EVALUATION OF THE CONTINUING PROFESSIONAL DEVELOPMENT PROGRAMME IN LIMPOPO DEPARTMENT OF EDUCATION

An Evaluation Report of the 2011 Mathematics and Physical Sciences Cohort

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CHAPTER 1: Introduction and Background of the CPD Programme

1.1 Introduction

The Limpopo Department of Education has a strategy for the Continuing Professional Development (CPD) programme of all its Curriculum Advisors and educators, recognising that career- long enhancement of their skills is a key element in raising the achievements of our learners. This evaluation report is a reflection on what the Limpopo Department of Education (LDoE) has done on the CPD programme, in the upgrading of its Educators and Curriculum Advisors in the area of Mathematics and Physical Sciences for the year 2011.

1.2 Background

The CPD programme is done through the delivery mode by using training methods that are relevant; that offer support before, during and after the training. The programme is run by MASTEC Institute, and the University of Pretoria was appointed as a service provider to present subject content and teaching methodologies.

This programme was presented for 12 weeks and was scheduled in two sessions. The first session of 9 weeks was offered from the 11th April 2011 to 24th June 2011. The second session of 3 weeks was offered from the 11th until the 30th September 2011. Presentations were from 8:00 until 16:30 Monday to Thursday, and 8:00 until 13:00 on Friday or the day preceding a public holiday to allow travel to their home districts. Public holidays and a very short partial week were excluded (22nd April to 2nd May, 16th and 17th June) which yielded 430 hours of contact time.

Educators from the educational districts of Capricorn, Greater Sekhukhune, Mopani, Vhembe and Waterberg were referred to the programme by the Limpopo Department of Education.

Content was designed to underpin the Grade 10 to 12 Mathematics and Physical Sciences syllabi as published in the CAPS document of the time, and since finalized in the Government Gazette as the National Curriculum Statement.

Physical Sciences educators who participated in 2011 training were accommodated at MASTEC in Seshego, Polokwane. However, the Mathematics educators were accommodated and trained at Tivumbeni satellite Centre in Nkowankowa (Mopani District). In 2011, as for 2010, the intervention took the form of the delivery of short courses for which certificates of competence were awarded to those that met the requirements. A summary of the modules is presented in Chapters 2 for Mathematics and Chapter 3 for Physical Sciences.

The educators participated actively in the classroom discussions and the group activities. The FET curriculum as laid out by the Department of Education was completely covered.

This proved to be very successful. The lectures involved both theoretical overview and the practical sessions (the use of technology that was welcomed by all). We used a "learner centred approach". Each session of the course provided the attendees with opportunities to share their experience, best practice and "nightmare" to assist them to effectively build their confidence and to be prepare when in front of their learners.

CHAPTER 2: MATHEMATICS FOR FET EDUCATORS

The course covers Mathematics for FET Educators with emphasis on Foundational Concepts, Problem Solving and practical skills and Enquiry Teaching. This dynamic course is aimed at equipping Grade 10-12 mathematics educators with skills on problems solving and mathematical manipulations as well as basic proofs. Although this course was based on grade 10-12 learning outcomes it was very flexible and refined by the group of pre-selected educators. This course did enhance the knowledge of the current, "in job educators" to perform better at their work. The presenters did adjust the course to accommodate the needs of the educators.

2.1 LEARNING OUTCOMES

The programme was designed to allow the educators to be able to:

- understand what the Grade 10-12 School Mathematics Curriculum entails, in terms of the key curriculum areas as determined by the Department of Education of Limpopo and the MASTEC institute;
- present the concepts and methods required by the curriculum;
- support learners in reducing their level of mathematics anxiety;
- support learners in their individual skills needs;

• support and guide learners in developing mathematical problem solving and thinking skills;

• engage with learners through a pedagogy that uses a variety of approaches to enhance their conceptual understanding; and

• plan and initiate community outreach projects in support of the mathematics network for the educators in the province.

2.2. OUTPUTS

2.2.1 Course curriculum and materials

In order to meet the above objectives, the course was structured around lectures and problem-based learning. Workshops addressing Pedagogy formed part of each day's activities.

Prescribed text book: Pre-calculus: Real Mathematics, Real People alternate Edition by Ron Larson was supplied.

Notes were supplied by each facilitator from week to week.

Learning was organised to progressively address fundamental and advanced themes according to the following modules:

Module 1: Understanding the grade 10-12 School Curriculum

Module 2: Understanding Number and Number Relationships

Module 2: Functions and Algebra

Module 3: Shape, Space and Measurement

Module 4: Data Handling and Probability

Module 5: Useful free software in mathematics education and the establishment of teacher's Network (Group project)

2.2.2 Facilitators

The course was facilitated by MASTEC together with the University of Pretoria

2.2.3 Participants

57 teachers attended the course.

2.3 METHODOLOGY

At the beginning of a module, a base line test (pre-test) was written by all to identify the misconceptions that existed amongst the teachers.The team was subdivided in groups. Activities/tasks were given to groups and one group member presented a comprehensive lesson allowing comments and discussion from the floor. A post-test was written to ascertain that the misconception has been addressed. The group also wrote small tests, a midterm and end of project large test (examination). Small test and midterm test formed what we call in the statistics below; year mark. From day one the teachers were encouraged to work in groups and as members of the group they all developed strong bonds and commitment to the end product to be presented to all. The formative assessments addressed teachers 'misconceptions; most of the work was based on the problems/questions brought by the teachers. These problems were addressed in the group and if the questions were still unanswered the problem was posed to the entire group and any group member who felt confident enough in that section freely demonstrated or solved the problem on the board for all.

In this programme, we used educational technology appropriate for mathematics education. Each teacher received a CD containing Winplot and Geogebra. These two items of mathematics software were introduced to the teachers to enhance their teaching & learning of topics such as geometry, trigonometry and functions. The use of these two software programmes gave the teachers the power to explore in greater depth the above mentioned topics in greater depth.

Week 12 was spent discussing and sharing few aspects like: the impact of pre knowledge and how people learn, how to bring tangible examples in the teaching of mathematics, how could educators engage in research and what are the stumbling blocks, what will happens after the training, where to go for assistance with the curriculum changes…

Some sections of the following two books were discussed with the teachers: "Adding It Up: Helping Children Learn Mathematics" by Jeremy Kilpatrick, Jane Swafford, Bradford Findell

and "How people learn: Brain, Mind, Experience, and School": Expanded Edition by John D. Bransford, Ann L. Brown, and Rodney R. Cocking.

2.4 MATTERS MENTIONED BY PARTICIPANTS CONCERNING THE COURSE

2.4.1 Comments

The educators experiences prior to the course and after the sixth week (written comments by some educators)

Educator 1:

- My approach to maths has changed, I am a grade 8 teacher, and now I can help FET band Colleagues who came to me for help
- Delivering the subject matters to the learners; lap top screen and data projectors, very efficient, use of technology. Geogebra was most loved and incorporated in my teaching.

- Organized the apparatus in the school; could cover more in the limited time, prepare some work sheet and it was great...
- Challenges: learners could not see or would like not to collaborate, circuit Inspectors saw the changes and indicated that other schools should complied and updated to it.

Educator 2:

- Gained a lot of experiences; shared with my colleagues but at school, they were no substitute teacher while I was here at the centre (Mastec).
- Learners asked for extra lessons to cover second term work in third term. His work load was given to colleagues who could not cover everything as it was not their competence

Educator 3:

- Colleague refused to give back his class to him and will carry on until the end of the year
- I gained a lot of experience

Educator 4:

- Difficulties in teaching higher level 11 and 12 and even difficulties in topics Calculus, Linear programming and Financial
- Educator 5:
- Used to teach lower grade...if a learner came with a problem, I used to send him away and will deal with the problem later
- After the nine week, I can now give answer, and giving scheme and layout
- Was eager to go and teach, but I could not practice what I learned here;

Educator 6:

- Was teaching FET and Grade 9
- Some topics were not my strong point; I used to rely on my colleague to relieve me on these topics. Now it is a story of the past.
- Challenge: grade 9, learners had no teacher while I was absent.
- Relationship with students did miss her, and that is rewarding
- Called all the maths teacher and share and confidently say they can use of my new approach.

Educator 7:

- Miss the environment where I came from...
- Was totally engaged with the learners...July to 9th September, very engage with the grade 11 learners.
- No teacher while he was here ....so first term was a disaster...very large group 70+ and 60+ learners…
- Add value by using technology

Educator 8:

- Was teaching maths literacy, with this workshop he can now teach any Maths grade.
- Negative aspects
- Was teaching 11 and 12 when he went back they gave him Maths literacy Grade 11, Maths Grade 9 and 12.
- Other colleagues were asking for his help,
- travelling long distance,
- extra classes

2.4.2 Areas/modules that still need attention:

- Linear programming
- Financial mathematics
- Euclidean geometry and
- Probability

2.4.3 The facilitation

All the facilitators received a higher; more than average score from the teachers' evaluation questionnaire.

2.4.4 Documentation

The teachers were satisfied with the documents (work sheets, notes, extra exercises) they received from each facilitator and were overjoyed when they received the copy of the

prescribed book and a Casio fx-991Es Plus. They expressed the wish these two items had been supplied from day one.

2.4.5 Duration of the course

It was long but worth every minute.

2.5 ASSESSMENTS

The educators wrote several assessments: at the very beginning they all wrote a pre-test that was based on Grade 11 mathematics papers (1 and 2). Although the results were poor as per figure1&2; it gave the facilitators a clear indication on the level of preparedness of the participants.

During the course of the training; the group wrote a post-test on grade twelve syllabuses. The results were pleasing and at midterm, major tests were written based again Grade 12 syllabus. The year marks (100%) is a composition of all post- tests (20%) + major tests (80%)

The final mark (100%) was calculated by taking 50% year mark and 50% exam marks.

An educator will be deemed to have passed if his/her final mark is 50% or more. In short, the results are as follows: for the pretest; only 15 educators achieved a mark of 50% or more with 65% as the highest percentage. At the end of the programme; 47 educators achieved 50% or more with 85% as the highest score! Of the 47 educators; 14 passed with a distinction (75% or higher)!

The two bar charts in Figures 1 and 2 below, give a full and comprehensive report on the performance of the educators.

Figure 1: Marks intervals of Educators' performance in pre and post-test, year mark, exam and final marks.

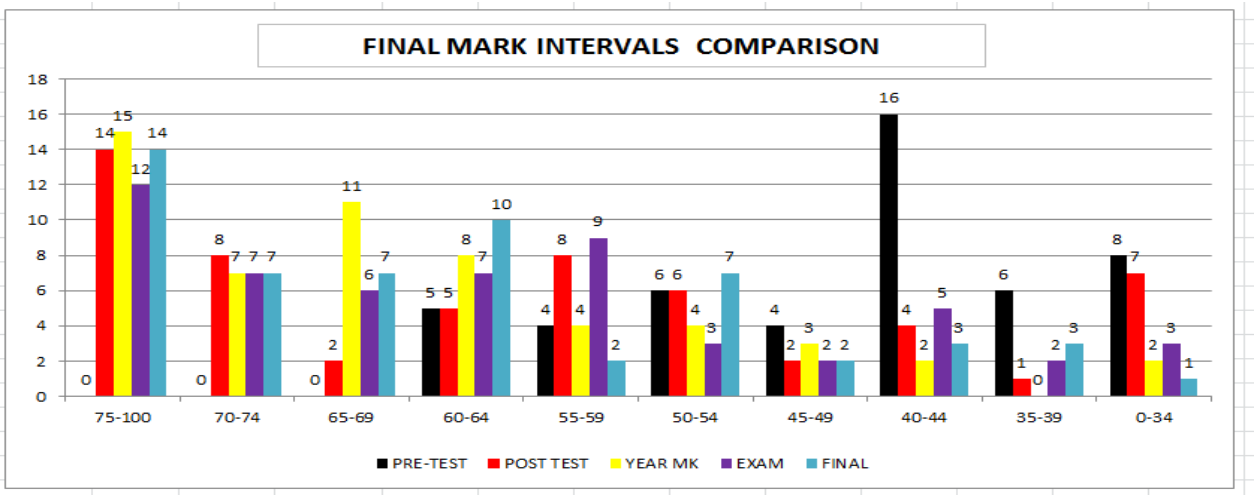
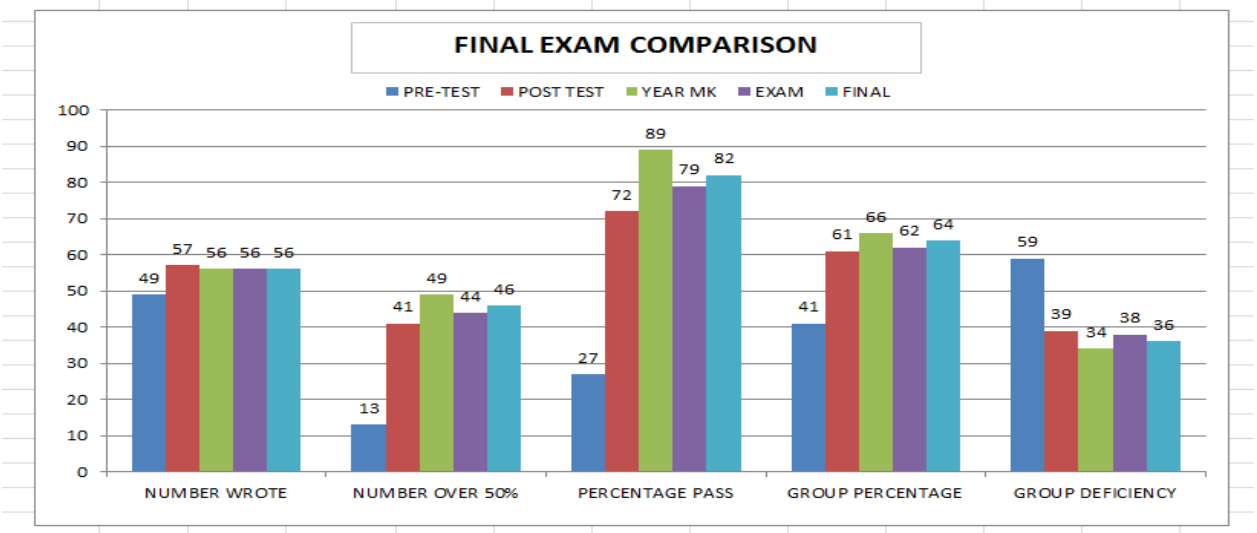


Figure 2: Educators' performance in pre and post-test, year mark, exam and final marks.



47 Certificates to all successfully completed delegates have been printed.

2.6 CONCLUSION AND RECOMMENDATIONS

2.6.1 Conclusion

This course was run successfully. The statistics on the improvement on the teachers' assessment marks speaks by itself: only 27% passed the grade 11 pre-test papers and at the end of the training; 82% of the teachers passed the grade 12 exam papers.

The teacher's network will carry on empowering the teachers for years to come. We believe that the positive feedback we received is an indication of a positive impact we played in this group. The fact that teachers are now able to share with others their experience and knowledge and start to engage and exchange is a plus in this process. Most of the

participants commented on the value of the training for their current positions. The course content was presented at an appropriate level for the participants.

2.6.2 Recommendations

Since this course was adequately pitched at the level of the participants and it developed and increased their confidence level, it is recommended that this course be presented in the future to a similar group.

The network must be supported and encourage most teachers (especially) those who were not selected to attend this training.

Substitution of educators undergoing the CPD programme should be done in the schools where it is necessary to avoid leaving leaner's without a teacher.

CHAPTER 3: PHYSICAL SCIENCES FOR FET EDUCATORS

The course covers Physical Sciences for FET Educators with emphasis on Foundational Concepts, Problem Solving and practical skills and Enquiry Teaching. The purpose of the

training was to assist the development of content knowledge and presentation strategies (pedagogy) in Grades 10-12 Physical Sciences content. The major focus in all content was mastery of fundamental concepts. Two approaches were used, theoretical problem-solving exercises and discussions which included conceptual and mathematical approaches to basic principles including those of the atomic/particle nature of matter, classical mechanics, and hands-on practicals in Chemistry; Electricity and Magnetism; Waves, sound and light; Industrial applications of Chemistry.

3.1 LEARNING OUTCOMES

The programme was designed to allow educators to be able to:
Understand content and requirements of the Grade 10-12 School Physical Science curriculum, in terms of the key areas of the curriculum as specified in the syllabus determined by the Department of Education of Limpopo and the MASTEC institute
Present the concepts, methods and practicals required by the curriculum
Support and guide learners in their understanding of the concepts and gaining of practical and problem solving skills required by the nature of Physics and Chemistry
Engage with learners through a pedagogy that uses a variety of approaches, and that uses enquiry based methods to enhance the conceptual understanding of learners

3.2 OUTPUTS

3.2.1 Course curriculum and materials

- Sections covered:
- Understanding the Grade 10-12 School Curriculum
- Matter and materials;
- Chemistry: Systems;
- Chemistry: Change;
- Physics: Mechanics;
- Physics: Waves, Sound and Light;
- Physics: Electricity and Magnetism

Notes, worksheets and CAPS documents were provided to all participants.

Three textbooks were provided, namely:

- "Conceptual Physics" (11th Edition) by Paul Hewitt

- "Chemistry and Chemical Reactivity" by John Kotz, Paul Treichel and Gabriela Weaver
- "Teach like a Champion" by Doug Lemov

Each participant was issued with a "Casio" scientific calculator.

3.2.2 Facilitators

The course was facilitated BY MASTEC together with the University of Pretoria.

Evaluations consistently showed above average evaluations of presenters.

3.2.3 Participants

The course was designed and presented for 60 educators.

3.3 METHODOLOGY

An eclectic approach in terms of the teaching methodology was followed:

- A didactic teaching methodology was mostly used to explain terminology and to facilitate discussion
- Works sheets which were completed both in class and after hours by participants and reported by groups for discussion were used
- Questioning, group discussions, learning-by-doing and revision were also used
- Hands-on practical's were done in pairs.

3.4 ASSESSMENTS

Assessments were of three kinds:

Monitoring tests to guide discussions. These included concept inventories and class problems. Class problems and overnight short assignments were generally done as groups, and reported on by group representatives and then discussed. These did not contribute to the term mark.

Continuous assessments that contributed to the term mark. Continuous assessments which included group assignments and individual tests were marked. The term mark was generated from these assessments.

Examinations were held in June and September. Both examinations were divided into two sessions of two hours each.

3.4.1 Overall outcomes

District	Distinctions	Passed (excluding distinctions)	Not successful
Capricorn	2	8 (6)	2
Greater Sekhukhune	1	11 (10)	1
Mopani	0	4 (4)	6
Vhembe	3	6 (3)	3
Waterberg	0	11 (11)	3
Not listed	0	1 (1)	3
Totals:	6	41 (35)	18

Fifty nine participants wrote the examinations. 41 successfully completed the programme and 18 were not successful after final examinations. Six distinctions were earned. The overall pass percentage is 54%.

3.4.2 Pre and Post testing

Several pre-test and post-test cycles were applied. The following table shows pre- and post-test averages:

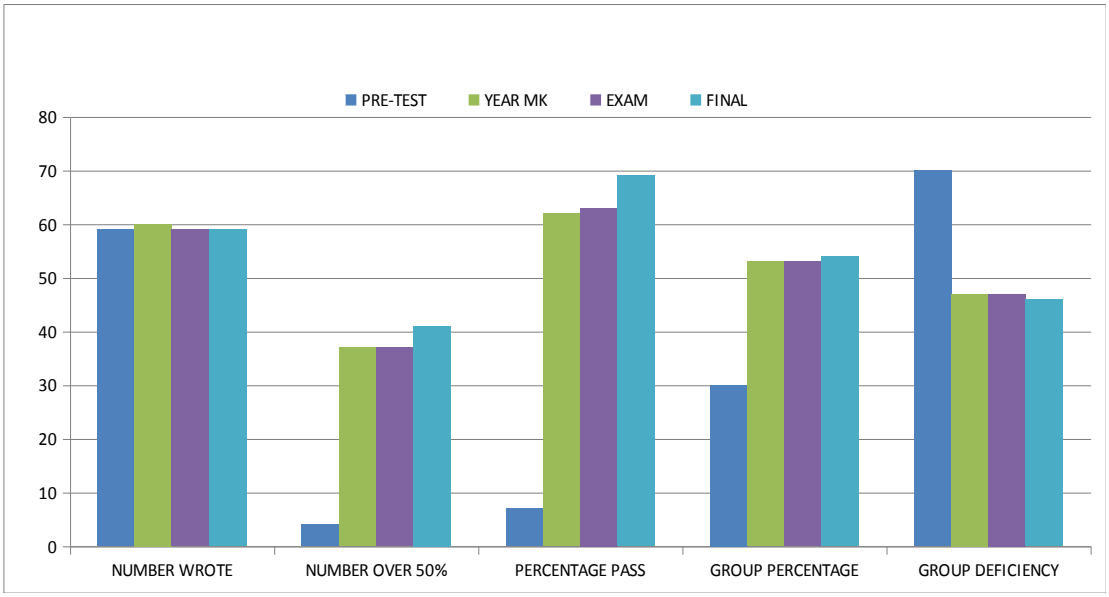
Test	Period: Pre test		Period: Post Test		Comment
Force Concept Inventory	April	29%	June	46%	The comparison applied to educators who wrote both assessments The Post-test consisted of the subset of the most poorly answered questions of the pre-test.
Energy & Momentum concept test	April	30%	June Sept	59% 51%	Poorly answered concepts were repeated in the June examination and emphasised in September
Principles of Electricity Practical	June	38%	June	67%	Electricity concepts of current, potential difference and current, as well as series and parallel clusters were pre-tested, presented in hands-on practical fashion, and then re-examined with the same test
Chemistry Tests	June	56%	Sept	44%	Decline shown from June to September as the level of work became more difficult

- A significant gain was seen from April to June and during June
- Dynamics concepts such as Energy and Momentum in Mechanics and later concepts of Chemistry remained difficult for the educators.

- The large break between June and September proved to be a challenge, with a rather short September period. Some earlier gains were lost here.

3.4.3 Comparisons between pre-test, term, exam and final marks

The chart shows a significant increase in pass rate from initial pre-tests to final mark, while little difference is seen between the scoring assessments. Final marks were calculated with 50-50, 60-40 and 40-60 weightings, and the highest combination was kept. This makes a negligible difference. The number of educators who wrote the scoring assessments remained steady at around 59.



3.5 CONCLUSION AND RECOMMENDATIONS

3.5.1 Conclusion

The course offered valuable reference information and practical training opportunities to the participants. Most of the participants commented on the value of the training for their current positions. The course content was presented at an appropriate level for the participants.

3.5.2 Recommendations

Districts are encouraged to send educators during the first day of the commencement of the training since joining late disadvantages the educators.

Monitoring and support of the CPD-trained educators in their schools is encouraged.

Some assistance should be provided to educators who wish to repeat assessments. It is recommended that educators who were unsuccessful in the 2011 programme be allowed to rewrite the important tests and examinations in 2012.