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# Improving student academic performance in Maths and Science

Benjamin Muridzo, Zimbabwe

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### School context

Established in 2015 by Archbishop Isaac Masuka, the Masuka Christian High School is a private co-educational institution located on the southern part of Mashonaland West province in Zimbabwe and just 21 kilometres from the capital city, Harare.

The school has a total student population of 338, with 184 girls and 154 boys from 13 to 18 years. It runs from form 1 to form 6 and offers parallel examination systems, namely, the local Zimbabwe Schools Examinations (ZimSec) and the Cambridge International Examinations at both Ordinary and Advanced levels. It has 15 male and 12 female teachers with various qualifications ranging from diplomas to university degrees.

### About the author


Benjamin Muridzo is the principal of Masuka Christian High School a position he has held for five years. He has a Bachelor of Education degree from the University of Zimbabwe, specialising in geography and curriculum studies. He also holds a diploma in Customer Relationship Management (CRM) and a Certificate in Performance Management Appraisal. He is a Certified Master Coach trained by the Certified Coaches Federation of Canada in 2017. He has vast experience in educational leadership at both government and private institutions spanning 30 years. Over and above that, Benjamin Muridzo is a renowned trainer, motivational speaker and researcher.



### Key learnings

This research explored strategies to improve student results in Maths and Science.

- The upgrading of the laboratories, improved equipment and an e-library has increased enrolment and motivation in Maths and Science. This led to more students engaging in Maths/Science video games.
- Benchmarking against cluster schools is necessary to remain competitive.
- Teamwork among both students and learners significantly improved.
- In terms of results, the lower-performing students need more remedial work while the high-performing group improved faster than anticipated.
- We need to implement a homegrown continuous professional development programme funded by local resources.



**For the past three years, the school's average in Maths and Science was below that of schools around us. It's imperative that our students gain a strong Science/Maths foundation so they can become active participants in this world of technology.**

### **Action research rationale**

For the past three years, the school's average pass rate in Maths and Science at Ordinary level was below that of schools around us, the cluster average. Our school pass rate for Maths was 56%, compared to the cluster average of 68%, and for Science ours was 64% compared to the cluster average of 74%.

Students, teachers and management were concerned and parents had also expressed concerns over the continued low performance. The arrival of the Action Research Grant was a very welcome gesture in terms of resolving the school's Maths and Science problem.

The then Minister of Primary and Secondary Education declared that, "From 2015 onwards, a new competence-based curriculum will be introduced in Zimbabwe and will have a strong bias towards STEM subjects". It therefore followed that a firm foundation in Science and Maths at Masuka Christian High would help our learners fulfil the Zimbabwe education dream, which is housed in STEM or what has been popularised as Education 5.0.

Herman Henkel once said, "Science helps us understand the world and in Maths alone each generation adds a new story to the structure". Therefore, good grades in Maths and Science at Masuka Christian High will open up a whole window of opportunities and help students continue to build their knowledge of these two subjects for the future.

The era in which we are living is driven by Maths and Science and according to Maria Mitchell, "In this world, we cannot continue to take anything for granted. We need scientific validation".

It became imperative that our learners at Masuka Christian High School get a very strong Science/Maths foundation so that they become active participants in this world of technology.

### **Exploratory research questions**

Three basic exploratory questions were used covering the three participating groups: namely the six Science and Maths teachers at the school; five Science and Maths teachers from our surrounding schools; and eight students from Masuka Christian High School.

1. What do teachers think is the reason for low pass rates over the past three years?
2. How do students in the school perceive Maths/ Science teaching and learning and their chances of success in these subjects?
3. What do colleagues in other schools believe promotes good teaching and learning in Science and Maths?

### **Data collection tools**

The research used three sets of data collection tools, namely: focus group discussions; interviews; and learners' written work.

Eight learners in Form 3 were selected to participate in the project and were divided into two groups of equal gender representation. Group 1 was made up of average-performing learners while Group 2 was made up of high-performing learners, all drawn from the Cambridge Science class. They were chosen by their Maths and Science teachers and ranged from 14 to 17 years.

Three Science and three Maths teachers from the school were chosen to participate in the research, four male and two female. Three are diploma holders while the other three are university graduates. Their average teaching experience was three years.

Finally, five Science and Maths teachers from our three surrounding schools were chosen, two female and three males. All are university graduates with an average teaching experience of six years.

All participants signed consent forms at the onset of the research.



Figure 1: Teachers attending staff development workshop

## Key findings from exploration

The findings are divided into three categories: issues raised by our teachers; issues raised by our participating students; and issues raised by teachers from the surrounding schools.

### Findings from our six local Science and Maths teachers

- 83.3% (5 out of 6) teachers believed that the low pass rates were due to limited resources, notably text books, science equipment and chemicals.
- 83.3% bemoaned limited opportunities to regular practicals in Science.
- 67.7% believed that the learners needed more remedial work for the 'average learners' and more extension work for the 'fast learners'.
- 100% believed that the two laboratories needed upgrading.
- 100% thought it was due to limited exposure to the Cambridge curriculum.

### Findings from the eight Science and Maths learners in Form 3 (14–17 years)

- 50% had a positive perception towards the teaching and learning of Maths and Science at the school while the other 50% had a negative attitude.
- 62.5% thought the two subjects were valued at the school.
- 75% wanted the two existing Science laboratories to be upgraded and equipped with more chemicals and other relevant apparatus to make them meet the quality of the laboratories found in our neighbouring schools.
- All learners thought they needed more practical lessons and extension work so that they could remain challenged to work harder.
- 75% believed that they would benefit from more experienced teachers who are more familiar with the Cambridge Science and Maths Curriculum.

### Findings from the five teachers from our surrounding schools

- They believed that collaborative teaching followed by guided presentations would improve the pass rates.
- They also advised that research would help our students to improve their academic performance.
- They all recommended that benchmarking was a useful teaching and learning method.
- They strongly recommended introducing Continuous Professional Development for Masuka High School teachers.

### Action plan

- Home-grown continuous development programmes
- Upgrading the two existing labs
- Introducing e-library for Science and Maths
- Sourcing a variety of more text books and Science equipment
- Watching Maths and Science video games
- Introducing video lessons
- Forming active Maths and Science clubs
- Increasing benchmarking opportunities
- Developing positive mindsets
- Increasing practicals in the two subjects
- Use of AI
- Increasing use of collaborative teaching methods



Figure 2: Students attending development workshop

### Action plan implementation

In trying to improve academic performance in Maths and Science at Masuka Christian High School, a raft of measures was introduced and existing ones were strengthened. As a result of complaints from parents and management, a continuous professional development programme was introduced to upgrade and motivate both learners and teachers.

Specific topics like syllabus choice, interpretation and implementation, modern pedagogical issues and issues to do with personal effectiveness were part of the package. Experienced Maths and Science teachers were invited to do the training for the month of March at a pace of three hours every Saturday.

Sessions for the six Science and Maths teachers and senior management were separated from those of the eight participating students. Also included during training were issues on developing positive mindsets, benchmarking and AI.

A decision was made by senior management and the board of directors to upgrade the existing laboratories to a level that matches British Council expectations at a cost of US\$825 from the research grant and another US\$1000 from the school.

The existing Maths and Science clubs were strengthened, while video games in these two subjects were introduced. Along the same lines, a decision was made to come up with a bank of video lessons serving as examples of modern teaching pedagogy. A new set of text books for both subjects were bought for US\$400, while new science equipment and chemicals were bought for US\$700.

### Data collection procedure

Post-implementation data collection tools included oral interviews, observation and learners' written work.

Oral interviews were used to obtain information on the effectiveness and impact of the whole project especially on issues related to academic performance improvement. The interviewees included our Science/Maths teachers, the learners and other staff members. The oral interviews also included asking learners on the impact of the upgraded laboratories, increased supply of science equipment and text books.

Observation, as a post-implementation research tool, was used to track the level of interest of the students in such newly introduced teaching/learning techniques like video games, the e-library room, continued use and recording of video games and exposure to practical lessons.

A tracking system of learners' written work was used and will continue to be used to check on progress or lack of it until they write their final O level exams in October/November 2024. Their final results will continue to be of interest when they are out in January 2025.

All participants signed consent forms at the onset of the data collection exercise.



### Average performing group

	2023					2024		
Month	June	July	Sept	Oct	Nov	Jan	Feb	March
Average Mark	47%	44%	49%	53%	58%	62%	67%	69%

### High performing group

	2023					2024		
Month	June	July	Sept	Oct	Nov	Jan	Feb	March
Average Mark	66%	69%	76%	78%	83%	85%	88%	89%

Figure 3: Masuka Christian High School monthly improvement in Maths and Science

## Key findings

While the monthly academic performance tracking system has shown a pleasing trend, two scenarios stand out clearly:

- progress from the lower-performing group of students is sluggish and needs more remedial work if they should score a B grade or better in their final Cambridge O-Level exams in October/ November 2024
- progress from the high-performing group has improved faster than anticipated and is expected to keep increasing to the A and A+ grades for the 2024 final exams.

The upgrading of the two laboratories and the subsequent improved supply of chemicals, equipment and textbooks brought about the following:

- a 20% increase in enrolment in the school's 2024 Form 3 and Form 5 Science and Maths classes
- highly motivated teaching staff and Science/ Maths student body across all classes from Forms 1 to 6
- more students can be seen engaging in Maths and Science video games across the school.

We also noted these findings.

- Benchmarking of our students against those from our cluster schools will remain necessary if our learners should continue to be competitive.
- Teamwork among both students and learners has significantly improved since the inception of the project.
- One of our very good Science teachers has become such a powerful and popular figure among our neighbouring schools so much that the school may lose him if more attractive incentives are not put on the table.

## Conclusion

The following conclusions were drawn from the main findings of the research.

### Conclusions from our Maths/Science teachers

It emerged from the findings of the research that the low pass rates over the past three years at Masuka Christian High School were due to limited supply of resources, notably textbooks, science equipment and chemicals. This related to insufficient funding when the Cambridge curriculum was introduced three years ago. To this end, new textbooks, chemicals and equipment were purchased for a total of US\$1100.

It also emerged that the two science laboratories needed structural upgrading to meet the new Cambridge requirements. The two laboratories were renovated at a cost of US\$1825, (\$825 was from the grant and the rest from the school).


### Conclusions from our learners

It emerged that the eight participating students concurred with their teachers on having the two laboratories upgraded and that more equipment and chemicals were needed. It can also be concluded from the same findings that the average performers needed more remedial work if they should improve to grade B, while the high-performing group needed more extension work through research. To this end, a monthly performance tracking record was instituted.

### Conclusions from the surrounding schools

The conclusion from the findings of these five teachers was the need to institute a homegrown continuous professional development programme for senior management, teachers and learners.

It also emerged that there was need to introduce an e-library facility, Science/ Maths video games and create a bank of local video lessons.



**We concluded that we need to institute a homegrown CPD programme for senior management, teachers and learners.**

**It also emerged that there was need to introduce an e-library facility, Science/Maths video games and create a bank of local video lessons.**

### Key takeaways

Some of the takeaways include the following points.

1. We need to adopt a homegrown continuous professional development programme funded by local resources.
2. Use of locally-produced video lessons by the best Science/Maths teachers that will always act as a school lesson bank for best practice. This has been spread to other departments.
3. The introduction of an e-library has improved interest in research at the school.
4. The introduction of artificial intelligence (AI) as a teaching tool should be encouraged in our schools. However, both teachers and learners should appreciate its merits and demerits.
5. The upgrading of the two science laboratories may not have happened so early if not for this Action Research Project.

### References

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Artificial intelligence was only used to check spelling and grammar.

**The findings showed that the low pass rates were due to limited supply of resources, notably textbooks, science equipment and chemicals, related to funding. To this end, new textbooks, chemicals and equipment were purchased. The upgrading of the two science laboratories may not have happened so early if not for this Action Research Project.**