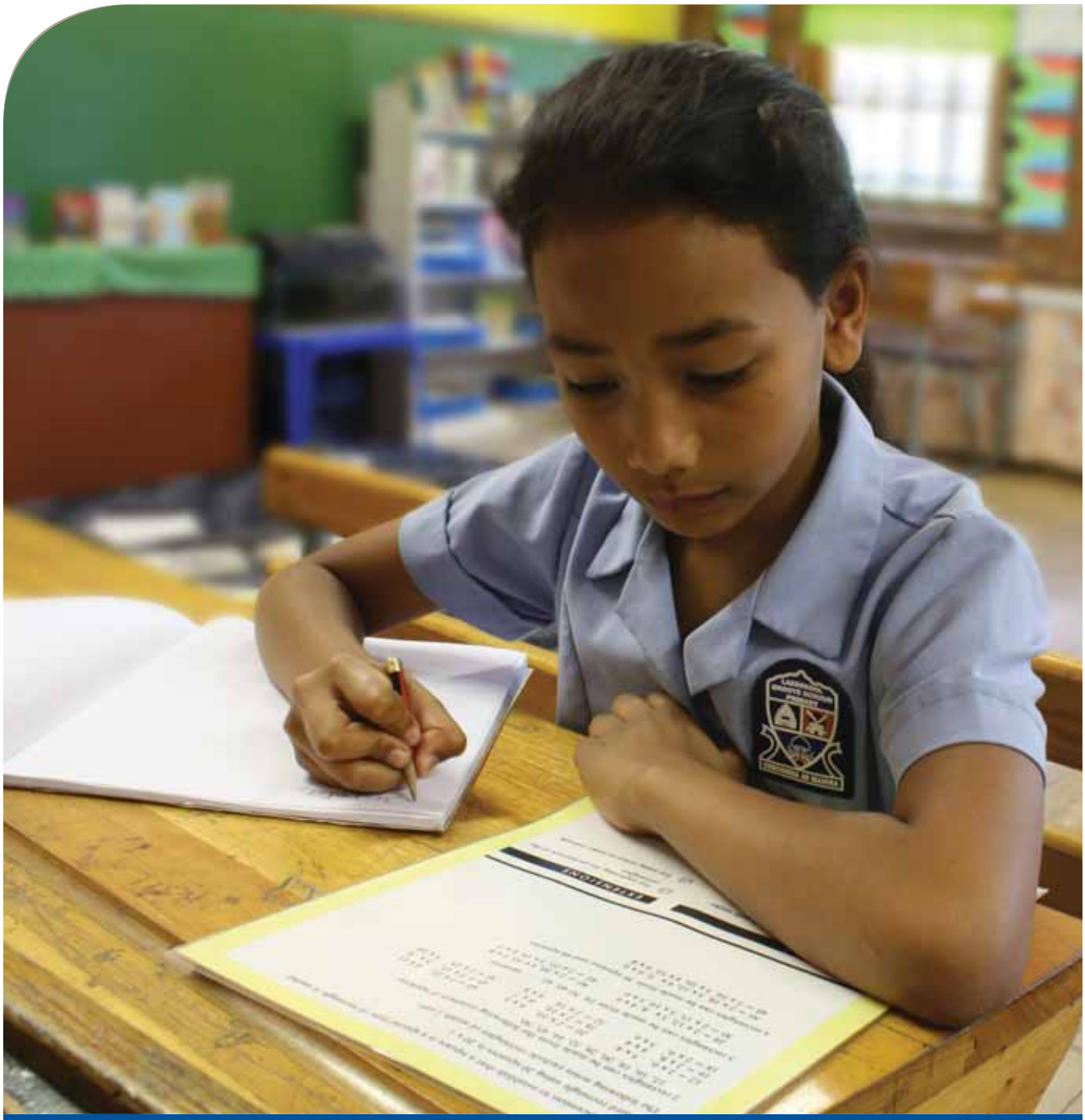
Western Cape Government

Education



Mathematics Strategy 2015 – 2019

Contents

Acronyms **3**
1. Introduction 4
2. Rationale for the strategy 5
   2.1 2014 Mathematics pass rate in the Western Cape 5
   2.2 The Annual National Assessment of Mathematics (Grade 1-6 and 9) 5
   2.3 WCED provincial systemic assessments in Mathematics 6
   2.4 TIMMS 6
   2.5 The National Senior Certificate (2007 – 2014) 7
3. Preamble to the Strategy 8
4. Details of the Strategy 10
   4.1 People development 10
   4.2 Use of productive pedagogies 12
   4.3 Resource/facility provision and use 13
   4.4 Monitoring and evaluation 14
5. The Strategy unpacked per phase 15
   5.1 Grade R – 3 15
   5.1.1 People development 15
   5.1.2 Use of productive pedagogies 16
   5.1.3 Resource/facility provision and use 17
   5.1.4 Monitoring and evaluation 17
5.2 Grade 4 – 7 18
   5.2.1 People development 18
   5.2.2 Use of productive pedagogies 19
   5.2.3 Resource/facility provision and use 19
   5.2.4 Monitoring and evaluation 20
5.3 Grade 8 – 9 21
   5.3.1 People development 21
   5.3.2 Use of productive pedagogies 22
   5.3.3 Resource/facility provision and use 23
   5.3.4 Monitoring and evaluation 23
5.4 Grade 10 – 12 24
   5.4.1 People development 24
   5.4.2 Use of productive pedagogies 25
   5.4.3 Resource/facility provision and use 26
   5.4.4 Monitoring and evaluation 26
6. Conclusion 27
7. Appendices: 28
   7.1 Dimensions and elements of Productive Pedagogies 28
   7.2 Effect sizes of different variables on learning 28

Acronyms

AMESA	Association for Mathematics Education of South Africa
ANA	Annual National Assessment
CAPS	Curriculum and Assessment Policy Statement
CM	Circuit Manager
CTLI	Cape Teaching and Leadership Institute
DBE	Department of Basic Education
DIP	District Improvement Plan
FAT	Formal Assessment Task
FET	Further Education and Training
FP	Foundation Phase
GET	General Education and Training
HEI	Higher Education Institution
HoD	Head of Department
IP	Intermediate Phase
LITNUM	Literacy and Numeracy
LoLT	Language of Learning and Teaching
LTSM	Learning and Teaching Support Material
NCS	National Senior Certificate
NGO	Non-governmental Organisation
PLC	Professional Learning Community
SA	Subject Adviser
SBA	School-based Assessment
SGB	School Governing Body
SIP	School Improvement Plan
SMT	Senior Management Team
SP	Senior Phase
WCED	Western Cape Education Department

> This provincial strategy aims to improve the quality of teaching and learning in Mathematics in all grades.

WCED Five-year Mathematics Strategy (2015 – 2019)

1 > Introduction

Mathematics is a compulsory subject in South African schools to Grade 9. All learners in the Grades 10 to 12 have to choose between Mathematics and Mathematical Literacy. Before 2006, many learners in these grades opted out of taking any form of Mathematics.

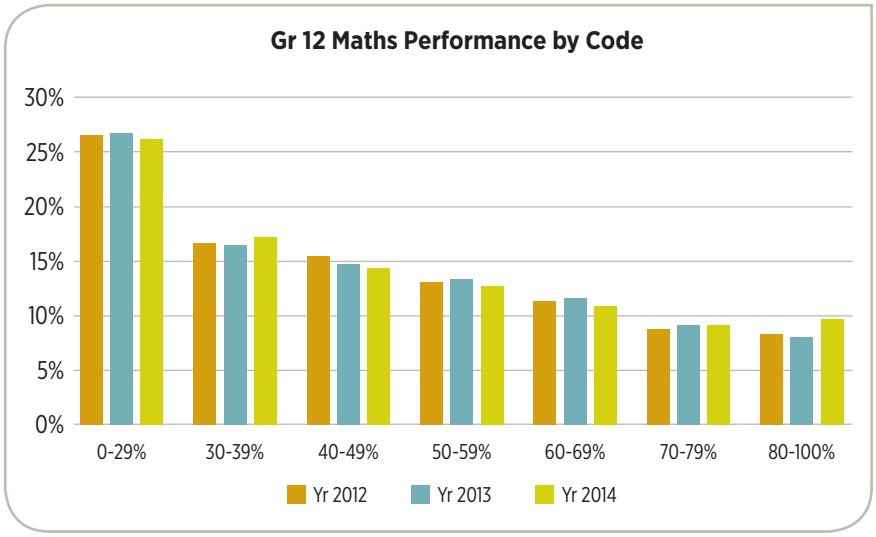
Various international assessments have provided evidence of poor learner performance in Mathematics in South Africa.

Against this background, this provincial mathematics strategy aims to achieve the following:

- Enhance the quality of Mathematics teaching in all schools
- Improve mathematical learning for all learners
- Improve the quality of passes in the subject
- Increase the number of learners taking and passing Mathematics in Grades 10 to 12.

Graph 1 below indicates Grade 12 performance in Mathematics by performance code. In the light of these results, the WCED will use three measures to determine progress, namely, the percentage of learners:

1) Passing Mathematics in the National Senior Certificate
2) Achieving above 60%, and
3) Achieving more than 80%.



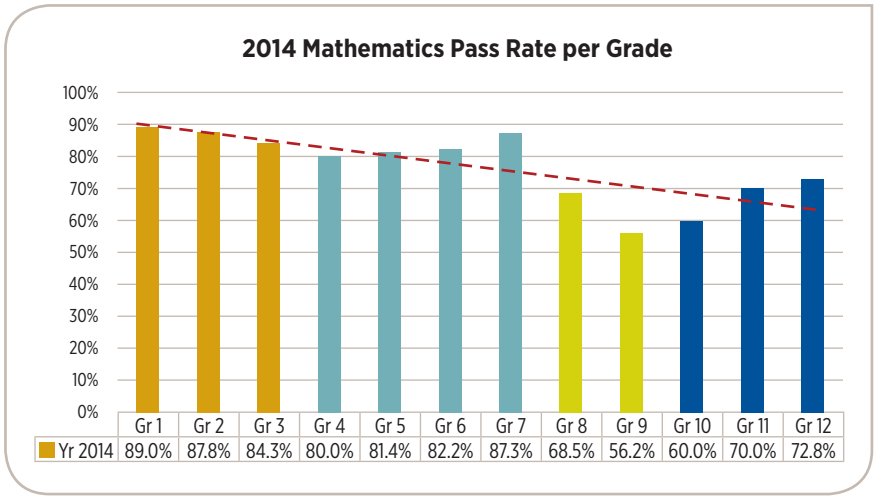
Graph 1: Grade 12 performance in Mathematics by performance code.

2 >**Rationale** for the Strategy

Various indicators point to weaknesses in performance and highlight opportunities for improving the quality of mathematics education in the province. They include results per grade, Annual National Assessments, and the WCED's systemic tests.

2.1 2014 Mathematics pass rate in the Western Cape

Graph 2 compares pass rates per grade in 2014. They indicate a gradual decline in performance from Grades 1 to 12.



Graph 2: Pass rates for the subject Mathematics in the Western Cape for Grade 1-12 in 2014 (a "pass" is above 40% for Grade 1-9 and 30% for Grade 10-12). Source: WCED Directorate: Assessment Management.

The end result of the declining pass rate can be seen in the participation rate in Mathematics of just 32.8% in Grade 12 in 2014.

2.2 The Annual National Assessment of Mathematics: Grade 1 – Grade 6 and Grade 9

ANA results indicate persistent low performance in Mathematics from 2012 to 2014 (see Table 1). They highlight the ongoing need for targeted support, interventions and monitoring in Grades R to 9.

Grade	Ave % mark	Ave % mark	Ave % mark	% Acceptable attainment (> 50 %)
	2012	2013	2014	2014
1	70.1	61.1	71.9	85.1
2	62.1	62.2	63	74.7
3	47.4	57.4	60.5	72.6
4	45.6	42.2	41.9	35.6
5	39.4	39.7	45.2	42.3
6	32.7	44.9	50.9	50.9
9	16.7	17	13	6.2

Table 1: Mathematics ANA 2012-2014 (Western Cape results, rounded off, from the ANA 2014 report)

> "ANA results indicate persistent low performance"

> “South African learners are still performing at the low end of the TIMMS test.”

The ANAs do not yet provide results that are strictly comparable year by year. Nevertheless, they do provide insights into key problem areas, which we address in this strategy. These problem areas include the following:

- Mathematical terminology and properties
- Basic algebra
- Problem solving skills, particularly geometry and spatial applications
- Grade 9 performance, when learners choose between Mathematics and Mathematical Literacy for the FET band.

2.3 WCED provincial systemic assessments in Mathematics

Table 2 below presents results of the annual WCED systemic assessments of Mathematics for grades 3, 6 and 9 for the five-year period, 2010 to 2014.

The WCED has set the pass percentage at 50% for the purposes of the test.

The results indicate steady improvement, but not at a rate that would achieve the province's objective of ensuring that 40% of Grade 12 learners take Mathematics by 2019.

Grade 3	% of Gr 3s who passed	Ave % Gr 3	Grade 6	% of Gr 6s who passed	Ave % Gr 6	Grade 9	% of Gr 9s who passed	Ave % Gr 9
2010	(48,3)	(48,0)	**2010**	(24,4)	(39,2)	**2010**	9,4	24,4
2011	47,2	46,3	**2011**	23,4	37,6	**2011**	10,4	24,9
2012	51,5	48,9	**2012**	26,4	39,5	**2012**	13,9	29,3
2013	55,0	51,1	**2013**	28,3	39,3	**2013**	14,3	28,7
2014	54,0	52,0	**2014**	30,4	41,4	**2014**	14,9	28,7

Table 2: Summary results of WCED systemic assessments for Mathematics: 2010 – 2014. A pass mark is 50% Source: WCED report obtained 11 Dec 2014

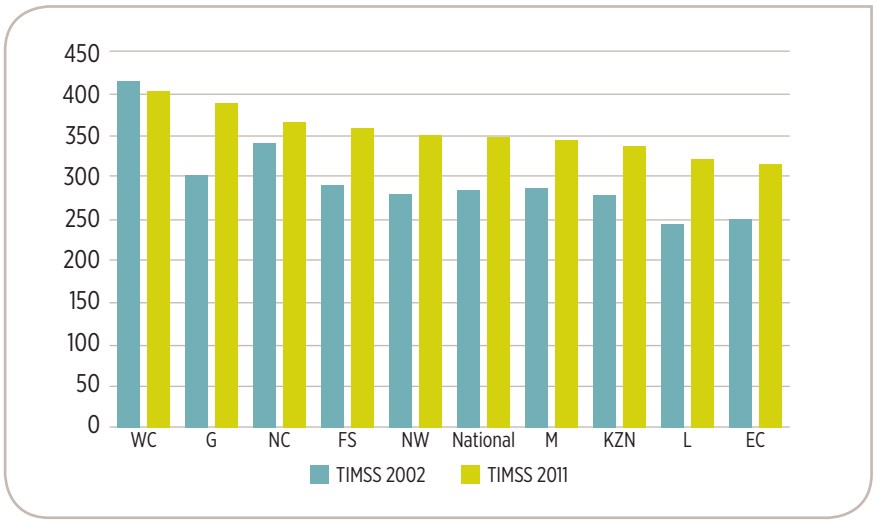
The results point to a decline in performance of 15% from Grade 3 to Grade 9. We use this indicator to set targets for achievement in Grade 9 to ensure greater participation subsequently in Grade 12.

2.4 TIMSS

The TIMSS studies help to assess South African performance against international benchmarks. They also indicate how our best learners compare internationally.

Grade 9 learners wrote the TIMMS test in 2011. South African learners improved their performance at this level compared to 2002, but still at the low end of international results (see Graph 3).

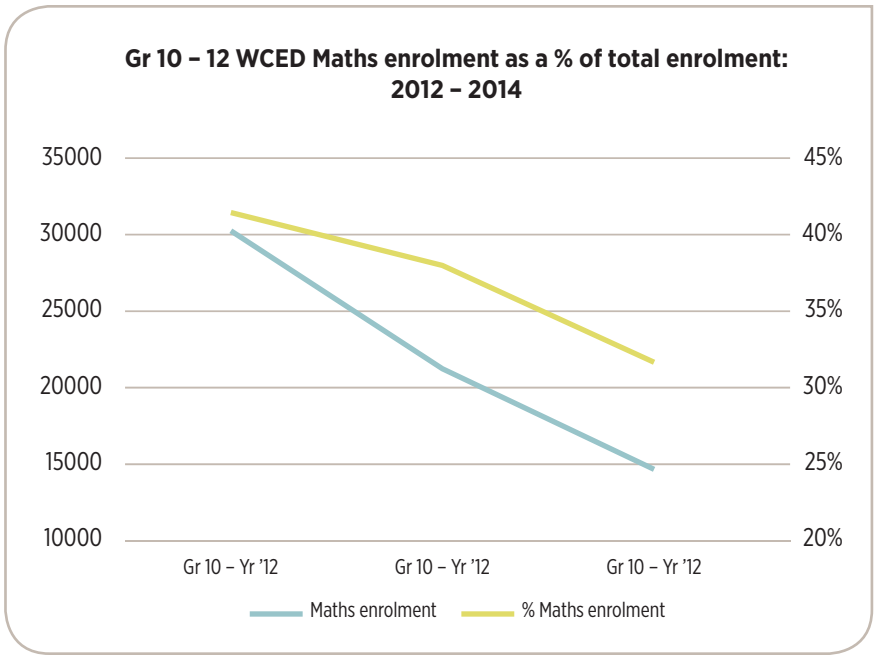
South Africa scored 352 points on the Grade 9 level in 2011 compared to 285 in 2002. The top South African performers approached the average performance of the top performing countries.



Graph 3: Change in achievement by province between 2002 and 2011

2.5 The National Senior Certificate (2007-2014)

Graph 3 shows the total enrolment of learners in each FET Grade



Graph 3: WCED Grade 10-12 Maths enrolment as a % of total enrolment: 2012 – 2014.

The number of learners choosing Mathematics in Grade 12 dropped by 6 000 per year in the Western Cape between 2012 and 2014, as more learners opted for Mathematical Literacy.

The number of learners enrolled for Mathematics in 2014 dropped by 15 252 compared to enrolment for the subject in Grade 10 in 2012.

This provincial strategy therefore aims to improve the quality of teaching and learning in Mathematics in all grades, to increase the numbers passing and to improve the quality of the results.

> **“ The Mathematics strategy also aims to increase the number of learners taking and passing Mathematics in Grades 10 – 12. ”**

3 > **Preamble** of the Strategy

The Mathematics strategy seeks to facilitate high-quality learning in Mathematics. The strategy focuses on integrating four dimensions of working towards and sustaining quality Mathematics teaching and learning. They are (see diagram below):

3.1 **People development**
(investing in the agents involved)

3.2 **Productive pedagogies**
(using effective teaching strategies that will result in learning)

3.3 **Resource/facility provision and use**
(acquisition and effective use of resources)

3.4 **Monitoring and evaluation**
(continuous in(tro)spection to reflect on success).

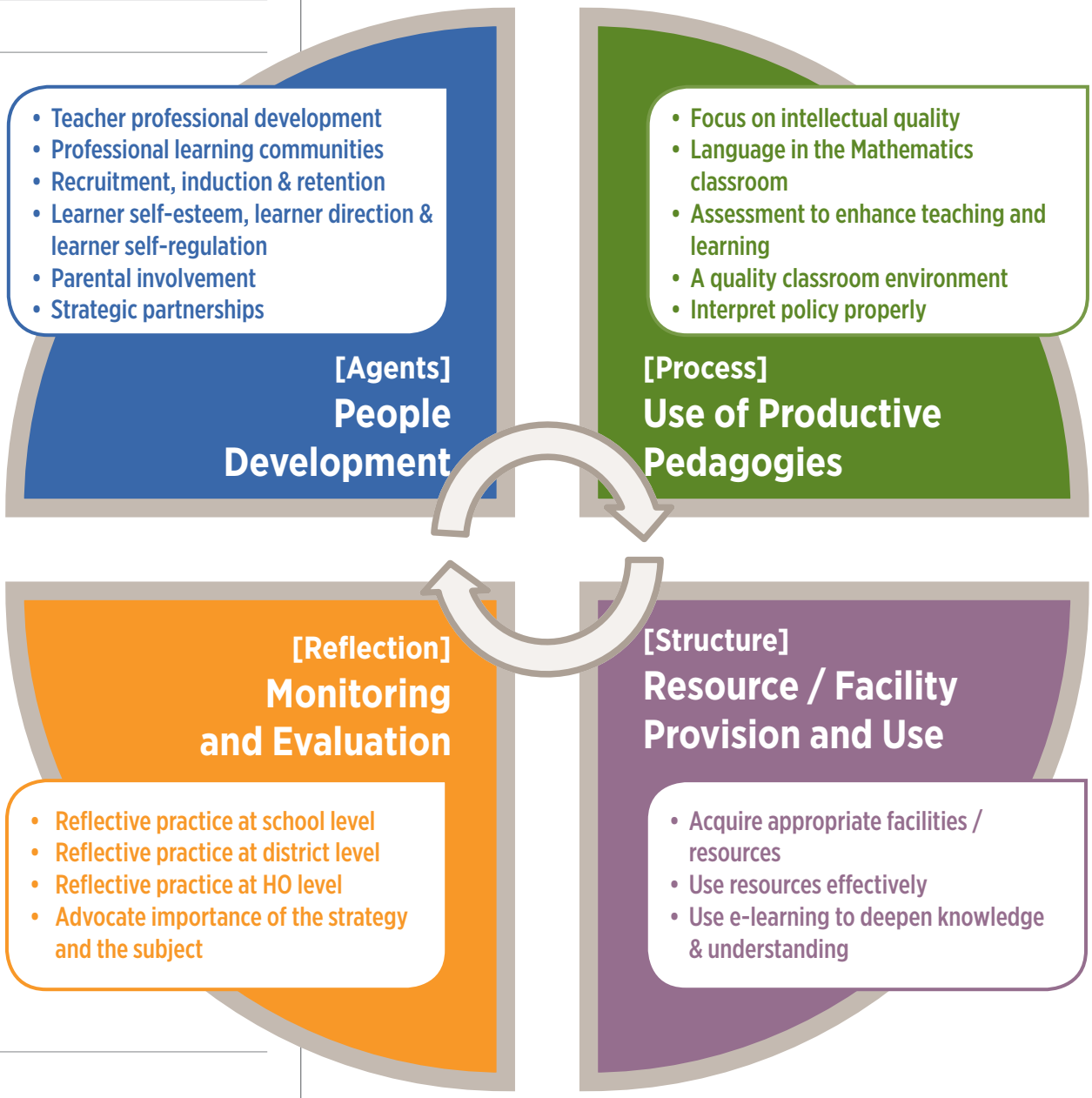


Fig. 1: Dimensions and elements of the WCED Mathematics Strategy (2015-2019)

There is continuous interaction between the different dimensions of the strategy as teachers and schools work towards better teaching. However, the emphasis placed on each or combinations of dimensions may shift due to the context and needs of the school as the best learning outcomes are pursued. Each dimension consists of key elements which are crucial in enhancing teaching and learner performance in Mathematics. While all the dimensions will be addressed in each phase, the development stage of the learner as well as the curriculum and school context will determine the emphasis.

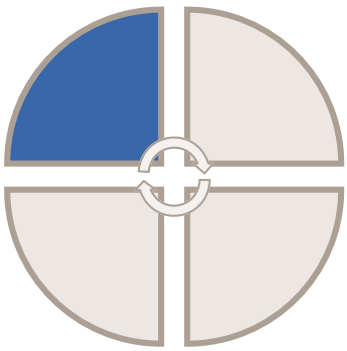
A considerable body of research, which speaks to the realities of schooling provision in the Western Cape, has informed the strategy. There is general consensus that high-quality learning can be facilitated through "appropriate" teaching approaches.

This strategy builds on insights from research on productive pedagogies, which highlight the kinds of teaching practices and organisational processes teachers use, and indicate that these make a difference to the academic and social learning of all learners (see Appendix A).

Research has also helped to identify attributes that have a marked and meaningful effect on learners' learning – not just a positive effect. This research has helped us to understand which teaching practices have made a significant difference, while also indicating who is mainly responsible for these practices (see Appendix B).

The following section explains the elements identified in each of the four dimensions of the WCED Mathematics strategy. Broad guidelines and principles are provided. Detail will be developed as the strategy unfolds in the District Improvement Plans and the School Improvement Plans of the next five years.

"While all the dimensions will be addressed in each phase, the development stage of the learner as well as the curriculum and school context will determine the emphasis."



People development

a) Teacher professional development
b) Professional learning communities
c) Recruitment, induction & retention
d) Learner self-esteem, learner direction & learner self-regulation
e) Parental involvement
f) Strategic partnerships

4 > **Details** of the Strategy

4.1 People development

The Mathematics Strategy promotes the professional development of all those involved in Mathematics teaching in the province: teachers, officials, learners, parents, HEIs and other subject relevant partners.

a) Teacher and official professional development

- Conduct a skills audit and establish a database of teachers' Mathematics competencies in order to establish training needs.
- Improve Mathematics content knowledge and pedagogical content knowledge in key content areas.
- Provide a deep understanding of curriculum continuity and progression across grades and phases.
- Develop teachers' ability to align learning aims, teaching and assessment.
- Support the development of realistic teaching plans.
- Improve teaching competence to help learners acquire mathematical process and other skills e.g. applying BODMAS, doing problem-solving, etc.
- Teacher development and related support so that both learner and teachers' differential needs are addressed.
- Grow strategic curriculum leadership and management by ensuring that HoDs and Mathematics subject heads participate in regular Mathematics strengthening forums to keep of abreast of subject developments.
- Ensure that teachers from identified schools participate in grade-specific Mathematics training programmes to enhance learner performance.
- Provide on-site support for differentiated teaching.

b) Professional Learning Communities (PLCs)

- Guide SAs, SMTs and lead teachers to start, facilitate and use PLCs at and between schools to promote the sharing of best practices and collaboration.
- Use PLCs to entrench professional development and have schools work together to offer all learners the best possible education.
- Conduct cluster work sessions to analyse teaching gaps identified in school-based assessment and systemic testing and design interventions to address the gaps.
- Acknowledge and provide incentives for lead teachers/PLC coordinators.
- Encourage attendance at short courses (e.g. offered at CTLI, and by teacher unions, universities, etc.) to support, refresh and strengthen teaching practice.

c) Recruitment, induction and retention strategies

- Embark on a vigorous recruitment drive at HEIs and elsewhere for mathematically competent teachers
- Incentivise talented learners to take up teaching
- Provide incentives to retain productive and competent teachers.
- Promote the appointment of capable Mathematics specialist teachers.
- Provide incentives for lead teachers and subject heads/HoDs in their early careers who display potential.
- Design an induction programme (CTLI) for new teachers to drive best practice and develop Mathematics teaching skills.
- Provide appropriate training for all new teachers and HoDs to ensure they are able to competently implement CAPS.

d) Learner self-esteem, learner direction and learner self-regulation

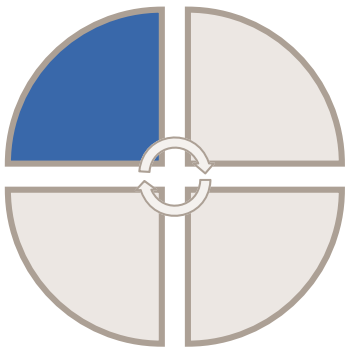
- Support learners in developing positive self-esteem. For this to happen, learners need clear and sustained guidance from teachers so that they take responsibility and take appropriate steps to address weaknesses.
- Develop a classroom culture that ensures learners enjoy learning and understand that their learning matters.
- Learners do homework and take ownership of their own learning and discover that success demands sacrifice and hard work.
- Promote teaching practices that help learners to link new knowledge to their background knowledge, to connect new learning to the world beyond the classroom and to integrate knowledge within and across subject boundaries.

e) Parental involvement

- Advocate the WCED Mathematics strategy as an improvement plan.
- Implement appropriate measures to ensure parental and community support for Mathematics teaching and learning.
- Discuss with parents the preparatory skills needed to improve and sustain their children's competence in mathematics.
- Encourage parents to support school targets and strategies to help learners at home.
- Sensitise parents to the fact that their expectations are important influences on their child's achievement.
- Communicate quarterly with parents on learner progress.
- Hold family Mathematics events where parents and learners engage in mathematics-based activities such as puzzles, quizzes, Maths games, etc.

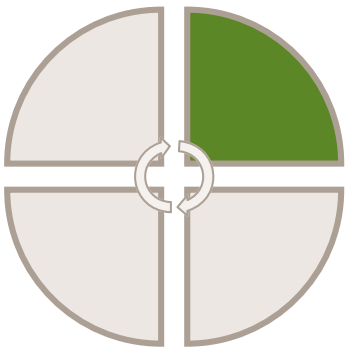
f) Strategic partnerships

- Partner with NGOs, HEIs and private sector initiatives that provide school-based/ on-site support to teachers.
- Provide interventions that support districts and schools in setting and attaining appropriate targets as articulated in DIPs and SIPs.



People development

a) Teacher professional development
b) Professional learning communities
c) Recruitment, induction & retention
d) **Learner self-esteem, learner direction & learner self-regulation**
e) **Parental involvement**
f) **Strategic partnerships**



Use of productive pedagogies

a) Focus on intellectual quality
b) Language in the Mathematics classroom
c) Assessment to enhance teaching and learning
d) A quality classroom environment
e) Interpret policy properly

4.2 Use of productive pedagogies

Productive pedagogies refer to teaching and learning practices that support improved student performance. This strategy promotes productive pedagogies in Mathematics teaching by emphasising intellectual quality, the importance of language in the Mathematics classroom, assessing for learning, creating quality classroom environments and the effective reading and interpretation of education policies.

a) Focus on intellectual quality

- Develop deep concept knowledge and understanding.
- Develop, demonstrate and implement structured Mental Mathematics programmes.
- Use questioning and examples that span the range of cognitive levels.
- Ensure assessment activities straddle different cognitive levels.
- Teaching should include substantive conversations about Mathematical concepts and themes and how they help learners to understand and mediate their world better.

b) Language in the Mathematics classroom

- Language is an essential tool for developing and conveying meaning.
- Use correct Mathematics terminology in learning conversations.
- For learners who do not have the school's LoLT as their mother tongue, devise extra support at all levels in that LoLT.
- Analyse assessment data for the effects of language deficits and plan necessary interventions.
- Encourage conversations between teachers and learners which include important concepts and ideas encountered in Mathematics.
- Compile and use a database to track performance of non-LoLT learners.

c) Assessment to enhance teaching and learning

- Develop and conduct a preparatory baseline assessment for learners in a new grade.
- Assess in order to promote learning.
- Design assessment activities that provide valid information about the success of teaching and learning.
- Use exemplar assessment tasks to design own tasks that are responsive to teacher and learner needs.
- Provide learners with prompt feedback and feed-forward aimed at closing the gap between the actual and desired learner achievement.
- Use evidence from assessments to draft plans for improving learner support.
- Increase the number of schools participating in Mathematics Challenges, Competitions and Olympiads.

d) A quality classroom environment

- Construct a welcoming classroom environment that is supportive, encouraging and focussed on learning so that learners can achieve their full potential.
- Learners respect each other, work individually in pairs and groups to develop deeper understanding and take responsibility for their and others' learning.
- Create a Mathematics resource-rich classroom that supports productive teaching and learning.
- Instil discipline and teach by example.
- Teaching and learning interactions should be orderly and well planned.

e) Interpret policy

- Principals, HoDs and teachers interpret the stated Mathematics curriculum correctly in terms of teaching and assessment requirements as well as time-tabling.
- Teachers understand continuity and progression of prescribed content/skills from phase to phase and how the teaching and consolidation of prescribed content/skills in one phase forms the basis for mathematical learning in the next phase.
- The correct notional time is allocated for mathematics.

4.3 Resource/facility provision and use

Effective Mathematics teaching requires the appropriate selection and effective integration of available resources and use of facilities to deepen and broaden Mathematics learning.

a) Acquire appropriate facilities/resources

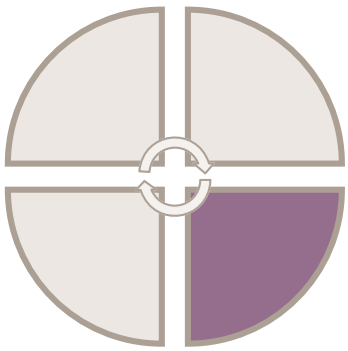
- Schools do a baseline asset assessment and progressively procure necessary textbooks, grade-appropriate learner manipulatives and teacher demonstration Mathematics kits.
- Ensure the distribution of learning support material to all learners.
- Keep asset registers to monitor the use and retention of resources and use allocated funds and other means to supplement equipment/facilities as needed to implement the SIP for Mathematics.

b) Use resources effectively

- Teachers use phase appropriate teaching and learning resources and materials.
- Cluster teams plan ahead per term for resources needed in teaching, etc.
- Share ideas about effective use of accessible resources to help mediate key concepts in Mathematics.
- Encourage collaboration between schools in developing and sharing resources and facilities.

c) Use e-learning to deepen knowledge and understanding

- Teachers use computers and select teaching sources on the Internet.
- Support teachers in the selection of e-learning resources to deepen learners' knowledge and understanding of concepts and skills.
- Review and recommend e-learning software and digital resources that support differentiated learning.
- Place suitable materials on the WCED server.
- Ensure parents are aware of these resources so that they are able to support and enhance Mathematics accessibility.
- Use PLCs to develop a data base of web-based teaching, assessment and learning resources for each of the content topics.



Resource/facility provision and use

a) Acquire appropriate facilities / resources
b) Use resources effectively
c) Use e-learning to deepen knowledge & understanding

Monitoring and Evaluation

a) Reflective practice at school level
b) Reflective practice at district level
c) Reflective practice at HO level
d) Advocate importance of the strategy and the subject

4.4 Monitoring and Evaluation

The improvement of practices that will sustain better Mathematics teaching and learning depends on reflection at different levels of the education system. These reflections should suggest changes to the Mathematics Strategy and how we advocate it.

a) Reflective practice at school level

- Each school develops a target-driven Mathematics improvement plan with collective staff input.
- Monitor teaching and learning by tracking progress and adjusting plans.
- Evaluate efficiency and impact of assessment by monitoring curriculum delivery and performance in SBAs in schools.
- Evaluate learner performance in Formal Assessment Tasks.
- Review the effectiveness of LTSM management.
- Continually improve Mathematics performance by adjusting internal SBA in the light of data from national and provincial systemic assessments.
- Schools follow an internal moderation policy and continually improve it taking into account subject developments and better teaching practices.
- SMTs support the subject head/HoD to manage the subject team by ensuring time on task, by moderating assessment and taking responsibility to address shortcomings.
- Improve the management and monitoring competencies of SMTs.

b) Reflective practice at district level

- Ensure competent appointments to strengthen district support.
- Recruit and develop district officials responsible for Mathematics.
- Evaluate curriculum coverage, impact and pace in accordance with national benchmarks.
- Moderate teaching plans and LTSM to gauge if gaps are addressed.
- Districts develop a Mathematics Improvement Plan within their DIP for reporting to provincial and national structures.
- Districts (1) monitor curriculum delivery as well as time on task at schools; (2) ensure that every school has an internal assessment and moderation policy; (3) moderate and verify the SBA; (4) monitor the use and safe-keeping of resources including textbooks.
- Specialists conduct workshops to support officials and teachers to attain desired outcomes.

c) Reflective practice at Head Office level

- Develop management and monitoring competencies of head office officials.
- Research external test results to inform teaching support measures in school and district improvement plans.
- Influence the design of teacher development and leadership courses in order to develop strategic curriculum leadership and management.
- Include Mathematics monitoring and support in induction courses at CTLI for all in management and leadership positions.
- Review the strategy annually to ensure that the targets of the provincial strategy are met and if necessary effect adjustments to ensure effective implementation.

d) Advocacy of subject and strategy

- Evaluate the understanding and implementation of the provincial Mathematics strategy at districts, at schools, and within communities.
- Ensure all role players understand the importance of this strategy.
- Substantiate changes to the planned strategy where needed.
- Advocate the importance of being numerate and being able to choose to have Mathematics as part of a learner's subject choice in Grade 10.

5 > The Strategy **unpacked per Phase**

The elements of each dimension in each phase should be read in conjunction with the general unpacking of the strategy in Section 4. Note that in the case of the Intermediate Phase Grades 4 to 7 (primary school) and in the Senior Phase Grades 8 and 9 (high school) were grouped for the sake of practicality.

5.1 Grade R – 3

5.1.1 People development

a) Teacher and official professional development

Improve Mathematics content knowledge and pedagogical content knowledge. Understand how young children make sense of mathematical concepts. Understand the importance of the pedagogy of play in Grade R. Develop a clear understanding of curriculum continuity and progression from Grades R to 4 and ensure alignment between learning aims, teaching and assessment. Support the development of realistic teaching plans. Implement teacher training that is accompanied by action research, monitoring and on-site support. Provide on-site support for differentiated group teaching. Implement assessment of teacher's own mathematical teaching competencies. Establish a data base of teachers' competencies to prioritise course attendance and eliminate unnecessary training. Include mathematics subject support in all curriculum leadership training. Ensure that FP Subject Advisors and FP HODs are equipped to monitor and support Mathematics from Grades R to 3.

b) Professional Learning Communities (PLCs)

Start and grow local PLCs into vibrant mathematics hubs to promote the sharing of best practices and collaboration. Use PLCs to entrench professional development and have schools work together to offer all learners the best possible mathematical teaching and learning. Analyse teaching gaps identified in SBA and systemic testing and design interventions to address the gaps. Acknowledge and provide incentives for lead teachers/ PLC coordinators to mentor peers. Encourage attendance of short courses to support, refresh and strengthen teaching practice.

c) Recruitment, induction and retention strategies

Embark on a vigorous recruitment drive for FP teachers who are mathematically astute. Promote the appointment and utilisation of capable FP mathematics teachers. Provide incentives for FP mathematics lead teachers, subject heads or HoDs. Design an induction programme for new FP teachers to drive best Mathematics teaching practice and ensure they are competent to implement CAPS.

d) Learner self-esteem, learner direction and learner self-regulation

Support learners in developing a positive self-esteem and willingness to engage with mathematics. Develop a classroom culture that ensures learners enjoy mathematical learning and understand that their learning matters. Promote teaching practices that help learners to link new mathematical knowledge to their existing knowledge, and to connect new learning to the mathematical world beyond the classroom and across all subjects.

e) Parental involvement

Advocate the WCED Mathematics strategy as an improvement plan for all children. Implement appropriate measures to ensure parental and community support for the importance of FP Mathematics. Provide parents with a "Welcome to Grade 1" booklet which describes the skills needed to improve and sustain their children's competence in mathematics. Encourage parents to support school targets and help learners at home with mathematics homework. Sensitise parents to the fact that their expectations are important influences on their child's achievement.

f) Strategic partnerships

Partner with specialist Mathematics NGOs, HEIs and private sector initiatives that provide school-based/ on-site mathematics support to teachers. Provide interventions that support districts and schools in setting and attaining appropriate Mathematics targets as articulated in DIPs and SIPs. Ensure all interventions have a clear theoretical framework and are accompanied by monitoring and evaluation.

5.1.2 Use of productive pedagogies

a) *Focus on intellectual quality*

While emphasis in the FP is mainly on memorisation and mastery of basic concepts, every effort should be made to develop deeper concept knowledge and understanding. Use a balanced approach to mathematics that includes direct instruction, exploration, investigation and problem solving. Understand and apply concrete, semi-concrete and abstract strategies at appropriate stages and build logical thinking skills. Develop, demonstrate and implement structured Mental Mathematics programmes. Design lesson plans with a systematic approach to build-up and build-on the skills in the CAPS with increasing complexity. Use the CAPS to benchmark mathematics standards, learners' performance and progress. Assessment activities in the phase should straddle different cognitive levels.

b) *Language in the Mathematics classroom*

Use mathematical language as an essential tool for developing and conveying mathematical meaning. Ensure meaningful conversations between teachers and learners about important concepts and ideas encountered in Mathematics. Use correct Mathematics terminology in learning conversations. Implement strategies that address language in Mathematics.

c) *Assessment to enhance teaching and learning*

Develop and conduct a preparatory skills baseline assessment in all grades. Emphasise assessment for learning. Design assessment activities that provide valid information about the success of teaching and learning. Use exemplar assessment tasks to design own tasks that are responsive to teaching and learner needs. Provide learners with prompt feedback and feed-forward aimed at closing the gap between the actual and desired learner achievement. Use assessments to draft plans for improving learner support.

d) *A quality classroom environment*

Construct a classroom environment that welcomes all learners, is supportive, encouraging and focussed on learning so that learners can achieve their full potential. Instil discipline and teach by example. Encourage teachers to create a Mathematics resource-rich classroom that supports productive teaching and learning. Plan systematic learning done orderly with good preparation.

e) *Interpret policy properly*

Ensure principals, HoDs and teachers interpret the CAPS Mathematics curriculum correctly in terms of teaching and assessment requirements as well as time-tabling. Ensure the correct notional time is allocated and used for Mathematics in the Foundation Phase. Support teachers in understanding continuity and progression of key mathematical knowledge/skills in the phase and beyond, emphasising how the teaching and consolidation of these prescribed content and skills form the basis for mathematical learning in the Intermediate Phase.

5.1.3 Resource/facility provision and use

a) *Acquire appropriate facilities/resources*

Review all current mathematics learning and teaching support materials. Ensure quality Mathematics textbooks, grade-appropriate learner manipulatives and teacher demonstration kits are included in the School Improvement Plan for Mathematics. Budget for procurement of a wide variety of quality FP mathematics learning and teaching support material and equipment. Ensure incremental augmentation of resources. Distribute learner support material, including DBE workbooks, to all learners. Keep asset registers to monitor the use and retention of resources.

b) *Use resources effectively*

Expose teachers to the effective use of FP phase appropriate teaching and learning resources and materials. Ensure FP teachers plan ahead per term for resources needed in teaching. Share ideas in PLCs about effective use of easily accessible resources to help mediate key concepts in FP Mathematics.

c) *Use e-learning to deepen knowledge and understanding*

Ensure that all teachers develop competence in the use of computers and the selection of teaching sources on the Internet. Support teachers in the selection of e-learning resources to improve and deepen learners' knowledge and understanding of concepts and skills. Review and recommend e-learning software and digital resources that support differentiated learning. Upload materials on the WCED server. Ensure parents are made aware of these resources. Use PLCs to develop a data base of web-based teaching, assessment and learning resources for each of the FP content topics.

5.1.4 Monitoring and Evaluation

a) *Reflective practice at school level*

Develop a target-driven Mathematics improvement plan for the school that is inclusive of all FP teachers. Monitor teaching and learning by tracking progress and adjusting plans. Evaluate efficiency and impact of assessment by monitoring curriculum delivery and performance in SBAs. Continually improve Mathematics performance by adjusting internal school-based assessment in the light of data from national and provincial systemic assessments. Schools follow an internal moderation policy and make adaptations in the light of subject developments and improved teaching practice. SMTs support the FP subject head/HoD to manage the FP team by ensuring time on task, moderating assessment and taking responsibility to address shortcomings. Share best practice regarding the moderation programme at all levels in the school system to track progress made in teaching, assessment and learning. Develop the management and monitoring competencies of SMTs.

b) *Reflective practice at district level*

Develop management and monitoring competencies of district officials. Evaluate curriculum coverage, impact and pace in accordance with national benchmarks. Ensure that every school follows an internal moderation policy. Moderate teaching plans, learner work and assessment. Develop a district Mathematics Improvement Plan that aligns to provincial objectives and targets. Provide regular progress reports.

c) *Reflective practice at Head Office level*

Develop management and monitoring competencies of head office officials. Analyse external test results to inform relevant teaching support measures for schools and districts. Influence the design of teacher development and leadership courses in order to develop strategic curriculum leadership and management. Include Mathematics monitoring in induction courses at CTLI for incumbent FP managers and principals. Review the Mathematics strategy on an annual basis to ensure that the targets of the strategy are met and if necessary make adjustments to ensure effective implementation.

d) *Advocacy of subject and strategy*

Evaluate the understanding and implementation of the provincial Mathematics strategy at districts, schools and within communities. Ensure all role players understand the importance of this strategy. Substantiate changes to the planned strategy where needed.

5.2 Grade 4 – 7

5.2.1 People development

a) *Teacher and official professional development*

Improve Mathematics content knowledge and pedagogical content knowledge keeping a strong focus on key Mathematics concepts and appropriate teaching methodology. Sustain a clear understanding of curriculum continuity and progression across Grades and Phases. Ensure alignment between learning aims, teaching and assessment. Support the development of realistic teaching plans that take into account the Mathematics pace setters. Implement teacher training and provide related support so that both learner and teachers' differential needs are addressed. Establish a data base of teachers' competencies in teaching Mathematics in this phase.

b) *Professional Learning Communities (PLCs)*

Guide SAs, SMTs and lead teachers to start, facilitate and use PLCs at and between schools to promote sharing best practices and enhance collaboration. Use PLCs to entrench professional development and have schools work together to offer all learners the best possible Mathematics teaching. Conduct PLC work sessions to reflect on teaching gaps found in SBA and systemic testing and consequently design interventions to address identified gaps. Encourage attendance at Mathematics conferences, PLCs and enrolment in short courses (e.g. CTLI and AMESA) to enhance teaching practice.

c) *Recruitment, induction and retention strategies*

Recruit mathematically competent learners from HEIs. Provide recognition and incentives to retain experienced and productive teachers of grades 4 – 7. Promote the appointment of capable teachers. Provide bursary incentives for IP teachers. Design an induction programme (CTLI) for new teachers to drive best practice and develop appropriate teaching skills. Provide appropriate training for all new incumbents to ensure they are able to competently implement CAPS.

d) *Learner self-esteem, learner direction and learner self-regulation*

Support learners in developing self-esteem based on a "growth mindset" rather than a "fixed mindset". For this to happen, learners need clear and sustained guidance from the teacher so that they are gradually given responsibility and take appropriate steps to address weaknesses. Create a classroom culture that enables learners to understand why their learning matters. Promote teaching practices that help learners to link new knowledge to their background knowledge, to connect new learning to the world beyond the classroom and to integrate knowledge within and across subject boundaries.

e) *Parental involvement*

Advocate the provincial Mathematics strategy as an improvement opportunity. Implement appropriate measures to ensure parental and community support so that Mathematics is accessible to all learners. Discuss with parents the skills their children need to develop competence in Mathematics. Engage parents to support school targets and help learners at home. Introduce parent support groups to engage with teaching methods used in the classroom.

f) *Strategic partnerships*

Use service providers to assist with training HoDs and teachers in the Mathematics content and teaching methodology and effective use of SASOL-Inzalo workbooks. Partner with NGOs, HEIs and private sector initiatives that provide school-based/ on-site support to teachers.

5.2.2 Use of productive pedagogies

a) *Focus on intellectual quality*

Every effort should be made to develop deeper concept knowledge and understanding. Develop, demonstrate and implement structured Mental Mathematics programmes. Assessment activities in the phase should progressively straddle different cognitive levels.

b) *Language in the Mathematics classroom*

Language is an essential tool for developing and conveying meaning. Use correct Mathematics terminology in learning conversations and encourage strategies that address the objectives of language in Mathematics. Ensure sustained and meaningful conversations between teacher to learner and learner to learner about important concepts and ideas encountered in mathematics.

c) *Assessment to enhance teaching and learning*

Assess for learning, using formal assessment tasks and informal assessment to guide learning as soon as learners show conceptual gaps. Provide learners with prompt feedback and feed-forward aimed at closing the gap between the actual and desired learner achievement. Use these assessments to draft plans for improving learner understanding.

d) *A quality classroom environment*

Construct a classroom environment that welcomes all learners, is supportive, encouraging and focussed on learning so that learners can achieve their full potential. Instil discipline, a work ethic and teach by example. Encourage teachers to create a Mathematics resource-rich classroom that supports productive teaching and learning. Teaching and learning interactions ought to be characterised by order and appropriate preparation that enables each learner to reach their full potential.

e) *Interpret policy properly*

Ensure principals, HoDs and teachers interpret the stated Mathematics curriculum correctly in terms of teaching and assessment requirements as well as time-tabling for IP. Ensure the correct notional time is allocated and used for mathematics.

5.2.3 Resource/facility provision and use

a) *Acquire appropriate facilities/resources*

Schools manage the procurement of textbooks, grade-appropriate learner equipment and teacher demonstration kits. They also ensure the distribution of DBE and SASOL-Inzalo workbooks to all learners. Schools should keep asset registers to monitor the use and retention of resources and use allocated funds and other means to supplement equipment/facilities as needed to implement the School Improvement Plan for Mathematics.

b) *Use resources effectively*

Expose teachers to the effective use of phase appropriate teaching and learning resources and materials. Help phase teams to plan ahead per term and identify resources needed for teaching, learning and assessment. Share ideas in PLCs about effective use of easily accessible resources to help mediate key concepts in Mathematics for grades 4 – 7.

c) *Use e-learning to deepen knowledge and understanding*

All teachers are competent in the use of computers and other digital equipment as well as accessing teaching/learning sources on the Internet. Support teachers in identifying e-learning resources that support teaching and deepen learners' knowledge and conceptual understanding. Review and recommend e-learning software and digital resources that support mathematical learning in IP. Place suitable materials on the WCED server. Encourage parents to acquire and use approved free software programmes and digital resources at home to support learners. Use PLCs to develop a data base of web-based teaching, assessment and learning resources for each of the content topics for grades 4 – 7.

5.2.4 Monitoring and Evaluation

a) *Reflective practice at school level*

Each school should develop a target-driven Mathematics improvement plan for grades 4 – 7. Relevant staff should be consulted. Monitor teaching and learning by tracking progress and adjusting plans. Evaluate efficiency and impact of assessment by monitoring curriculum delivery. Continually improve Mathematics performance by adjusting internal SBA in the light of data from national and provincial systemic assessments. Ensure that schools follow an internal moderation policy and that the policy is continually improved taking into account subject developments and better teaching practices. SMTs support the responsible HoD to manage the team for grades 4 – 7 by ensuring time on task, by moderating assessment and taking responsibility to address gaps. Develop the skills of the HoD and Mathematics subject head to track progress in teaching, learning and assessment. Improve the management and monitoring competencies of SMTs.

b) *Reflective practice at district level*

Districts develop a Mathematics Improvement Plan that is aligned with their DIP for reporting to the WCED and/or DBE. CMs and SAs report to the district on progress and plan focussed support where needed. Improve management and monitoring competencies of district officials. Moderate teaching plans and learner exercise books to gauge if gaps are addressed. Moderate and verify assessment by ensuring that every school follows an internal moderation policy.

c) *Reflective practice at Head Office level*

Develop management and monitoring competencies of Head Office officials. Research external test results to establish knowledge gaps to inform teaching support measures in school and district improvement plans annually.

Influence the design of teacher development and leadership courses. Include Mathematics monitoring and support into induction courses at CTLI for all in management and leadership positions. Review the strategy on an annual basis to ensure that the targets of the Mathematics strategy are met and if necessary make adjustments to ensure effective implementation.

d) *Advocacy of subject and strategy*

Evaluate the understanding and implementation of the provincial Mathematics strategy at districts, at schools, and within communities. Ensure all role players understand the importance of this strategy and provide reasons for changes to the planned strategy if needed.

5.3 Grade 8 – 9

5.3.1 People development

a) *Teacher and official professional development*

Support the development of realistic teaching plans that take into account the Mathematics pace setters. Undertake a skills audit and establish a data base that shows teachers' Maths competence in order to establish content and pedagogical content knowledge training needs. Focus training on specific key topics which prove to be difficult for teachers and learners to grasp such as Euclidean geometry, functions and graphs, statistics and probability. Promote a clear understanding of curriculum continuity and progression from grade 4, across grades and in FET. Improve teacher competence in integrating higher order cognitive skills in teaching and assessment. Provide support for differentiated teaching and remediation.

b) *Professional Learning Communities (PLCs)*

Guide HoDs, subject heads and lead teachers to start, facilitate and use PLCs at and between schools to promote best practices and enhance collaboration. Acknowledge and provide incentives for lead teachers/PLC coordinators. Use PLCs to entrench professional development and have schools work together to offer all learners the best possible Mathematics education. Conduct PLC/cluster work sessions to reflect on teaching gaps found in SBA and systemic testing. Encourage attendance at Mathematics conferences, PLCs and enrolment in short courses (e.g. CTLI and AMESA) to refresh teaching practice.

c) *Recruitment, induction and retention strategies*

Embark on a vigorous recruitment drive to attract mathematically competent teachers. Provide recognition and incentives to retain experienced and productive grades 8 and 9 teachers. Promote the appointment of capable teachers. Provide bursary incentives for Mathematics teachers of grades 8 and 9. Design an induction programme for new teachers to drive best practice and develop Mathematics teaching skills. Use expert teachers to mentor new mathematics teachers. Provide appropriate training for all new incumbents to ensure they are able to competently implement CAPS.

d) *Learner self-esteem, learner direction and learner self-regulation*

Support learners in developing self-esteem based on a "growth mindset" instead of a "fixed mindset". For this to happen, learners need clear and sustained guidance from the teacher so that they are given responsibility and take steps to address weaknesses. Help learners to understand that their learning matters. Promote teaching practices that help learners to link new knowledge to their background knowledge, to connect new learning to the world beyond the classroom and to integrate knowledge within and across subject boundaries. Learners use the booklet "Transition from Grade 9 to Grade 10: Tips for success" to plan study goals.

e) *Parental involvement*

Implement appropriate measures to ensure parental and community support for the importance of FP Mathematics. Encourage parents to support school targets and help learners at home with mathematics homework. Advocate the provincial Mathematics strategy as an improvement opportunity for their children. Discuss with parents the skills their children need in order to develop competence in Mathematics.

f) *Strategic partnerships*

Establish strategic partnerships with NGOs, HEIs and the private sector in order to promote participation and performance in Mathematics. Facilitate training of SMTs to enable them to drive the Mathematics strategy in their schools towards attaining identified targets. Provide adequate and appropriate training of Mathematics teachers and HoDs. Encourage participation in external Mathematics Association conferences (AMESA), subject committees, PLCs, etc. Partner with NGOs, HEIs and private sector initiatives that provide school-based/ on-site support to teachers.

5.3.2 Use of productive pedagogies

a) *Focus on intellectual quality*

Whilst understanding of basic Mathematical concepts is important, every effort should be made to focus on higher cognitive skills like application and problem-solving to develop deeper conceptual knowledge and understanding. Use questioning that spans the range of cognitive levels. Assessment activities in the phase should progressively straddle different cognitive levels.

b) *Language in the Mathematics classroom*

Language is important for learning and should be promoted through the teaching of Mathematics. Use correct mathematical terminology. Encourage strategies that address language in Mathematics as language is an essential tool for developing and conveying meaning. Encourage substantive conversations between Mathematics teachers and learners and between learners about important concepts and ideas. This dialogue should be in verbal, written, graphic and symbolic formats.

c) *Assessment to enhance teaching and learning*

The emphasis ought to be on assessment for and of learning. This should lead to dedicated steps to close gaps in understanding to ensure learners develop the mathematical competence to take mathematics at FET level. Provide learners with prompt feedback and feed-forward aimed at guiding them to attain the learning targets. Design assessment activities that provide valid information about the success of teaching and learning. Teachers use exemplar assessment tasks to design their own tasks that are responsive to teaching and learner needs.

d) *A quality classroom environment*

Construct a classroom environment that welcomes all learners, is supportive, encouraging and focussed on learning so that learners can achieve their full potential. Instil discipline, a work ethic and teach by example. Encourage teachers to create a Mathematics resource-rich classroom that supports productive teaching and learning. Teaching and learning interactions are characterised by order, good preparation and routine.

e) *Interpret policy properly*

Ensure principals, HoDs and teachers interpret the stated Mathematics curriculum correctly in terms of teaching and assessment requirements as well as time-tabling for grades 8 and 9. Support teachers to understand the continuity and progression in mathematics skills from IP to SP and how this forms a basis for mathematical learning in grades 10 to 12.

5.3.3 Resource/facility provision and use

a) *Acquire appropriate facilities/resources*

Manage the procurement and top-up of Mathematics textbooks and the distribution of DBE and SASOL-Inzalo workbooks to all learners. Procure Grade-appropriate learning and teaching resource materials. Teachers keep registers to control use and retention of resources. Schools keep asset registers of Mathematics resources and use allocated funds and other means to supplement equipment/facilities needed to support the School Improvement Plan for Mathematics.

b) *Use resources effectively*

Ensure that all teachers are competent in the use of computers and other digital equipment as well as sourcing of teaching/learning sources on the Internet. Expose teachers to the effective use of phase appropriate teaching and learning resources and materials. Help phase teams to plan ahead per term to secure the resources needed for teaching and assessment. Share ideas in PLCs about effective use of easily obtainable resources to help mediate key concepts in SP Mathematics. Encourage collaboration between schools in developing and sharing resources and facilities.

c) *Use e-learning to deepen knowledge and understanding*

Support teachers in selecting e-learning resources to improve teaching and deepen learners' knowledge and understanding of mathematical concepts and skills. Review and recommend e-learning software that supports learning in the phase. Place suitable materials on the WCED server. Encourage parents to acquire and use approved free software programmes at home to support learners. Use PLCs to develop a data base of web-based teaching, assessment and learning resources for each of the SP content topics.

5.3.4 Monitoring and Evaluation

a) *Reflective practice at school level*

Each school should develop a target-driven Mathematics improvement plan for grades 8 and 9 with collective staff input. Monitor teaching and learning by tracking progress and effecting adjustments if necessary. Evaluate efficiency and relevance of assessment by monitoring curriculum delivery and performance in SBAs. Continually improve Mathematics performance by adjusting internal SBA in the light of data from national and provincial systemic assessments. Ensure that schools continually improve their internal moderation policy and implement it. SMT to support the HoD responsible for Mathematics and the subject head to manage the SP team by ensuring time on task, by moderating assessment and taking responsibility to address gaps. Share best practice regarding monitoring the moderation programme at all levels in the school system. Develop the management and monitoring competencies of SMTs.

b) *Reflective practice at district level*

Districts should develop a Mathematics Improvement Plan within their DIP for reporting to provincial and national structures. CMs and SAs report to the district on progress. Provide quarterly reports to Head Office. Ensure competent appointments to strengthen SMTs and district components.

c) *Reflective practice at Head Office level*

Develop management and monitoring competencies of Head Office officials. Research external test results to establish knowledge gaps to inform teaching support measures in school and district improvement plans.

Influence the design of leadership courses in order to develop strategic curriculum leadership and management. Include Mathematics monitoring and support in induction courses at CTLI for all in management and leadership positions. Review the Mathematics strategy annually to ensure that the targets of the strategy are met and if necessary effect adjustments to ensure effective implementation.

d) *Advocacy of subject and strategy*

Ensure that learners understand the importance of being mathematically literate. Use the grade 8 Mathematics diagnostic test and grade 9 systemic tests to ensure greater participation in Mathematics in Grade 10. Evaluate the understanding and implementation of the provincial Mathematics strategy at districts, at schools, and within communities. Ensure all role players understand the importance of this strategy. Substantiate changes to the planned strategy.

5.4 Grade 10 – 12

5.4.1 People development

a) *Teacher and official professional development*

Focus training on high priority topics which prove to be difficult for teachers and learners to grasp such as Euclidean geometry, compound angle trigonometry, applications of calculus, functions and graphs, statistics and probability. Support the development of realistic teaching plans. Work on a clear understanding of curriculum continuity and progression across grades 10 to 12. Ensure alignment between learning aims, teaching and assessment. Improve teacher competence in integrating higher order cognitive skills in teaching and assessment.

b) *Professional Learning Communities (PLCs)*

Guide HoDs, subject heads and lead teachers to start, facilitate and use PLCs at and between schools to promote best practice and enhance collaboration. Acknowledge and provide incentives for lead teachers/PLC coordinators. Use PLCs to entrench professional development and encourage schools to work together to offer all learners the best possible Mathematics teaching. Conduct PLC work sessions to reflect on teaching gaps found in SBA and systemic testing. Encourage attendance at Mathematics conferences, PLCs and enrolment in short courses (e.g. CTLI and AMESA) to refresh teaching practice.

c) *Recruitment, induction and retention strategies*

Embark on a vigorous recruitment drive to place mathematically competent teachers where they are most needed. Conduct needs analysis of growth and attrition to inform the Mathematics teacher recruitment campaign. Provide recognition and incentives to retain experienced and productive FET teachers. Design induction programmes at all levels. Subject advisors induct new FET Mathematics teachers especially where they are alone at that level. Use expert teachers to mentor novice teachers.

d) *Learner self-esteem, learner direction and learner self-regulation*

Support learners in developing self-esteem based on a "growth mindset" rather than a "fixed mindset". For this to happen, learners need clear and sustained guidance from the teacher so that they are given responsibility and take steps to address weaknesses. Develop and mediate study tips/guidelines for grade 12 learners. Learners should require regular homework/revision so that they can identify areas in which they need more help from teachers. Help learners to understand why their learning matters. Promote teaching practices that help learners to link new knowledge to their background knowledge, to connect new learning to the world beyond the classroom and to integrate knowledge within and across subject boundaries.

e) *Parental involvement*

Encourage parents to participate in their child's learning programme by supporting them to use the colour-coded consolidation tasks on the WCED Curriculum website. Advocate the provincial Mathematics strategy as an improvement opportunity for learners. Discuss with parents the skills their children need in order to develop competence in Mathematics.

f) *Strategic partnerships*

Establish strategic partnerships with NGOs, HEIs and the private sector in order to promote participation and performance in Mathematics. Organise tutoring by expert tutors during winter and spring schools. Facilitate training of SMTs to enable them to drive the Mathematics strategy in their school towards attaining identified targets. Provide adequate and appropriate training of Mathematics teachers and HoDs. Encourage participation in external Mathematics association conferences (AMESA), subject committees, PLCs, etc. Partner with NGOs, HEIs and private sector initiatives that provide school-based/ on-site support to teachers.

5.4.2 Use of productive pedagogies

a) *Focus on intellectual quality*

Consolidate prescribed mathematical concepts and skills, while always pushing learners to higher cognitive levels. Assessment activities should increasingly require more than just a repetition of recall and routine procedures, but also focus on developing higher cognitive skills. This will help learners to develop deep mathematical knowledge and understanding. Emphasise the use of mathematical terminology in the LoLT during teaching and learning conversations and activities. Special effort should be made to support progressed learners and those with other special learning needs.

b) *Language in the Mathematics classroom*

Language is important for learning and should be promoted through the teaching of Mathematics. Always use correct mathematical terminology. Encourage strategies that address objectives of language in Mathematics as an essential tool for developing and conveying meaning at the FET level. Encourage in-depth communication between Mathematics teachers and learners and between learners about important concepts and ideas. This dialogue should be in verbal, written, graphic and symbolic formats. Analyse assessment data for the effects of language deficits and intervene.

c) *Assessment to enhance teaching and learning*

Learners should be encouraged to work through past examination papers and exemplar papers that are a good reflection of the examination requirements. The emphasis of assessments should be on using assessments as a learning tool. Provide learners with prompt feedback and feed-forward aimed at guiding them to attain the learning targets. Feedback about weaknesses and feedforward about the next steps the learner should take. This should inform the actions of learners as they use the evidence/guidance from the assessment to work independently on their weaknesses in the subject.

d) *A quality classroom environment*

Construct a classroom environment that welcomes all learners, is supportive, encouraging and focussed on learning so that learners can achieve their full potential. Instil discipline and teach a work ethic by example. Teachers create a Mathematics resource-rich classroom that supports productive teaching and learning. Plan systematic learning characterised by good preparation, orderliness and caring for mathematics learners.

e) *Interpret policy properly*

Ensure principals, HoDs and teachers interpret the stated Mathematics curriculum correctly in terms of teaching and assessment requirements as well as time-tabling. Support teachers to understand the continuity and progression in mathematics skills from SP to FET and how this forms a basis for mathematical learning beyond school, in life, in work and in further study contexts.

5.4.3 Resource/facility provision and use

a) *Acquire appropriate facilities/resources*

Manage the procurement of Mathematics textbooks and the distribution of DBE and other quality LTSM to all learners. Procure and catalogue resources including e-learning resources and replace outdated materials and equipment. Schools keep asset registers of Mathematics resources and use allocated funds and other means to supplement equipment/facilities as needed to support the School Improvement Plan for Mathematics.

b) *Use resources effectively*

Ensure that all teachers are competent in the use of computers and other digital equipment as well as sourcing of teaching/learning sources on the Internet. Establish a resource-rich learning environment where learners' potential is maximised by providing appropriate texts, technology and software for mathematics classrooms. Expose teachers to the effective use of appropriate teaching and learning resources and materials. Help teams to plan ahead per term to source the resources needed for teaching and assessment. Share ideas in PLCs about effective use of resources to mediate key concepts in Mathematics. Encourage collaboration between schools in developing and sharing resources and facilities. Train and support teachers and Subject Advisors in the use of open source software appropriate for the subject. Develop a repository of excellent learning resources, both digital and paper-based.

c) *Use e-learning to deepen knowledge and understanding*

Support teachers in selecting e-learning resources to improve teaching and deepen learners' knowledge and understanding of mathematical concepts and skills. Review and recommend e-learning software that supports mathematical learning. Place suitable materials on the WCED server. Encourage parents to acquire and use approved free software programmes at home to support learners.

5.4.4 Monitoring and Evaluation

a) *Reflective practice at school level*

Each school should develop a target-driven Mathematics improvement plan with collective staff input. Monitor teaching and learning by tracking progress and effecting adjustments where necessary. Evaluate efficiency and impact of assessment by monitoring curriculum delivery and performance in SBAs in schools. Continually improve Mathematics performance by adjusting internal SBA in the light of data from national and provincial systemic assessments. Ensure that schools continually improve their internal moderation policy and implement it. SMT to support the Mathematics HoD/subject head to manage the Mathematics team by ensuring time on task, by moderating assessment and taking responsibility to address problems. Share best practice regarding monitoring the moderation programme at all levels in the school system. Develop the management and monitoring competencies of SMTs.

b) *Reflective practice at district level*

Districts develop a Mathematics improvement plan within their DIP aligned for reporting to provincial and national structures. CMs and SAs report to the district on progress. Provide quarterly reports to the district concerning progress towards goals. Ensure competent appointments to strengthen SMTs, district and head office components.

c) *Reflective practice Head Office level*

Develop management and monitoring competencies of Head Office officials. Research external test results to establish knowledge gaps and inform teaching support interventions in school and districts. Influence the design of leadership courses in order to develop strategic curriculum leadership and management. Include Mathematics monitoring and support into induction courses at CTLI for all in management and leadership positions. Review the strategy on an annual basis to ensure that the targets of the strategy are met and if necessary effect adjustments to ensure effective implementation.

d) *Advocacy of subject and strategy*

Ensure that learners understand the importance of being mathematically literate and having Mathematics as part of their subject choice in high school. Evaluate the understanding and implementation of the provincial Mathematics strategy at districts, at schools, and within communities. Ensure all role players understand the importance of this provincial strategy. Substantiate changes to the planned strategy.

6 > Conclusion

The Western Cape Education Department has introduced a range of initiatives over the past 20 years to improve Mathematics education.

These initiatives are work in progress and subject to ongoing review and revision. While we can point to some gains, systemic tests and our National Senior Certificate results show that we still have a long way to go before we can be satisfied with our results.

We will continue to build on success, while learning from experience, the latest research and from international best practice.

This strategy focuses on four key success factors, namely, people development, productive pedagogies, resources, facilities and ongoing evaluation. They will guide us over the next five years as we seek to ensure quality teaching and quality learning.

While we apply this strategy to support Mathematics teaching and learning, we believe that we can use the same approach to improving education as a whole in the province. We will use this approach as we work on strategies with our schools to maximise teaching and learning opportunities for our learners.

“ We will use this approach as we work on strategies with our schools to maximise teaching and learning opportunities for our learners. ”

7 > Appendices

7.1 Appendix 1: Dimensions and elements of productive pedagogies

Adapted from:

- Hayes, D., Mills, M., Christie, P. & Lingard, B. (2006) *Teaching and Schooling Making a Difference: Productive Pedagogies, Assessment and Performance*. Crows Nest: Allen & Unwin.
- Killen, R. (2005) *Programming and Assessment for Quality Teaching and Learning*. Southbank Victoria: Thomson.

7.2 Appendix 2: Effect sizes of different variables on learning

Influence	*Effect Size*	*Source of Influence*
Feedback	1.13	Teacher
Students' prior cognitive ability	1.04	Student
Instructional quality	1.00	Teacher
Direct instruction	.82	Teacher
Remediation/feedback	.65	Teacher
Students' disposition to learn	.61	Student
Class environment	.56	Teacher
Challenge of Goals	.52	Teacher
Peer tutoring	.50	Teacher
Mastery learning	.50	Teacher
Parent involvement	.46	Home
Homework	.43	Teacher
Teacher Style	.42	Teacher
Questioning	.41	Teacher
Peer effects	.38	Peers
Advance organisers	.37	Teacher
Simulation & games	.34	Teacher
Computer-assisted instruction	.31	Teacher
Testing	.30	Teacher
Instructional media	.30	Teacher
Aims & policy of the school	.24	School
Affective attributes of students	.24	Student
Physical attributes of students	.21	Student
Programmed instruction	.18	Teacher
Ability grouping	.18	School
Audio-visual aids	.16	Teacher
Individualisation	.14	Teacher
Finances/money	.12	School
Behavioural objectives	.12	Teacher
Team teaching	.06	Teacher
Physical attributes (e.g., class size)	-.05	School
Television	-.12	Home
Retention	-.15	School

Adapted from: Hattie, J. (2012) *Visible Learning for Teachers: Maximizing impact on learning*. London: Routledge.