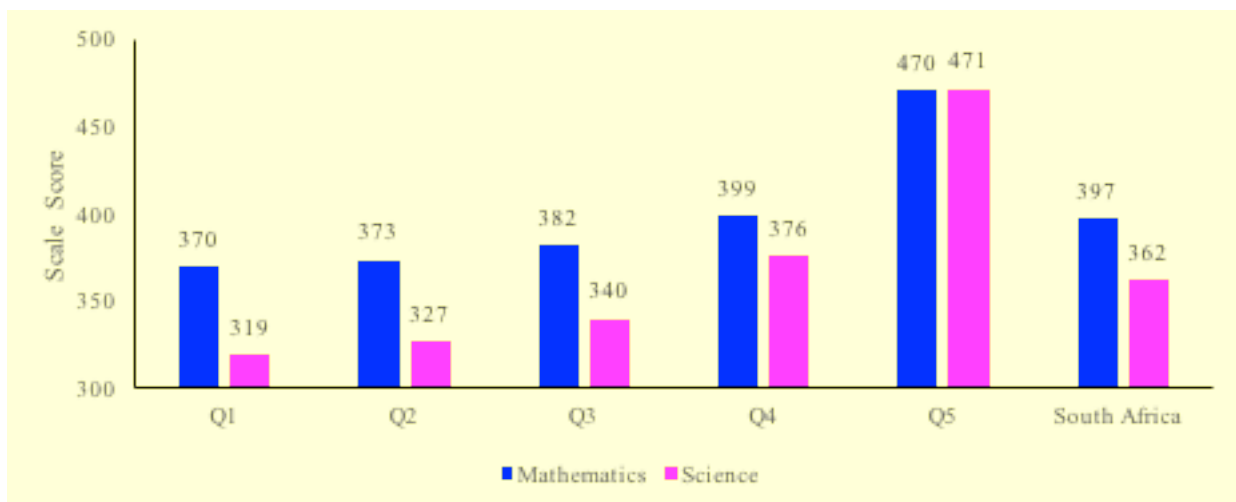

Figure 9.2: Grade 9 Mathematics and Science achievement by Quintile

9.3 Grade 9 achievement by Gender

The findings presented in Figure 9.3 illustrate the persistent gap in the achievement of Grade 9 boys and girls in both mathematics and science achievement. In mathematics, boys have an average achievement score of 393, while girls have a slightly higher average score of 401. The difference in scores between boys and girls is 8 points*[9], suggesting a modest gender gap in mathematics achievement.

In science, the pattern is similar, with boys achieving an average score of 355, compared to girls who have an average score of 370. The difference in science scores is more pronounced, 15 points*.
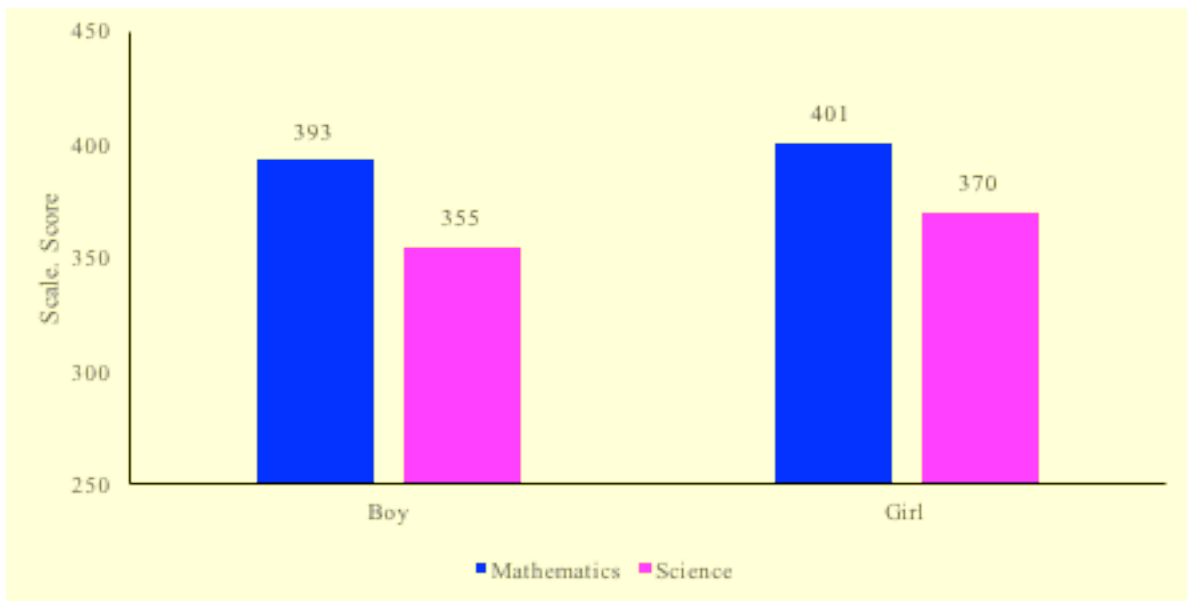

Figure 9.3: Grade 9 Mathematics and Science achievement by Gender

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9 *Indicating significant differences ($p < 0.05$)

A review of the trends in the average achievement of girls and boys reveals substantial differences in achievement scores. In mathematics and science, no significant differences were noted in the 2011 and 2015 TIMSS cycles. However, for the 2019 cycle, the difference was significant in favour of girls, at 12* points in mathematics and 7 points in science. For the 2023 TIMSS cycle, the difference was also significant in favour of girls, at 15* points in science and 8* points in mathematics.
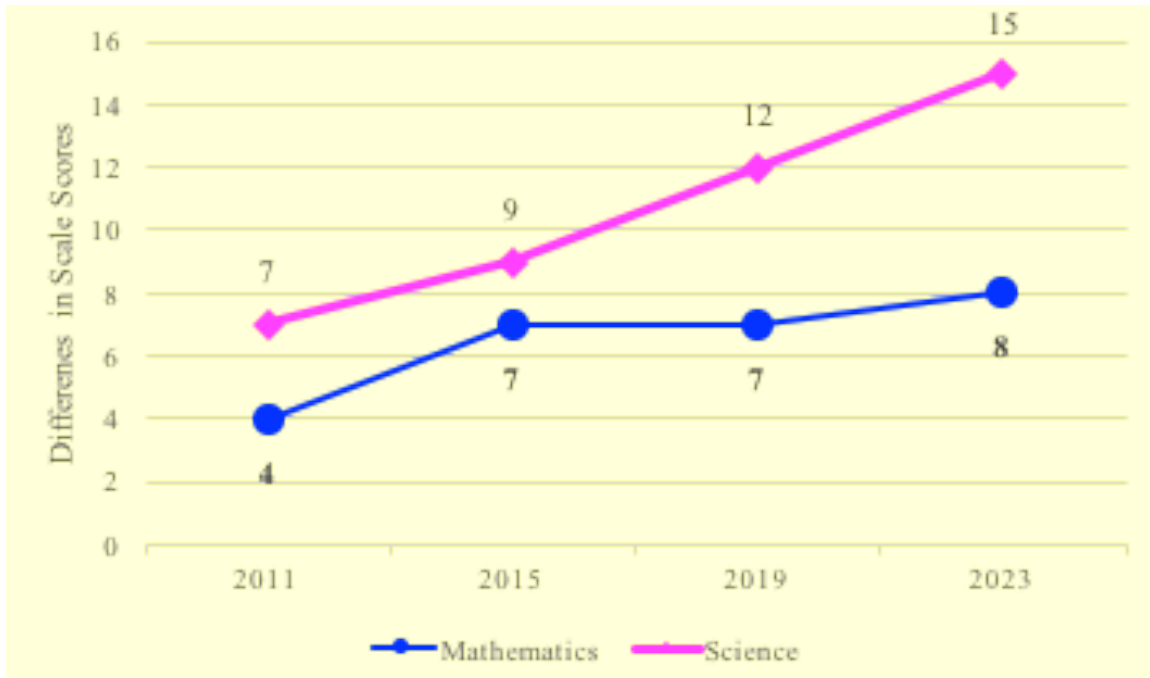

Figure 9.4: Grade 9 Trends in Gender differences in achievement

9.4 Grade 9 achievement by Language of learning and teaching

Figure 9.5 presents the average achievement scores in mathematics and science by the language of learning, teaching, and assessment (LOLTA). Learners in Afrikaans medium schools achieved an average score of 421 in mathematics, while learners in English medium schools scored an average of 386, revealing a substantial difference of 24 points in favour of Afrikaans. Similarly, in science, Afrikaans learners attained an average score of 421, considerably higher than the average score of 346 for English learners, with a difference of 59 points.
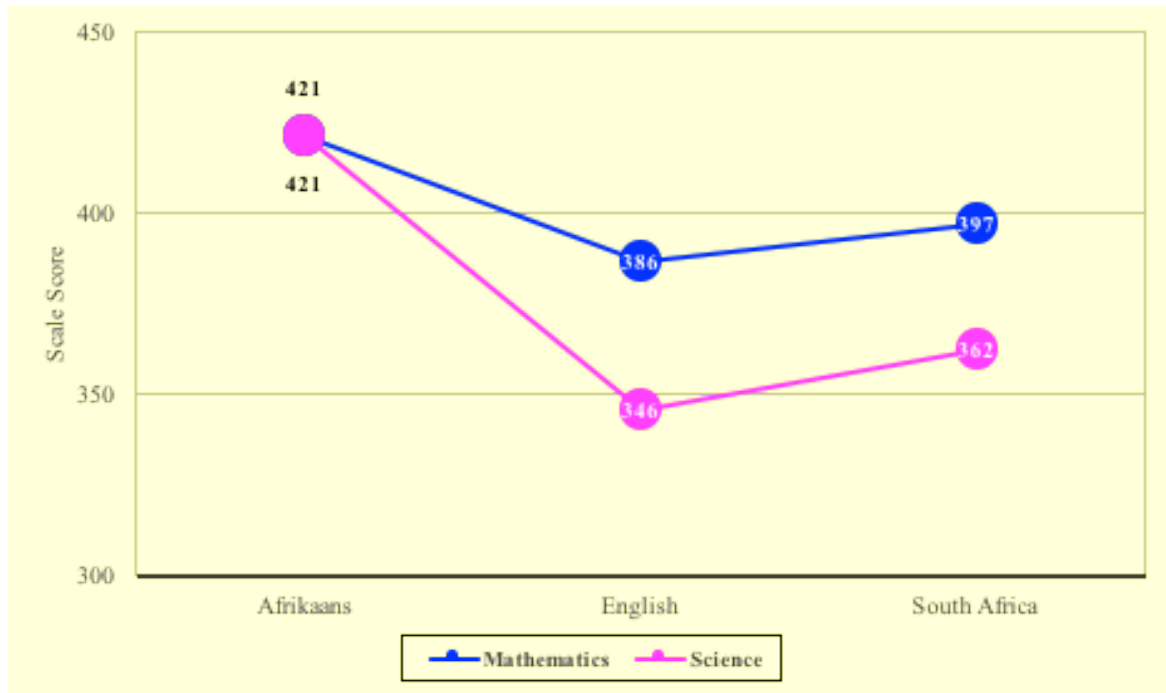

Figure 9.5: Grade 9 Mathematics and Science achievement by LOLT

Additional information on how language used outside of school influences academic success is presented in Figure 9.6. Thirteen percent of learners reported that they "always" speak the language of the test at home, 17% indicated "almost always" speaking the language of the test at home, 64% reported they "sometimes" speak the language of the test at home with a further 6% stating that they "never" speak the language of the test at home.

The results reveal a clear positive correlation between the learners' reported frequency of LOLT usage at home and academic achievement in both mathematics and science. In mathematics, learners who "always" speak the language of the test at home have the highest average achievement score of 438. Those who indicated "almost always" have a score of 420, while learners who indicated "sometimes" have an average score of 383. Learners who reported they "never" speak the language at home have the lowest average score of 371. The difference between learners who indicate "always" and those indicating "never" (at 67 points) and "sometimes" (at 55 points) is substantial.

In science, the pattern is similar. Learners who "always" speak the language at home achieved an average score of 439, while those who indicated "almost always" had a score of 407. Learners who indicated "sometimes" scored 338, and those who indicated "never" had the lowest average score of 318. Here too, the difference between learners who indicate "always" and those indicating "never" (at 121 points) and "sometimes" (at 101 points) is extremely high.
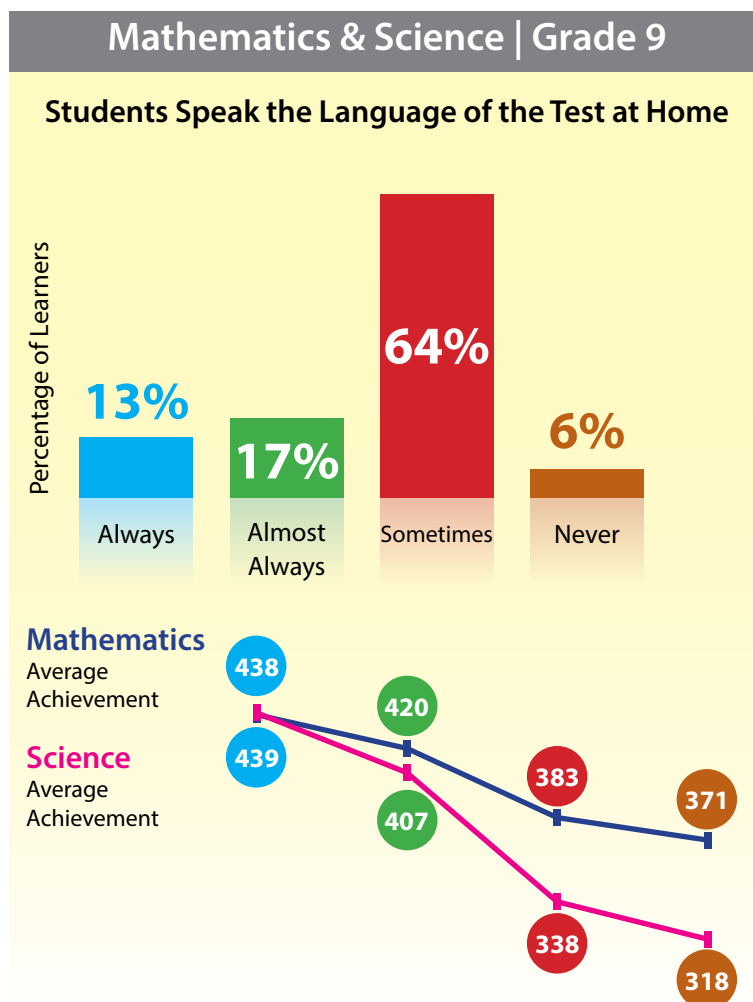

Figure 9.6: Leaner usage of test language at home

10. Context of Grade 9 Mathematics and Science achievement

The results presented in this section were drawn from the Exhibits provided by the IEA for the 2023 TIMSS results. These findings highlight the relationship between the specific context within which learning and teaching takes place and learner levels of achievement. It is important to note that additional analysis is required to determine and identify the specific factors that explain these relationships.

10.1 Grade 9 learner context

This section presents results regarding the selected learner variable factors that impact average achievement levels of Grade 9 learners.

10.1.1 Home education resources

The TIMSS 2023 Home Educational Resources scale is based on learners' reports about the number of books and other study support materials in their homes, as well as the highest level of their parents' education. Based on these reports, learners were classified as having "many resources," "some resources," or "few resources." On average, 5% of learners were classified as having "many resources," 39% were classified as having "some resources," and 56% percent were classified as having "few resources."

As noted in Figure 10.1, in mathematics, learners with "many resources" had an average achievement of 468, and learners with "few resources" had an average achievement of 383. The pattern is similar in science achievement, learners with "many resources" had an average achievement of 468, and learners with "few resources" had an average achievement of 341. The gap in achievement between higher and lower SES is 85 points in mathematics and 127 points in science.
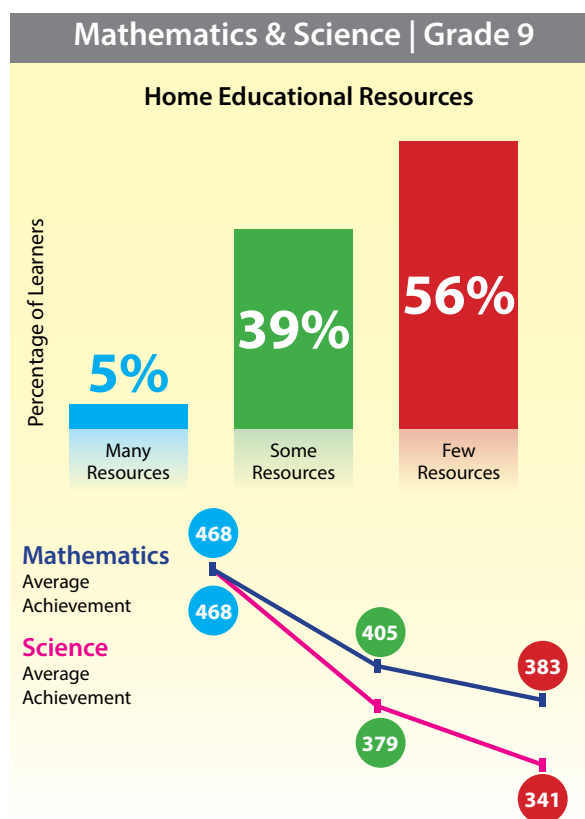

Figure 10.1: Grade 9 Achievement by Home learning resources

10.1.2 Learner attitude towards Mathematics and Science

The Learners Like Learning Mathematics and Like Learning Mathematics scale was based on learner responses regarding their agreement with specific questions about their attitudes toward mathematics and science, respectively.

In mathematics, 38 percent of the Grade 9 learners stated they "very much like" learning mathematics, 41% reported that they "somewhat" like it and 21% indicated that they "do not like" learning mathematics.

There were no differences in the average achievement scores among Grade 9 learners who "very much like" learning mathematics to those who "somewhat like" it, and those who "do not like" it, with average scores of 402, 388, and 400, respectively.
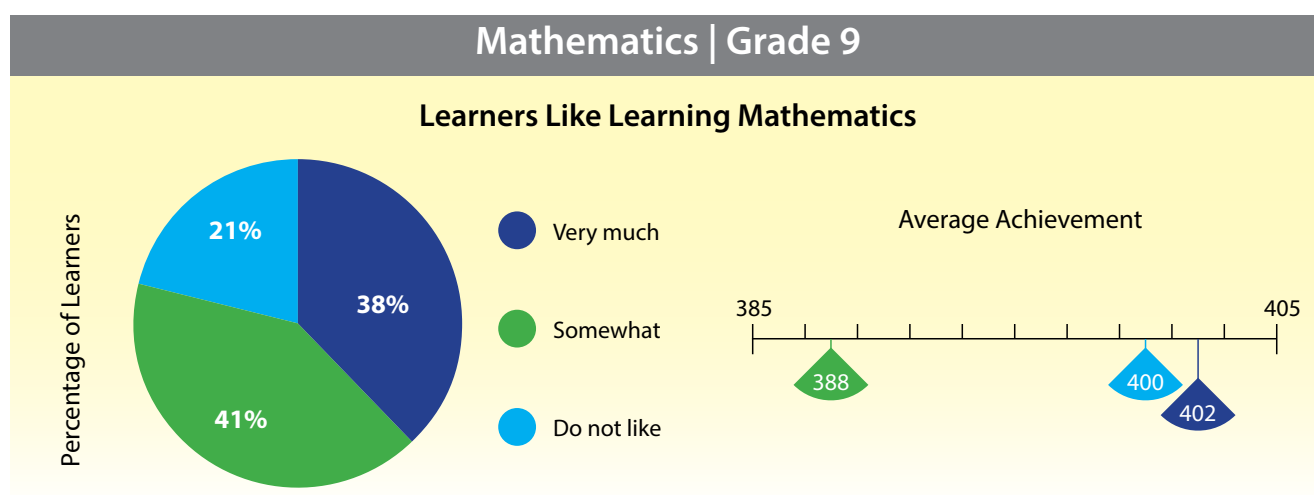
Figure 10.2: Grade 9 Achievement by learners' attitude to Mathematics

For science, Figure 10.3, indicates that 49% of Grade 9 learners reported that they "very much like" learning science, 35% noted "somewhat" and 16% indicated that they "do not like" learning science. The learners who indicated "very much like" learning science achieved a higher average science achievement score (373), a difference of 22 points.

Figure 10.3: Grade 9 Achievement by learners' attitude to science

10.1.3 Learners' Digital Self-Efficacy

The TIMSS 2023 Digital Self-Efficacy scale (Exhibit 6.4.1) is based on learners' agreement with statements about confidence in using digital devices in different ways, such as writing text or creating presentations.
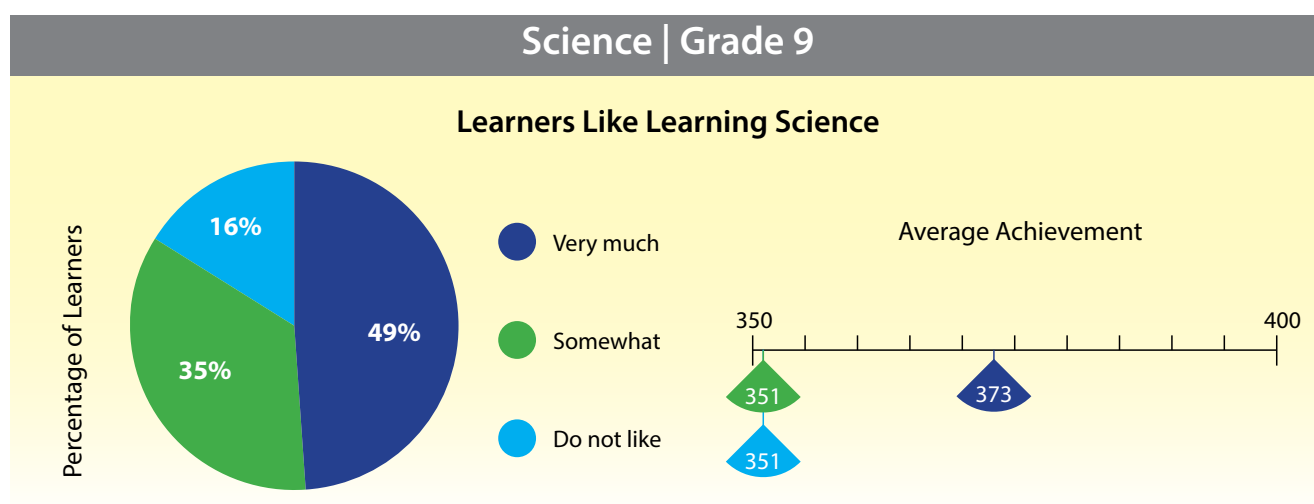
About one-fifth of Grade 9 learners were classified as having "high" digital self-efficacy (22%). Sixty-one percent of learners were classified as having "medium" digital self-efficacy and 16% of learners were classified as having "low" digital self-efficacy.

In both mathematics and science, learners classified as having "high" digital self-efficacy achieved substantially higher average achievement. In mathematics and science, the average achievement scores for learners with "high" digital self-efficacy was 425 and 409 respectively, for "medium" digital self-efficacy it was 389 and 351 and for "low" digital self-efficacy it was 380 and 336.
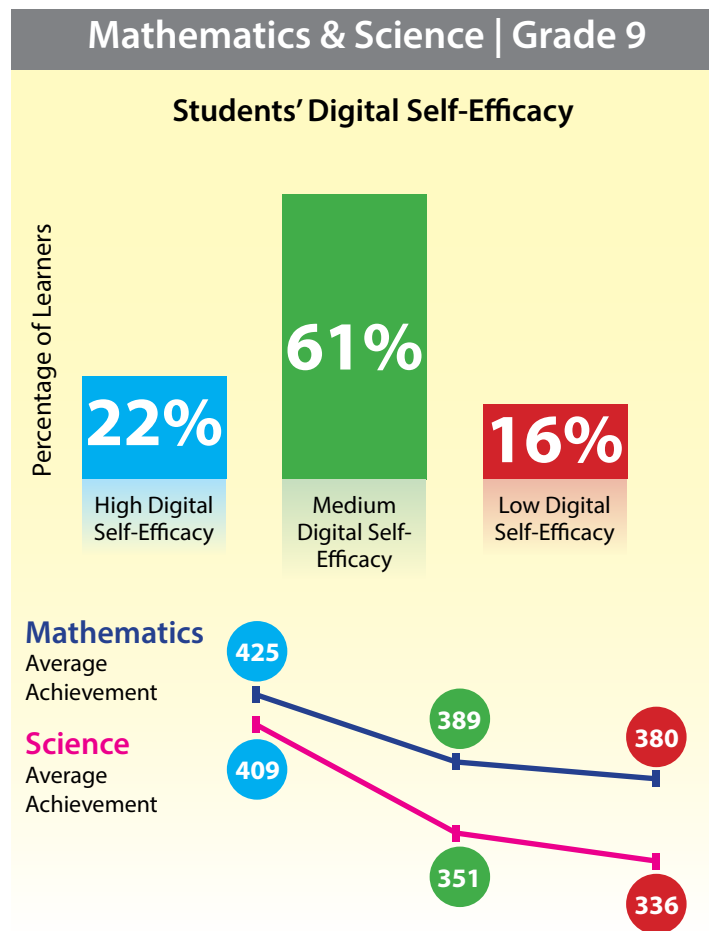

Figure 10.4: Grade 9 Achievement by learners' digital self-efficacy

10.2 Grade 9 School Contexts

This section presents results regarding the schools' context within which learning and teaching in mathematics and science took place and the relationship of these contexts with average achievement levels of Grade 5 learners.

10.2.1 Teachers' Formal Education

Information obtained from teachers regarding their formal education was reported in four categories as noted in Figure 10.5. For mathematics learners, 18% had mathematics teachers with a postgraduate university degree, 49% had teachers with a Bachelor's degree, 22% had teachers who had completed a post-secondary education, and 11% had teachers who completed upper-secondary education.

Similarly, for Grade 9 science learners, 22% of their teachers had a postgraduate university degree, 55% had teachers with a Bachelor's degree, 17% had teachers with some post-secondary education, and 7% had teachers who completed upper-secondary education
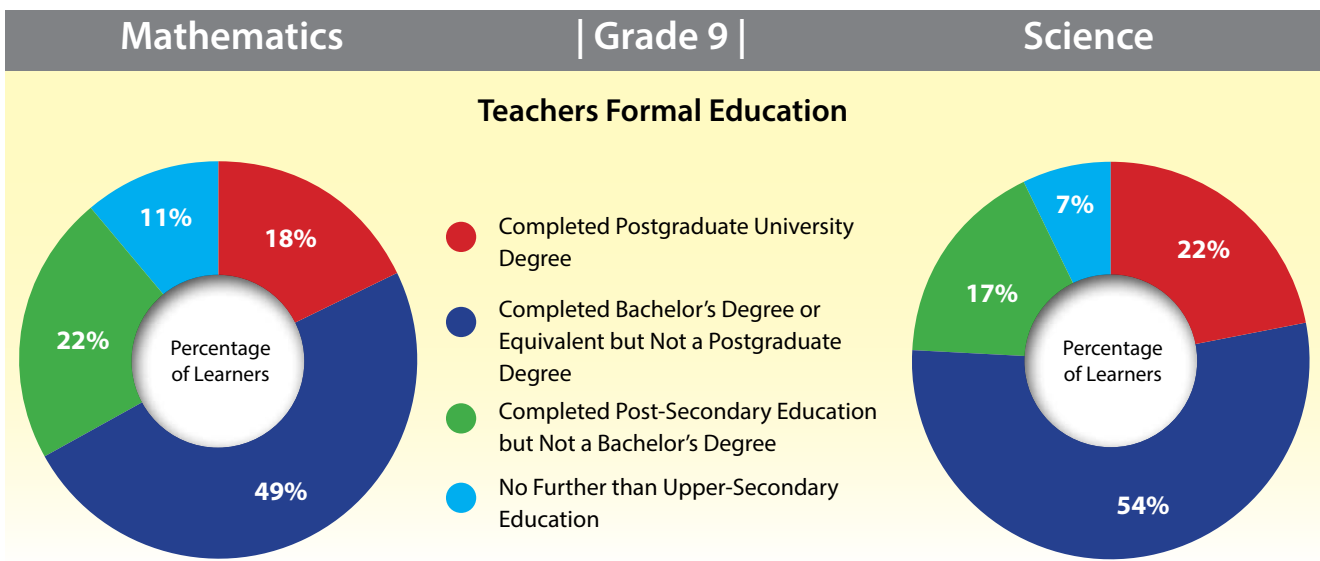

Figure 10.5: Formal education of Grade 9 teachers

10.2.2 School affluence level

The TIMSS 2023 index for school affluence is defined by socio economic background of the learners attending the school. The "more affluent" schools are classified as having more than 25% of learners from economically affluent homes and not more than 25% percent from economically disadvantaged homes, while "more disadvantaged" schools have more than 25% of learners from disadvantaged homes and not more than 25% from affluent homes. All other combinations are considered to be "neither more affluent nor more disadvantaged."

As noted in Figure 10.6, a positive correlation was found between affluence of the school and average achievement in both mathematics and science. The 8% of Grade 9 learners who attended schools categorised as "more affluent" obtained an average mathematics achievement of 479 in mathematics and 469 in science.

For the 79% of learners who attended schools categorised as "more disadvantaged" schools, the average achievement was 381 in mathematics and 343 in science. The learners who attended schools categorised as "neither more affluent nor more disadvantaged" (13%) obtained an average of 424 in mathematics achievement 406 in science. Substantial gap was noted between the" more affluent" and "more disadvantaged" schools, 98 points for mathematics and 126 points for science.
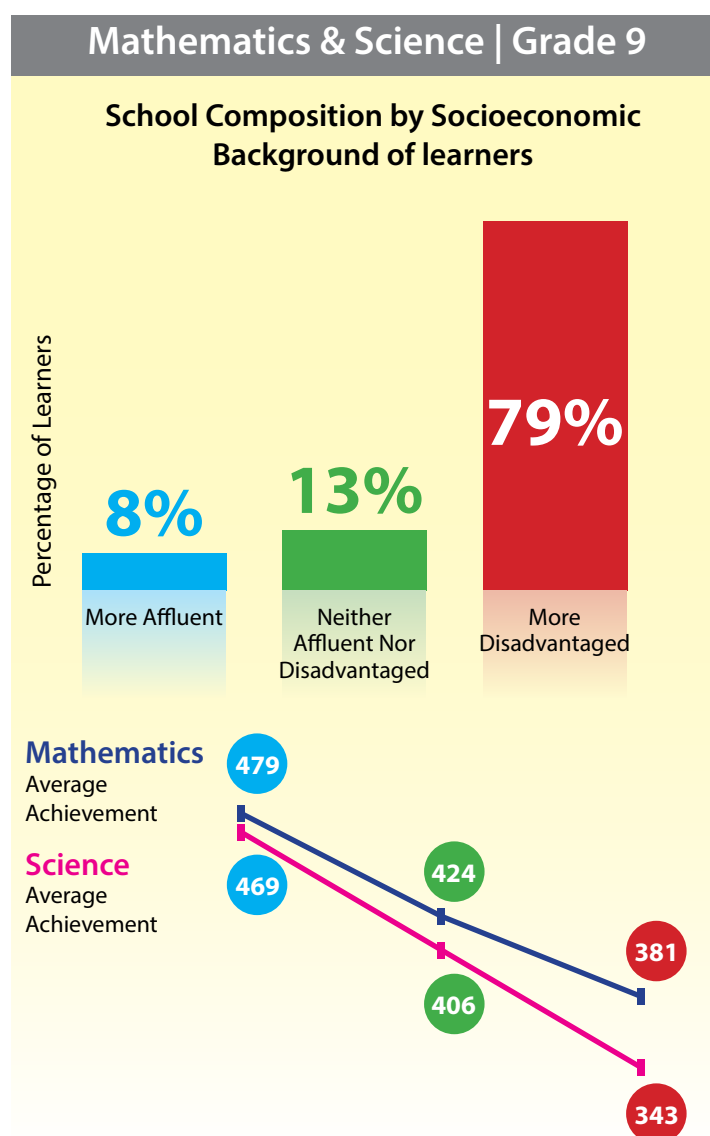

Figure 10.6: Grade 9 Achievement by school affluence

10.2.3 School Emphasis on Academic Success

The School Emphasis on Academic Success scale includes items that asked school principals about their perceptions of how different school community members exhibit support for academic achievement.

As noted in Figure 10.7, only 3% of Grade 9 learners attended schools with a "very high emphasis" on academic success, while 31% attended schools where the principal reported a "high emphasis" on academic success and 66% percent attended schools with a "medium emphasis" on academic success.

Albeit based on a small percentage, learners in schools with a "very high emphasis" on academic success achieved the highest average scores in both subjects (517 in mathematics and 531 in science). Learners in schools with a "high emphasis" on academic success had an average achievement of 402 in mathematics and 369 in science, while learners in schools with a "medium emphasis" on academic success had an average achievement of 387 in mathematics and 352 in science.
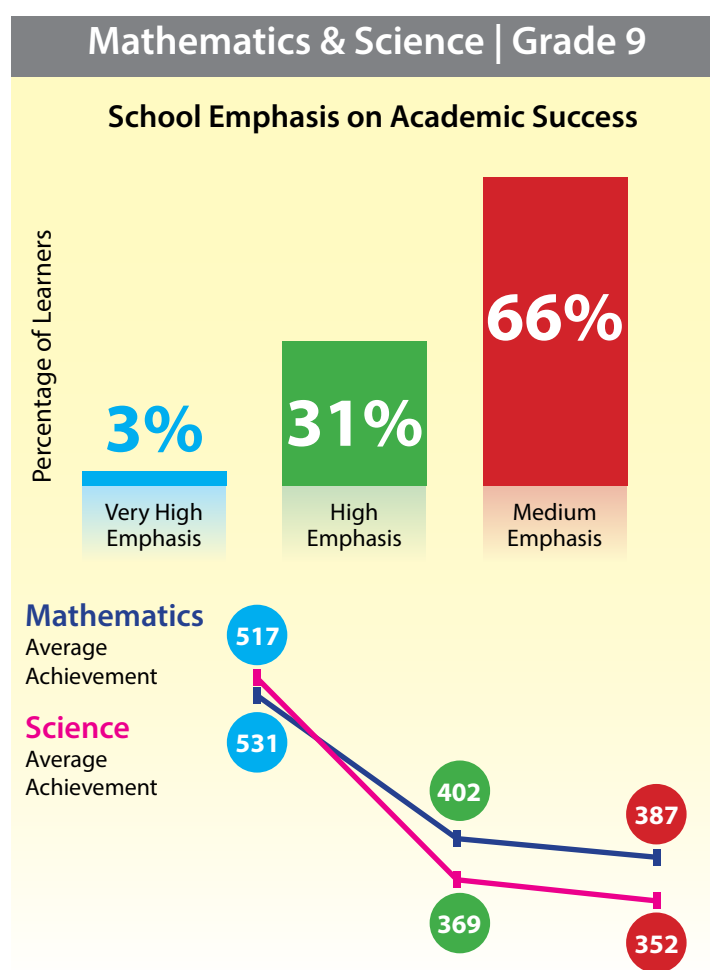

Figure 10.7: Grade 9 Achievement by School emphasis on academic success

10.2.4 Bullying in school

The TIMSS 2023 eighth-grade Learner Bullying scale classified learners based on their reports of how frequently they experienced different forms of bullying over the past school year.

Figure 10.8 indicates that approximately a third of Grade 9 learners (30%) noted that they "never or almost never experienced " being bullied, 48% reported being bullied "about monthly" and 22%reported being bullied "about weekly." A review of the results indicates a negative relationship between achievement and being bullied.

Learners who reported "never or almost never" had the highest average achievement in both mathematics and science (422 and 404, respectively). The average achievement for learners classified as being bullied "about monthly" was 395 in mathematics and 359 in science. Learners classified as being bullied "about weekly" had the lowest average achievement in both mathematics (361) and science (307). For mathematics and science, this gap was substantial, at 61 and 97 points respectively.
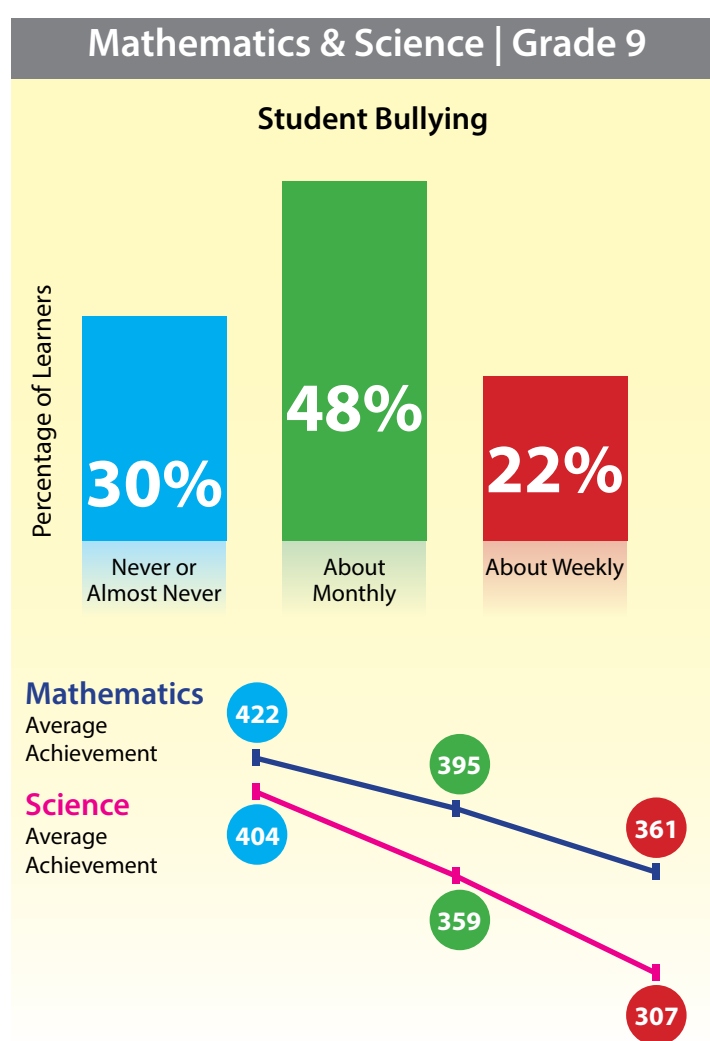

Figure 10.8: Grade 9 Achievement by prevalence of bullying in schools

10.2.5 Safe and Orderly School

The Safe and Orderly School scale was based on teachers' responses regarding the degree to which they agreed with statements regarding safety and discipline within the school. The results in Figure 10.9 reveals that 26% of Grade 9 learners attended schools judged by their teachers to be "very safe and orderly," while 61% (mathematics) vs 58% (science) attended schools perceived by teachers as "somewhat safe and orderly," and 14% (mathematics) vs 16% (science) attended schools perceived as "less than safe and orderly."

Learners in "very safe and orderly" schools achieved the highest average achievement in both subjects (411 in mathematics and 400 in science), followed by those in "somewhat safe and orderly" schools (396 in mathematics and 356 in science). Learners in "less than safe and orderly" schools had the lowest average scores (370 in mathematics and 344 in science).). Here too, achievement gaps was substantial, at 41 and 56 points respectively for mathematics and science.
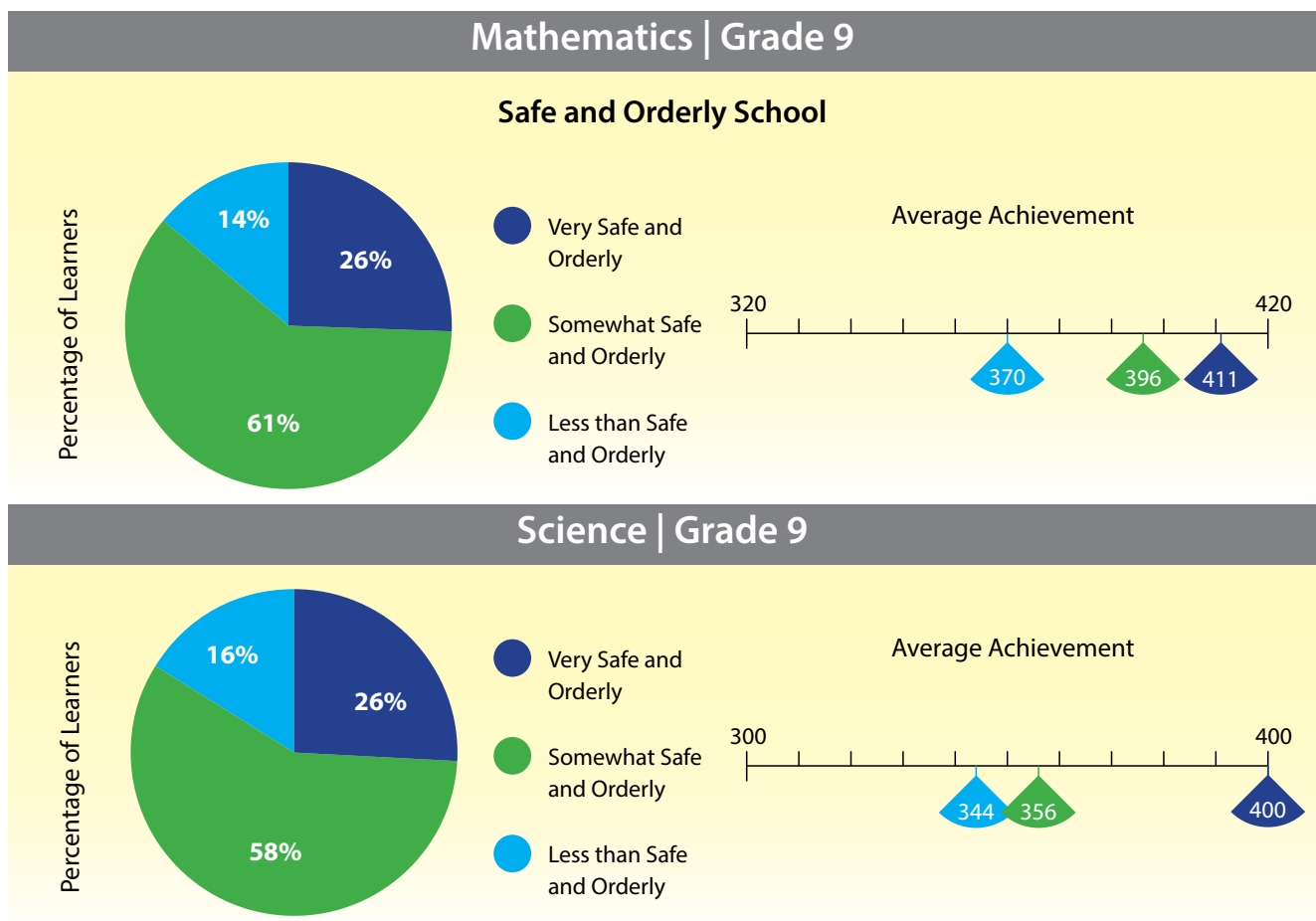

Figure 10.9: Grade 9 Achievement by School Safety

11. Conclusion and Way forward

This section provides a summary of the key findings emanating from the South African Highlights Report and lists next steps regarding the effective use of the TIMSS 2023 results

11.1 Learner achievement: International Comparisons

At the international level, the results for both mathematics and science in TIMSS 2023 revealed a similar trend noted in previous cycles. Across both grades and subjects, learners from participating South East Asian countries obtained the highest average achievement score while learners from participating African countries (i.e., Morocco, South Africa) and Middle Eastern countries (i.e., Kuwait, Jordan, Saudi Arabia) obtained the lowest achievement scores. However, South African Grade 9 learners outperformed their African counterparts.

The average achievement score for South African learners was extremely low for both Grades 5 and 9 mathematics and science, at 362 for Grade 5 mathematics and 308 for Grade 5 science, and 397 for Grade 9 mathematics and 362 for Grade 9 science. The low levels of achievement at Grade 5 underscores the need for greater focus and support in earlier grades of schooling.

Notwithstanding the low levels of achievement, the results for both Grade 9 mathematics and science remained stable between 2019 and 2023. This finding is particularly meaningful given that many experts had predicted substantial learning losses during the pandemic. The system's ability to maintain achievement levels suggests an underlying resilience and robustness that deserves further study and recognition.

Regarding the international benchmarks, the majority of learners function at or below the Low benchmark level for both grades and subject areas. However, here to, there is some reason for optimism. The small but notable percentage of learners functioning at the Advanced and High benchmark levels point to pockets of excellence across the system. These "success exemplars" offer valuable insights that need to be studied and applied more broadly to enhance learning outcomes for all learners across the system.

11.2 Learner achievement: National Comparisons

The national disaggregated results for TIMSS 2023 highlights persistent challenges impacting South African learners. For both Grades 5 and 9, mathematics and science, substantial disparities in achievement levels were noted across provinces, school quintiles, gender, and language groups.

At the provincial level, learners from two provinces, Gauteng and the Western Cape, continue to demonstrate higher achievement levels, reflecting a common trend evident in previous studies. More concerning is the large achievement gaps between high and low achieving provinces. For Grade 5 mathematics, a difference of 97 points was noted while for Grade 5 science this difference was even greater, at 142 points. Similarly, for Grade 9 mathematics, the average achievement gap was 56 points and 94 points for science.

With regard to quintiles, learners in the lower quintile schools (Q1 to Q3) continue to achieve low levels of performance for both grades and subject areas. Of concern, however, is the substantial average achievement gaps noted between the lowest quintile and highest quintiles. For Grade 5, the gap in mathematics was 185 points, while for science it was a massive 266 points. The differences in mathematics for Grade 9 was 100 points, and 152 points in science.

Similar to previous TIMSS cycles, girls obtained higher scores in both mathematics and science. At the Grade 5 level, substantial differences are noted in favour of girls, with a 28-point gap in mathematics and a of 39-point gap in science. The difference in scores between boys and girls in Grade 9 is much less, at 8 points in mathematics achievement and 15 points in science. The trend results indicate that for both subject areas and grades, these differences persist across the different TIMSS cycles, showing increasing gaps in favour of girls.

Substantial differences in achievement levels regarding the language of learning and teaching also persists across the two grades and subject areas. The results reveal a clear positive correlation between the learners' reported frequency of LOLT usage at home and academic achievement in both mathematics and science. Additional analyses based on learners speaking the language of learning at home indicates that learners who reported that they "always" spoke the language of the test at home, obtained substantially higher scores compared to their classmates who reported "never speak".

11.3 Context of learning and teaching

A review of the key factors associated with learner achievement in mathematics and science reveals a number of critical emerging trends regarding the learners' home contexts and school contexts. The results reveal different levels of association with factors in Grade 5 and Grade 9 achievement levels in mathematics and science across a range of selected factors drawn from the TIMSS 2023 international report.

Learner Context

The socio-economic status of learners is the most important indicator of learner achievement levels. The higher the socio-economic status (SES) of learners, the higher their average achievement score. For TIMSS 2023 results, the gap in achievement between Grade 5 learners from higher and lower SES backgrounds was a massive 173 points in mathematics and 221 points in science. For Grade 9, information was obtained on the availability of home learning resources, which can also serve as a proxy for SES. The gap in achievement between those indicating "many resources" and those indicating "few resources was 85 points in mathematics and 127 points in science.

Engaging in early literacy and numeracy activities before entering primary schools also served as an advantage for Grade 5 learners. Those learners reporting "very often" obtained significantly higher average achievement scores, 87 points higher in mathematics and 118 points higher in science, compared to learners reporting "sometimes".

Moreover, those learners expressing a more positive attitude (like learning) also scored higher. For Grade 5, these learners scored 35 points higher in mathematics and 67 points higher in science, compared to learners who reported that they "did not like learning" mathematics and science. However, for Grade 9 mathematics, no differences were noted while for Grade 9 science a 22-point gap was noted.

Learners digital self-efficacy served as an advantage. Grade 5 learners who reported high levels of digital self-efficacy obtained an average of 91 points higher in mathematics than those who reported low digital self-efficacy. The gap for science was 126 points. Similarly for Grade 9, the gap was 45 points for mathematics and 73 points for science.

School Contexts

The level of "school affluence" also correlated strongly with learners' achievement. Those learners attending schools classified as "more affluent" obtained significantly higher average scores compared to learners attending schools classified as "more disadvantaged". For Grade 5, the gap for mathematics stood at 153 points while for science, the gap was at 212 points while for Grade 9 this gaps was 98 and 126 points respectively.

The emphasis that schools placed on academic success was also associated with learner achievement. Grade 5 learners attending schools classified as placing a "very high emphasis" on academic success, obtained an average of 32 points higher in mathematics and 41 points higher in science, compared to those attending schools classified as 'medium emphasis'. The gaps in the average achievement for Grade 9, was much starker, with 130 points difference for mathematics and at 179 points difference for science.

School safety was another key factor associated with learner achievement. Learners who attended schools classified by their teachers as "very safe and orderly" achieved higher average scores compared to learners attending schools classified as "less safe and orderly". The gap for Grade 5 was 29 points for mathematics and 79 points for science while for Grade 9, the gap was 41 points for mathematics and 56 points for science.

In addition, to school safety, Grade 9 learners also reported on their experiences with bullying. The difference between learners who reported "never or almost never" and those who reported "about weekly", was 61 points for mathematics and 97 points for science.

11.4 Way forward and next steps

The TIMSS 2023 results provide valuable information for use in supporting the decision-making processes at the system and schools levels to support teachers to identify, and thereafter, action specific learning and teaching activities aimed at improving learning for all learners.

The overall results from TIMSS 2023 depict substantial challenges to address, given the concerning trend of low levels of performance among the majority of Grade 5 and 9 learners. An additional concern pertains to the increasing disparities across learners, from different socio-economic status groups, language groups, as well as across and between provinces, and school quintiles. Notwithstanding these challenges, the results also reveal the existence of pockets of excellence across the system. In addition, contrary to expectations of a significant decline, the Grade 9 Science scores remained stable since the last TIMSS cycle, reflecting some resilience within the education system.

In ensuring that the results of the TIMSS 2023 are effectively used, several next steps have been planned by the department. This will include:

- Undertaking a standard setting exercise to develop appropriate performance levels. The aim of this exercise is to provide a format for reporting the TIMSS 2023 results to enhance and support decision-making processes among policy makers, provincial and district officials as well as school leaders and teachers, aimed at improving learning and teaching.

- Producing a national country TIMSS 2023 report to provide more nuanced and detailed information on the national context within which learning and teaching takes places and how this impacts on learners' achievement in TIMSS 2023. This will include addressing the concerns identified by the IEA regarding the reliability of the South African data, determining the impact of curriculum streamlining implemented during and after COVID, identifying key national factors impacting on learning and teaching, and engaging in dialogue on identifying policy and practice implications.

- Producing a diagnostic report for use by school leaders and teachers to improve teaching and learning in the classroom. The underlying pedagogical support for teachers and diagnostic support for learners is linked to an assessment for learning approach must be based on additional analyses within specific content and cognitive domains of mathematics and science.

- Expanding the Assessment Literacy Capacity Development Programme, using the TIMSS 2023 data. This capacity development programme was first implemented in 2023 to support education officials to analyse, report and use results from large scale studies like TIMSS, SEACMEQ, Systemic Evaluation and the Early Learning National Assessment Study (ELNA).

These dual challenges of equity and quality have impacted the education system in South Africa since the introduction of the new democratic dispensation in 1994. The availability of information from large-scale assessment studies like TIMSS and Systemic Evaluation provides a rich source of evidence that can be used to identify underlying reasons for these persistent educational challenges. However, for effective change to occur, the ultimate value of this assessment data lies in its use by all role-players to respond to the specific learning needs of ALL learners, with particular emphasis on supporting learners from poor and marginalised communities.

Notes

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