The challenges concerning implementation of the new mathematics curriculum at school level are considered in this paper. More emphasis is placed on those challenges that in the author’s view can be best handled by AMESA and SAMS (South African Mathematical Society) together.

INTRODUCTION

According to the Department of Education (DoE) documents listed in the website [1], the imperatives show an adequately developed curriculum relevant to the needs of the 21st century. The aims and objectives contained therein are good.

POLICY

The policy for the mathematics curriculum is good and is detailed as follows:

Our vision is of a South Africa in which all our people will have access to lifelong learning, education and training opportunities, which will, in turn, contribute towards improving the quality of life and building a peaceful, prosperous and democratic South Africa.

Our mission is to provide leadership in the establishment of a South African education system for the 21st century.

The Department of Education adheres to the following values:

People

Upholding the Constitution, being accountable to the Minister, the government and the people of South Africa

Excellence

Maintaining high standards of performance and professionalism by aiming for excellence in everything we do, including being fair, ethical and trustworthy in all that we do.
Teamwork

Co-operating with one another and with our partners in education in an open and supportive way to achieve shared goals.

Learning

Creating a learning organization in which staff members seek and share knowledge and information, while committing themselves to personal growth.

Innovation

Striving to address the training needs for high quality service and seeking ways to achieve our goals.

We are at the implementation phase of the policies governing the new curriculum. It is mentioned in the Director-General’s introductory remarks that the department’s focus is on the full and effective implementation of policies that have a positive impact on the lives of South Africans and furthermore to review those policies that show little or no impact. The government has committed itself to deliver quality education for all South Africans. Where huge cash injection is being made, we often hear corporate statements like: “Return on investments”. Likewise, government is also expecting improvements in the education sector as a return on the huge financial investment of taxpayer’s money.

In order to implement the new curriculum, we look at the following stakeholders:

1. Government
2. Educators
3. Learners
4. Parents
5. Environment

Sincere, committed and constructive interaction among all the above stakeholders, is critically important to guarantee the success of this new curriculum implementation. The roles that the different stakeholders play in the whole scenario are themselves different, but complement one another i.e. one cannot successfully work without the others. For example, government must supply the necessary resources such as teaching aids, subject materials, software materials, infrastructure etc, educators must dedicate themselves to quality teaching and learning etc, learners must exert themselves to study and work hard to their maximum potential etc.

PROBLEMS AND CHALLENGES

As things are at present, there is a huge wastage in terms of dropout rates, failure and pass rates and this necessitates immediate action. Problems experienced at school level can be summarized as follows:
**Educators/teachers**

In mathematics, it is absolutely unrealistic to expect a teacher with grade 12 mathematical knowledge to teach mathematics at high school level. Do our educators actually have the required **content knowledge in mathematics** as a subject in order for them to be able to teach the mathematics **content** at the required level? Focus is on those teachers who already have a professional qualification. It is even worse if the said teacher is expected to adjust to new curriculum developments. Mind you, we are doing pretty badly as a country in the international mathematics olympiad. According to Rudy Rucker [3]:

> unlike chess or astrology, mathematics has the curious property of being an intellectual game that really matters. Mathematics is a language whose form is universal. There is no such a thing as Chinese mathematics or American mathematics.

**Learners**

The problems of the teachers cannot be divorced from those of the learners. Teachers in primary schools are sometimes expected to teach everything resulting in teachers with NO knowledge and background of mathematics ending up teaching mathematics. This has happened in the past and still continues to happen, with NO visible sign of the trend ending. This results in learners being **pushed** to higher levels. Some of us do interact with teachers and learners in an endeavour to help. Teachers who are proficient in the subject, especially at high school level will tell you that these learners are **blank** in mathematics albeit they can express themselves well in English. The reality is that there is no correlation between speaking good English and mathematical proficiency.

Learners with shining results from school, more often than not they struggle in mathematics at tertiary level. The struggle is based on lack of understanding the very basic concepts.

**Government**

Government fails to supply adequate resources for a meaningful teaching and learning environment, e.g. some schools still teach under trees. For the successful implementation of the new curriculum, it is expected that REAL subject specialists are employed across all levels of education. However this expectation is far from being a reality.

Adequately qualified mathematics teachers leave the teaching service **en masse** as they feel undervalued and unappreciated by the government and other stakeholders. This is evidenced by the remuneration level of the teachers which is demoralizing. Hence there are few adequately qualified mathematics teachers, who themselves leave as soon as opportunities present themselves. It is a fact that the employment scope of mathematics teachers is large. It is also a fact that bright students who study mathematics and science
in general, are altogether NOT interested in becoming teachers. What does this say about us as a developing country and its future?

It is already mentioned somewhere above that the major obstacle in the teaching and learning of mathematics is associated with the deficiencies in the teachers’ mathematical proficiency. The practice of learners being pushed to higher levels is going to be exacerbated since the teachers’ remuneration will be linked to the pass rate of learners as was recently announced by the National Minister of Education. However, such a practice will definitely defeat the good intentions of the new curriculum. The practice of learners being pushed to higher levels leads to semi-literate graduates.

**Tertiary Institutions**

The government funding policies for higher education, necessitate further pushing of students to graduate in order for the institutions to access the subsidy from government of such students. In particular, higher education institutions are entrusted with producing well-skilled graduates for the development of the country. These institutions have found ways to come up with programmes like “ACE” which are fully subsidized by the government, but DO NOT contribute to improving the situation and do not even add value to the knowledge of the mathematics subject that the teachers already have. These programmes are lifelines for certain sections within the tertiary education institutions. The irony of the situation is that people who were previously excluded from studying science related disciplines, are the ones who are registering for these programmes *en masse*. In view of the legacies of the past, these institutions have a responsibility to make sure that government resources which are taxpayers’ money are not wasted, by directing their limited resources to producing good quality programmes which add value. The lack of proficiency in the mathematics content of the teachers, should precisely be attributed to tertiary institutions as they are the ones that train teachers.

The tertiary institutions have established foundation programmes to address the under preparedness of school leavers in science and engineering. It is alluded that people who go into teaching cannot go anywhere else and so the science teachers would probably not be the best school leavers in science. These teacher-trainees are not put through foundation programmes which are aimed at correcting the content deficiencies from high school. Is it a real wonder that when they graduate they still are not proficient content wise, but they are professional educators.

**Parents**

Parents have to provide support to their children by ensuring that they do homeworks, go to school everyday, be respectful to the teachers, wear uniform to school, provide a conducive studying environment at home, make sure that their children do not carry weapons e.g. guns to school etc. It is not easy for parents to be visibly involved in their children’s educational activities because in most cases, both parents are working and also a vast majority of parents are illiterate due to apartheid legacy. Despite all the other
activities like working taking most of the parents’ time, parents must NOT abdicate their roles in their children’s educational activities. In fact the successful implantation of the new curriculum demands more of the parents’ involvement than ever before.

MATHEMATICAL LITERACY

With the current situation in most schools that mathematics teachers lack proficiency in mathematics, it stands to reason that those who will be tasked with teaching Mathematics Literacy may have never had any numeracy exposure in their lives. This being the case, what is expected of these teachers to teach and learners to learn. This is a complex problem!

When mathematics literacy learners do well and later want to join the mainstream mathematics stream, serious problems will certainly arise. Presently, the trend is that people are ill-advised and want to take “shortcuts” to obtain higher qualifications. However, in mathematics, shortcuts certainly do not exist.

In the South African context, it is a fact that the learners who take Mathematical Literacy are assumed will follow the social sciences. When these learners pursue research in their respectively chosen disciplines, they will be seriously disadvantaged. Internationally, even social scientists are well-grounded in mathematics (See “The Origins of Finite Mathematics: The Social Science Connection, pages 106-118” [2]).

COMPARISON BETWEEN MATHEMATICS AND MATHEMATICS LITERACY

The comparison is based on the information obtained from the government document entitled National Curriculum Statement, Learning Programme Guidelines, January 2007. According to the Mathematics Literacy document, the purpose for Mathematics Literacy is as follows:

The inclusion of Mathematical Literacy as a fundamental subject in the Grade 10-12 curriculum, will ensure that learners are highly numerate consumers of mathematics. In the teaching and learning of Mathematical Literacy learners will be provided with opportunities to engage with real life problems in different contexts and so consolidate and extend basis mathematical skills. Mathematical Literacy will thus result in the ability to understand mathematical terminology and make sense of numerical and spatial information communicated in tables, graphs, diagrams and texts. Mathematical Literacy will, furthermore, develop the use of basis mathematical skills in critically analyzing situations and creatively solving everyday problems.

The subject Mathematical Literacy should enable the learner to become a self-managing person, a contributing worker and a participating citizen in a developing democracy. Mathematical Literacy “will ensure a broadening of the education of the learner that is suited to the modern world.”

According to the Mathematics document, the purpose for Mathematics is as follows:

Mathematics provides powerful conceptual tools to:
• **Analyze situations and arguments;**
• **Make and justify critical decisions, and**
• **Take transformative action, thereby empowering people to:**
  
  *Work towards the reconstruction and development of society.*
  
  *Develop equal opportunities and choice.*
  
  *Contribute towards the widest development of society’s cultures, in a rapidly changing technological global context.*
  
  *Derive pleasure and satisfaction through the pursuit of rigour, elegance and the analysis of patterns and relationships.*
  
  *Engage with political, organizational and socio-economic relations.*

In the statement of intent for Mathematical Literacy, it should have the same effects as Mathematics (which appears to be quite noble). However the syllabus for the Mathematical Literacy seems not to be in agreement with the noble statement of intent. According to the statements of intent for both Mathematical Literacy and Mathematics, the syllabi of the two should overlap and thus raising a curious question as to why the need for Mathematical Literacy.

**RECOMMENDATIONS**

At present it is a reality that there is a serious deficiency in the content knowledge of the teachers. In order to effectively address the shortcomings of the teachers, SAMS and AMESA must both work together to come up with a new curriculum for teacher training in mathematics, where SAMS is solely responsible for the **content** and AMESA is solely responsible for the **pedagogy**.

It would be ideal if in the future everybody were to be well-grounded in Mathematics for their whole schooling years, i.e. before tertiary level. This would help grow the economy (positively) at a faster rate than currently is the case and everybody would benefit from such a growth.

There should be minimum mathematics requirements for admission into mathematics teacher training.

Mathematics professionals have a critical role to play in designing the curriculum. Amongst other things, they are supposed to be role models in the real sense as they are involved in developing the discipline. As specialists (researchers) in the discipline, they are better placed to identify problem areas such as deficiencies.
REFERENCES

