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A Comparative Study of the FET Phase Mathematical Literacy and Mathematics Curriculum

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This article is based on a study that compared the FET (further education and training) phase mathematics literacy curriculum and mathematics curriculum. The study looked into how the conceptualization of a mathematical literacy curriculum enhanced the acquisition of mathematical concepts among the learners. In order to carry out this comparison between the two curricula, views of 355 participants comprising of mathematics and mathematical literacy teachers, mathematics and mathematical literacy subject advisors and heads of departments at the MST (mathematics, science and technology) units were sought. The findings of the study revealed that both curricula have similar learning outcomes, but different assessment standards. Factors that hinder the learning and teaching of mathematics in both curricula, such as lack of qualified mathematics teachers, lack of parental support, negative societal attitudes towards mathematics and lack of support from the Department of Education among others, were identified by the study. Intervention mechanisms, such as the use of information technology as an instructional tool, contextualized teaching and learning materials for mathematics, recruiting and training mathematics teachers and continuous professional development, were suggested. Further research is necessary for exploring the benefits of cross-curriculum teaching and learning of mathematical literacy as a way of enhancing the acquisition of mathematical skills at the FET phase.

Keywords: mathematics curriculum, mathematical literacy curriculum and further education and training phase, teacher/educator used interchangeably

Introduction and Background

South Africa comes from a past, in which poor quality or lack of education resulted in very low levels of mathematical literacy and numeracy in the adult population (Department of Education, 2003, p. 9). International researches and studies have shown that learners from South Africa do very poorly in mathematical literacy tests when compared to other learners in developed and developing countries (Department of Education, 2005). According to the MST (mathematics science and technology) units, 55% of the learners study mathematics at standard grade and only 5% study the subject at higher grade. The remaining 40% do not study mathematics beyond Grade 9, thus rendering the learners mathematically illiterate and innumerate. The inclusion of mathematical literacy as a fundamental subject in the FET (further education and training) phase of the national curriculum is intended to ensure that future citizens of South Africa are numerate in the use of basic mathematics skills. A mathematically literate person should be able to estimate, interpret statistical data,

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solve day-to-day mathematical problems, reason in numerical, graphical and geometric situations and communicate using mathematics.

As knowledge expands and the economy evolves, more people work with technologies or in settings where mathematics is a cornerstone. Problem-solving, the processing of data and communication become routine job requirements. Outside the workplace, mathematics is found in everyday activities. Hence, mathematical literacy becomes necessary both at work and in daily life. Mathematical literacy is, therefore, one of the keys to coping in a changing and technological society. Confidence and competence in mathematics lead to productive participation in today's complex information society and open the doors to worldwide opportunities (Ontario Ministry of Education and Training, 1999a). Whilst the introduction of mathematical literacy as a compulsory subject at the FET phase is noble and academically justified, there are a number of areas of concern associated with its inception. These grey areas will have to be identified and addressed if the concept of mathematical literacy is to achieve its intended goals.

The AMESA (Association for Mathematics Education of South Africa) (2003) identified the lack of adequate numbers of qualified educators to teach mathematical literacy at the FET phase as one of the biggest challenges faced by the Department of Education on the introduction of mathematical literacy as a compulsory subject at the FET phase. AMESA's (2003) arguments are based on the observation that the outcomes set for mathematical literacy require a high level of mathematical skills. Consequently, content mathematics training is necessary for teachers who teach and will teach mathematical literacy. The big question is: Do the Faculties of Education at universities in South Africa have the capacity and resources to accommodate the re-training of teachers in order to prepare them to teach mathematical literacy?

Apart from the lack of qualified educators' and learners' support materials, the piloting of the programme in the introduction of mathematical literacy has never been undertaken (AMESA, 2003). This piloting could have highlighted the strengths and weaknesses of the introduction of mathematical literacy as a compulsory subject at the FET phase. AMESA (2003) was convinced that if a piloting programme had been implemented, concerns, such as shortage of qualified educators and the lack of learning support materials, could have been exposed, resulting in relevant intervention mechanisms being put in place. The successful implementation of mathematical literacy depended on the development of appropriate learning support materials. At the moment, few teachers have the experience of teaching mathematical literacy and as such, there are inadequate teaching resources. These teaching and learning resources should reflect proper selection and organization of mathematical knowledge, skills and values appropriate for mathematical literacy.

The introduction of mathematical literacy raises many questions that need to be addressed in a number of areas, such as the concept of mathematical literacy and how it will enhance the mathematical skills of South Africans in general.

Statement of the Problem

According to the Department of Education (2005), the introduction of mathematical literacy at the FET phase aimed at providing learners with an awareness and understanding of the role that mathematics plays in the modern world. Mathematical literacy is a subject driven by life applications of mathematics, and it should enable learners to develop the ability and confidence to think numerically and spatially, in order to interpret and critically analyze everyday situations and solve problems. The learning outcomes and assessment standards of mathematical literacy were designed to enable all learners at the FET phase to handle, with confidence in the mathematics that affects their lives in whatever area of life they endeavor to pursue in future. However, the introduction of mathematical literacy as a compulsory subject at the FET phase has left many questions unanswered about whether the mathematical literacy curriculum provides any significant difference as far as the acquisition of mathematical knowledge, and skills are concerned at the FET phase. This raises an interesting question: Will changing the curriculum address the lack of basic mathematical literacy of South African learners or does it further distract the attention of teachers and policymakers away from addressing fundamental problems, such as the shortage of qualified teachers teaching mathematics?

Hence, a comparative study of the FET phase mathematical literacy curriculum and mathematics curriculum was deemed necessary, in order to evaluate their comparative impact in the acquisition of mathematical knowledge and skills by learners.

Purpose of the Study

This study compares the FET phase mathematics curriculum with the mathematical literacy curriculum, in order to establish whether the latter would bring in the required changes as far as the acquisition of mathematical skills of the learners at the FET phase is concerned. The comparison between the two curricula aimed at determining their similarities and differences in the form of learning outcomes, assessment standards or teaching and learning. In addition, the study aimed at identifying aspects of the mathematical literacy curriculum which were not part of the mathematics curriculum at the FET phase that could enhance the acquisition of mathematical skills by learners. The study also intended to identify intervention mechanisms that could enhance the acquisition of mathematical skills at the FET phase apart from those offered by mathematical literacy. This study also sought to determine the impact of the introduction of mathematical literacy as a compulsory subject at the FET phase in enhancing the acquisition of mathematical skills.

Research Questions

The following research questions guide this study:

(1) What are the similarities and differences between mathematical literacy curriculum and the FET phase mathematics curriculum?

(2) Are there common factors in both the mathematical literacy curriculum and the mathematics curriculum that inhibit the acquisition of mathematical skills among the learners?

(3) What aspects of the mathematical literacy curriculum will make a significant difference in enhancing the acquisition of mathematical skills?

(4) What intervention mechanisms can enhance the acquisition of mathematical skills at the FET phase apart from those offered by mathematical literacy?

Significance of the Study

The significance of the study lay in the fact that its findings provided an in-depth comparison between the mathematical literacy curriculum and the FET phase mathematics curriculum with the aim of bringing out similarities and differences between the two curricula. This comparison was also aimed at identifying aspects of the mathematical literacy curriculum that were not part of the FET phase mathematics curriculum that helped learners to acquire life-long mathematical skills. The research findings highlighted other further intervention mechanisms, apart from those provided by the mathematical literacy curriculum that could help the learners to acquire mathematical knowledge and life-long mathematical skills. Equally important, the study identified factors which impede the acquisition of mathematical skills in the mathematics curriculum that could equally be factors in the mathematical literacy curriculum. In addition, this study provides platforms for further research work by curriculum developers and research institutions in setting up literacy programmes, such as reading literacy and scientific literacy.

The question is: Does the introduction of mathematical literacy solve all the problems related to the acquisition of mathematical knowledge and skills at the FET phase? Thus, the findings of the study provide a critical analysis on the extent to which the concept of mathematical literacy enhanced the acquisition of mathematical skills of the learners at the FET phase. This was a critical issue especially after a report by the TIMSS-R (Third International Mathematics and Science Study-Repeat) (1995-1998) showing that the South African Grade-12 learners performed worst among 22 countries that participated in the mathematics and science study. CDE (Centre of Development and Enterprise) (2004) also showed that South African learners are extremely weak in mathematics.

Reforming the Teaching and Learning of Mathematics

During the past quarter of the century, there has been considerable rhetoric about the need to reform the teaching and learning of mathematics. The standards-based reform movement now under way in many countries, states and schools is the outcome in response to calls for change. The central philosophy underlying this shift in epistemology is for learners to become mathematically literate (Romberg, 1985).

The concept of this epistemological shift involves moving from judging learners' learning in terms of mastery of concepts and procedures to making judgments about learner understanding of the concepts and procedures and the ability to interpret mathematical problem situations. In the past, too little instructional emphasis on the understanding of mathematical concepts and the tests was used to judge learning failed to adequately provide evidence about understanding or ability to solve non-routine problems (Romberg, 1985).

Important aspects which learners are expected to learn have since changed due to the changes in technology and new applications. The applications aspect of mathematics is increasingly playing a pivotal role in the structuring of the mathematics curricula. Technological tools increasingly make it possible to create new, different and engaging instructional environments. The critical learning of mathematics by learners also occurs as a consequence of building on prior knowledge via purposeful engagement in activities and by discourse with learners and educators in the classrooms. This idea is best known as the constructivist theory of learning (Vygotsky, 1978). Since all learning occurs as consequence of experiences and all humans have a variety of experiences, virtually all complex ideas in mathematics are understood by a learner at a number of different levels in different ways (Carpenter & Lehrer, 1999).

In mathematical literacy, the assumption is that the preconceptions of learners are engaged due to the practical nature of the subject. The pattern of classroom instruction needs to become non-routine or non-traditional. The teaching of mathematical literacy constitutes a departure from traditional routine (Weller, 1991). However, the major challenge for educators in the face of globalization is how to create a classroom environment that integrates the development of mathematical experiences in different cultures and how to deal with the abilities in the multicultural mathematics classroom.

Weller (1991) pointed out that the challenge of achieving mathematical literacy for all was a complex one calling for a multi-pronged approach. To achieve this vision, teachers need to focus on adopting the best mathematics instructional and assessment strategies for all learners, with emphasis on strategies to benefit the weaker learners and provide a stronger leadership at all levels of the education system to promote mathematical literacy for all.

A number of assumptions about instruction and educational practices have been associated with the concept of mathematical literacy (Cobb, 1994, p. 79). These assumptions, among others, advocate that all learners can and must learn more and somewhat different mathematics to be productive citizens in tomorrow's world. Learners need to have the opportunity to learn mathematics regardless of their socio-economic class, gender and ethnicity. It should be noted that the ability of learners to learn mathematics has been underestimated for a long time. All learners can learn mathematics, provided the environment to do so is conducive and enabling (Cobb, 1994). The use of context is one of the factors deemed necessary in the learning and teaching of mathematical literacy (Cobb, 1994). The contexts allow learners to learn mathematics through the use of everyday experiences, such as budgets and bills among others.

Mathematical Literacy Domain

According to the PISA (Programme for International Student Assessment) (2003), mathematical literacy domain is concerned with the capacities of learners to analyze, reason and communicate ideas effectively as they pose, and to formulate, solve and interpret mathematical problems in a variety of situations. Under PISA (2003, p. 109), mathematical literacy is defined as "An individual's capacity to identify and understand the role that Mathematics plays in the world, to make well founded judgments and to use and engage with mathematics in ways that meet the needs of that individual's life as a constructive, concerned and reflective citizen".

Mathematics framework provides the rationale for and the description of an assessment of the extent, to which 15-year-olds can handle mathematics meaningfully when confronted with its everyday applications. In order to describe the domain that is assessed in these 15-year-olds, the following components must be singled out: the situations or context in which the problems are located, the mathematical content that has to be used to solve the problems and the competencies that have to be activated in order to connect the real world in which the problems are generated (PISA, 2003, p. 129).

Figure 1 is a concept map showing the components of the 15-year-olds domain (PISA, 2003, p. 30).

The extent of a person's mathematical literacy proficiency is seen in the way that person uses mathematical knowledge and skills in solving everyday real life problems.

A brief analysis of the concept map (see Figure 1) demonstrates how individual learners learn mathematical literacy.

Contexts. It represents an important aspect of mathematical literacy, which is an engagement with mathematics by using and doing mathematics in a variety of situations. These situations represent the closest activities in the learner's personal life, school life, work life and leisure, followed by the local community and society as encountered in everyday life. These situations can also include economic, democratic and socio-cultural issues encountered by the learner.

Content component. It consists of a list of overarching ideas to meet the requirements for historical development in mathematics, coverage of the domain and reflection of the major threads of school mathematics curriculum. The overarching ideas such as space and shape, change and relationships and uncertainty, which are otherwise, known as data and probabilities, form the contents of the mathematical literacy curriculum. With these four overarching ideas, mathematically, contents are organized into a sufficient number of areas to ensure a spread of items across the curriculum but at the same time, a number small enough to avoid a fine division that would work against a focus on problems based on real life situations. It is important at this juncture to mention that the same overarching ideas expressed by PISA (2003) are practically the same as those underpinning the concept of mathematical literacy in the South African context.

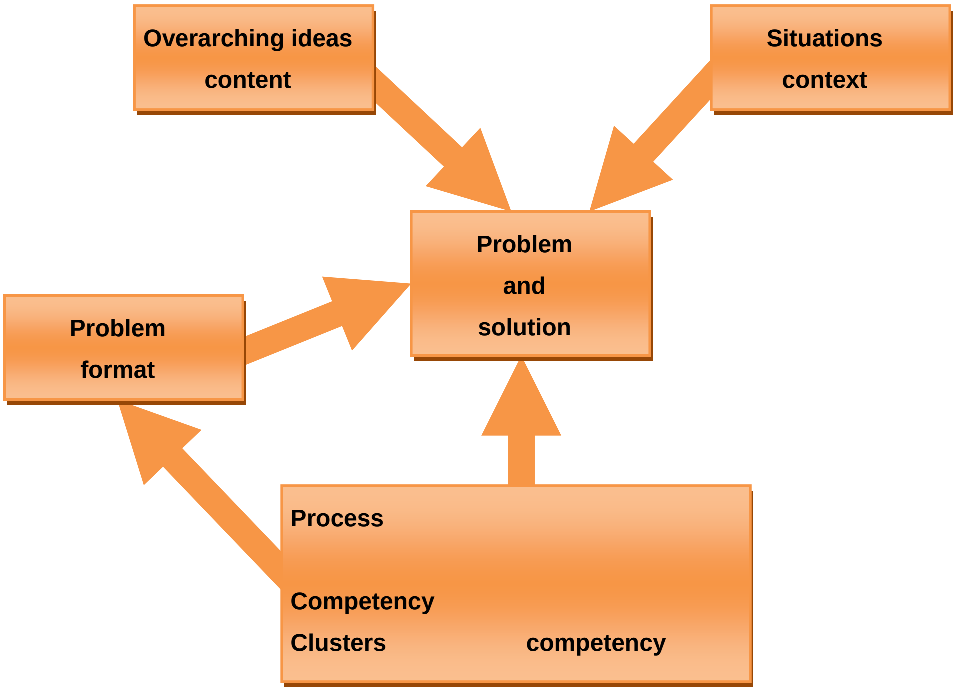

Figure 1. Assessment framework of mathematical literacy source of the concept map: PISA's (2003, p. 30) assessment framework.

Mathematical process. This component examines the capacities of learners to analyze, reason and communicate mathematical ideas effectively as they pose, formulate, solve and interpret mathematical problems in a variety of situations. Problem-solving requires learners to use the skills and competencies they have acquired through schooling and life experiences (PISA, 2003). PISA (2003) has described the cognitive activities or clusters that these competencies encompass. The three competency clusters are: the reproduction cluster, the connections cluster and the reflection cluster. The diagram in Figure 2 shows the cognitive activities associated with each competency cluster.

Assessment in Mathematical Literacy

PISA (2003) described mathematical literacy as the use of mathematical competencies at several levels, ranging from performance of standard mathematical operations to mathematical critical thinking and insight. Mathematical literacy also requires the knowledge and application of a range of mathematical contents that are drawn from areas, such as chance, change and growth, space and shape, quantitative reasoning, uncertainty and dependency relationships. The contents of mathematical literacy include areas of the mathematics curriculum, such as algebra, numbers and geometry and everyday arithmetical problems.

PISA (2003) assessed competencies in mathematical literacy in three dimensions as follows.

The content of mathematics. It is determined in two ways, that is, in terms of broad mathematical concepts underlying mathematical thinking, such as chance, change and growth, space and shape, quantitative reasoning, uncertainty and dependency relationships and in terms of curriculum contents of mathematics, such as numbers, algebra and geometry. According to PISA (2000), assessment of mathematical literacy focuses on two concepts, which are change and growth and space and shape. The two areas also allow a wide representation of aspects of the curriculum without giving too much weight to a number of skills.

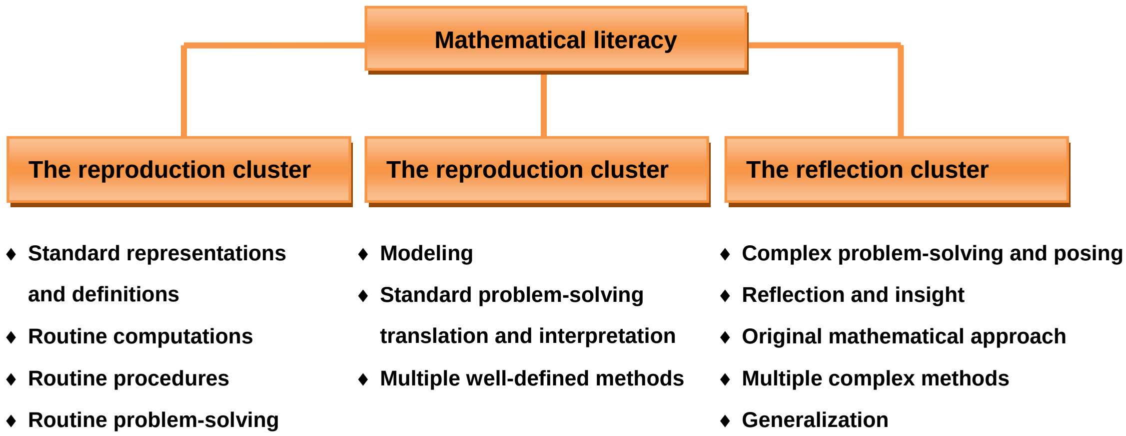

Figure 2. Diagrammatic representations of the competency clusters.

The process of mathematics. This is defined by general mathematical competencies. The PISA (2003) items place varying demands on learners, such as the use of mathematical language, modeling and problem-solving skills. The aim is not to separate such skills in different test instruments, since it is assured that a range of competencies will be needed to perform any given mathematical task. In as far as assessing the process of mathematics, questions are organized in terms of three "competency classes" defining the type of thinking skills needed:

(1) The first class of mathematical skills will consist of simple computations or definitions of the type most familiar in conventional mathematics assessment;

(2) The second class requires connections to be made to solve straight forward problems;

(3) The third competency class consists of mathematical thinking, generalization and insight and requires learners to engage in analysis, in order to identify the mathematical elements in a situation and pose their own problems.

The situation in which mathematics is used. This has to do with using mathematics to solve realistic problems ranging from private contexts to those relating to wider scientific and public issues.

Research Design, Method and Procedures

The survey method—both qualitative and quantitative research techniques, was employed. The research consisted of 842 mathematics and mathematical literacy teachers from 160 high schools from the four districts of Mafikeng, Lichtenburg, Zeerust and Vryburg, in the Northwest Province of South Africa, including eight mathematics and mathematical literacy subject advisors from the Department of Education and five heads of departments at the MST units.

The study used random sampling in order to identify schools, whose mathematics teachers participated in responding to the questionnaire. Schools in each district were grouped into two sub-groups, that is, urban high schools and rural high schools. It was also important to note that the number of mathematics and mathematical literacy teachers per high school was known from the records provided by the Provincial Department of Education. The names of schools in a sub-group were placed in a hat for random selection. Within a sub-group random, selection of schools continued until the required number of teachers was attained. The mathematics and mathematical literacy teachers of the selected schools were the only ones who received the questionnaire to respond to. The resulting research sample consisted of 350 mathematics and mathematical literacy teachers, three subject advisors of mathematics and mathematical literacy from the Department of Education and two heads of departments of MST units. These subject advisors of mathematics and mathematical literacy from the four districts and two heads of departments of MST units were interviewed.

Table 1

Distribution of the Research Population

District	Location	Number of schools	Number of educators
Mafikeng	Urban	29	174
	Rural	40	203
Lichtenberg	Urban	11	59
	Rural	19	95
Zeerust	Urban	12	63
	Rural	21	105
Vryburg	Urban	10	54
	Rural	18	89
Total		160	842

Table 2

Distribution of the Research Sample

District	Urban	Rural	Total
Mafikeng	55	55	110
Zeerust	30	50	80
Lichtenburg	30	50	80
Vryburg	30	50	80
Total			350

The study used two research instruments for the purposes of data collection. Firstly, an interview schedule was used to interview mathematics and mathematical literacy subject advisors from the Department of Education and also to interview the heads of departments of MST units. Secondly, questionnaire was used to gather data from the sample of mathematics and mathematical literacy teachers.

The questionnaire composed of both closed questions and open-ended questions. Closed questions provided direct and factual responses. These closed questions were structured according to a six-point Likert scale: "Strongly disagree", "Disagree", "Slightly disagree", "Slightly agree", "Agree" and "Strongly agree". Below each open-ended question, there were spaces provided for teachers to express their feelings in writing about any issue raised by a question regarding the concepts of mathematical literacy and mathematics curricula.

The interviews took two formats: structured interviews and unstructured interviews. All interviews were recorded using a tape recorder for the purposes of interview analysis. A coding system was developed and used to analyze data from open-ended questions in questionnaires and interviews. When data were presented and analyzed, only two categories of the Likert scale emerged: "Disagree" derived from the responses ("Strongly disagree", "Disagree" and "Slightly disagree") and "Agree" derived from the responses ("Slightly agree",

"Agree" and "Strongly agree").

In order to ensure validity and reliability of the study, triangulation was used. In this study, triangulation occurred in the sense that there were three different data sources: teachers of mathematics and mathematical literacy, subject advisors of mathematics and mathematical literacy and heads of department at the MST units. The use of two research instruments (questionnaires and interviews schedules) further strengthened triangulation.

Presentation and Analysis of Research Findings

Demographics of the Teachers Who Participated in the Study

Figure 3 shows that the majority of teachers who took part in this study had either a highest qualification of a Dip Ed (Diploma in Education) or an ACE (Advanced Certificate in Education). This supports the highly publicized notion that teachers were not qualified enough to teach mathematics and mathematical literacy at the FET phase.

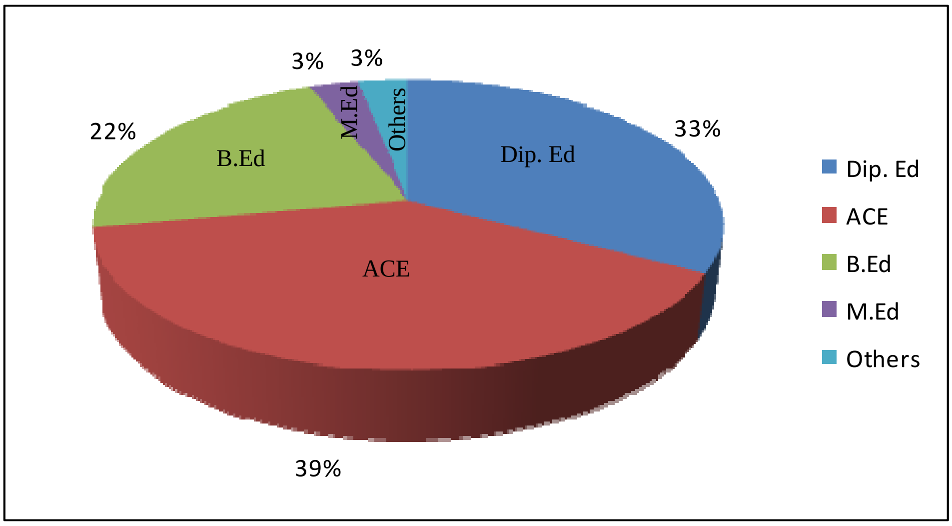

Figure 3. Highest qualifications of teachers.

Table 3 shows the subject specialization of teachers who were teaching mathematics and mathematical literacy at their respective schools. The interesting factor here is that even those teachers who were not specialized in mathematics were involved with the teaching of the subject. It also confirmed the notion that there is lack of qualified mathematics teachers.

Table 3

Subject of Specialization of Teachers

Subject	Number of teachers	Percentage (%)
Mathematics	129	37
Science	72	21
Both mathematics and science	97	28
Other, e.g., biology, English, etc.	52	14
Total	350	100

Similarities Between the Mathematics and Mathematical Literacy Curricula

The mathematics and mathematical literacy curricula have similar learning outcomes. These similar learning outcomes are: number and number relationships, functions and algebra, space, shape and measurement and data handling and probability.

Both the mathematics curriculum and mathematical literacy curriculum deal with content and context (a notion that was supported by 83% of the respondents), as shown in Figure 4.

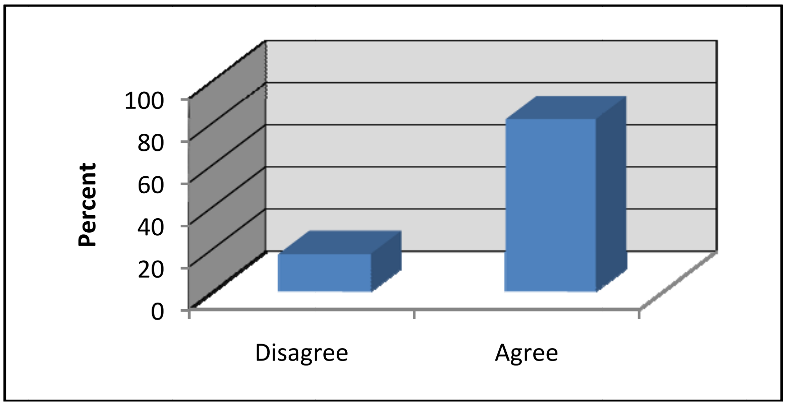

Figure 4. Mathematical literacy is socially constructed, that is, it is a product of a particular society.

Differences Between the Mathematics Curriculum and the Mathematical Literacy Curriculum

Figure 4 shows the proportions of teachers who perceived that mathematical literacy has its roots in the socio-cultural and political discourses of a particular society. In the mathematical literacy curriculum, the contents are driven by contexts derived from everyday life experiences of the learners. This was in appreciation of the contextual nature of mathematical literacy curriculum and the fact that these contexts vary from one country to another. The skills acquired in mathematical literacy should allow an individual to be mathematically literate within a given society. One of the most popular characteristics of the study was the fact that the mathematical knowledge acquired in mathematical literacy curriculum can be used or applied in other subjects, notably economics, physical science, biology and environmental studies. This is called cross-curriculum teaching or cross-discipline teaching. Mathematical literacy, therefore, promotes and encourages cross-curriculum teaching.

Figure 5 shows the perceptions of teachers who shared the view that mathematics is derived from deductive truths which have universal applicability. In the mathematics curriculum, the context is driven by content derived from mathematical operations (calculus), algorithms and algebraic manipulations and representations.

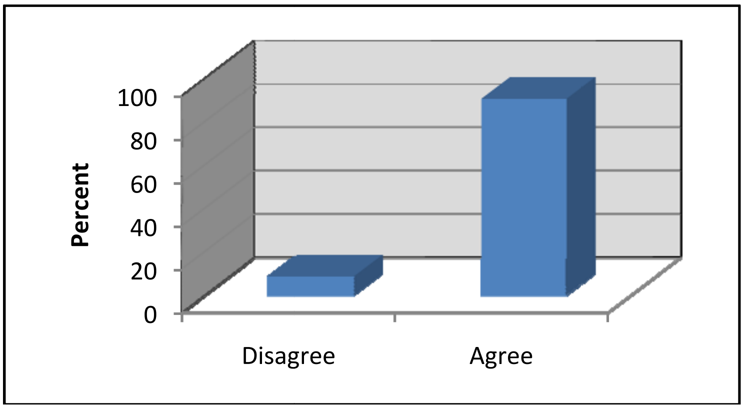

Figure 5. Mathematics is derived from deductive truth that has universal applicability.

Assessment standards in both curricula are different in orientation. In the mathematical literacy curriculum, the assessment standards focus on the application of the learning outcomes to everyday life contexts of the learners. It is these contexts which then inform the learning and teaching of mathematical literacy curriculum (see Figure 6).

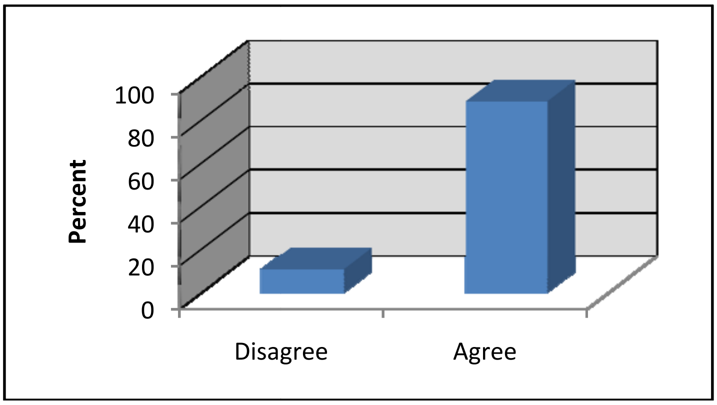

Figure 6. Mathematical literacy emphasises on problem solving as an instructional strategy.

In the mathematics curriculum, the assessment standards put more emphasis on mastery of mathematical skills (see Figure 7). These assessment standards give two kinds of mathematics with different purposes, mathematical literacy aimed at creating numerate citizens and mathematics directed at learners wishing to pursue careers involving sciences or where mathematics is a major. The fact that these two curricula have different assessment standards is one major finding of the study. These assessment standards explain the reason why research has shown that traditional mathematics and mathematical literacy are taught and learnt differently.

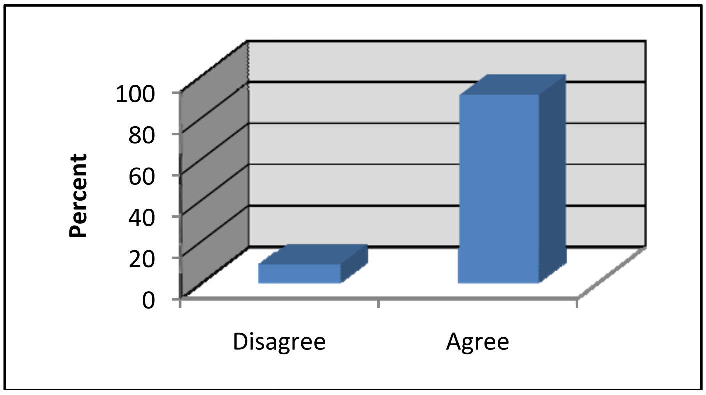

Figure 7. Mathematics curriculum emphasize on the mastery of mathematical skills.

In Figure 8, teachers agreed with the perception that as far as assessment is concerned, and in mathematics, the emphasis is on testing mathematical knowledge (contents).

The learning process in mathematical literacy is multifaceted, with a variety of instructional strategies used to cater for individual learners. It then follows that a variety of assessment methods should be encouraged to accommodate the individual needs of all learners (see Figure 9). The testing, understanding and application of skills is emphasized on mathematical literacy. As learners have different ways of conceptualizing different concepts, the teachers should encourage and nurture the line of thinking of individual learners. Mathematical literacy encourages the best instructional and assessment strategies for all learners, with emphasis on strategies that benefit weaker learners.

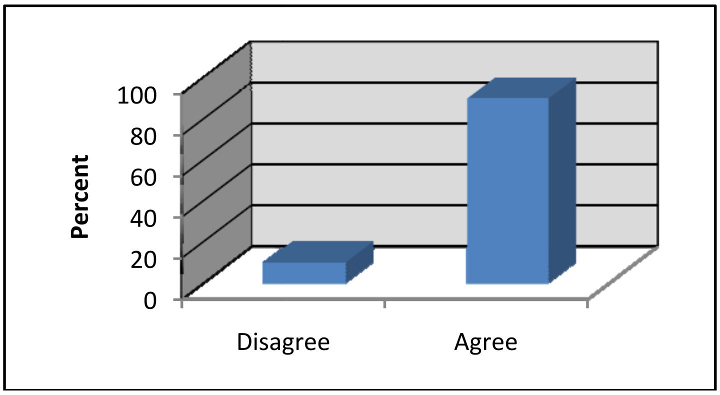

Figure 8. In mathematics, assessment has more emphasis on testing mathematical knowledge.

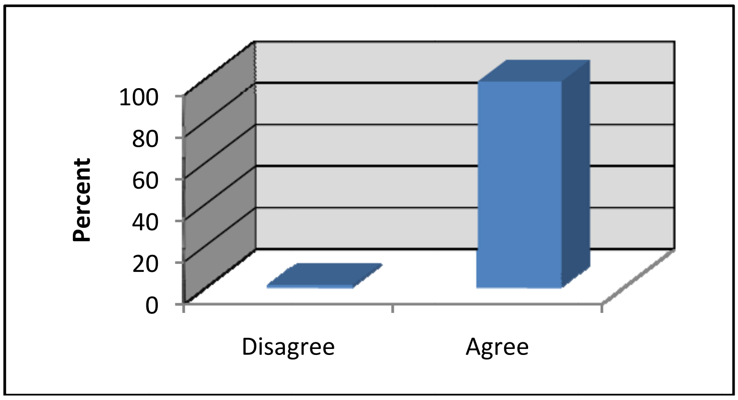

Figure 9. A variety of assessment methods are encouraged in mathematical literacy.

Factors That Inhibit the Acquisition of Mathematical Skills Among Learners in Both Mathematical Literacy Curriculum and Mathematics Curriculum

Figure 10 shows a summary of the common factors from the research findings that may inhibit the acquisition of mathematical skills in both curricula. This summary is based on the responses of teachers. In Figure 10, the percentages of teachers who agreed that the particular factors inhibited the acquisition of mathematical skills are given. At the beginning of the paper, an interesting question was raised about the impact of changing the curriculum as opposed to addressing the fundamental problems that inhibit the teaching and learning of mathematics. AMESA (2003) already identified some of these factors, viz.: lack of qualified educators to teach mathematical literacy and mathematics and learner support materials. It seems that these factors by implication existed before the introduction of mathematical literacy. This study has shown that these inhibiting factors are still a part of the major challenges experienced by teaching and learning mathematics and mathematical literacy.

Intervention Mechanisms That Can Enhance the Acquisition of Mathematical Skills at the FET Phase Apart From Those Offered by Mathematical Literacy

Figure 11 shows the summary of possible intervention mechanisms that could enhance the acquisition of mathematical skills as identified from the findings of this study from the teachers' point of view. Percentages on the diagram indicate the number of teachers who identified intervention mechanisms as a way forward for enhancing the acquisition of mathematical skills. These intervention mechanisms represent what teachers perceive as factors that could enhance the teaching and learning of mathematics if properly implemented.

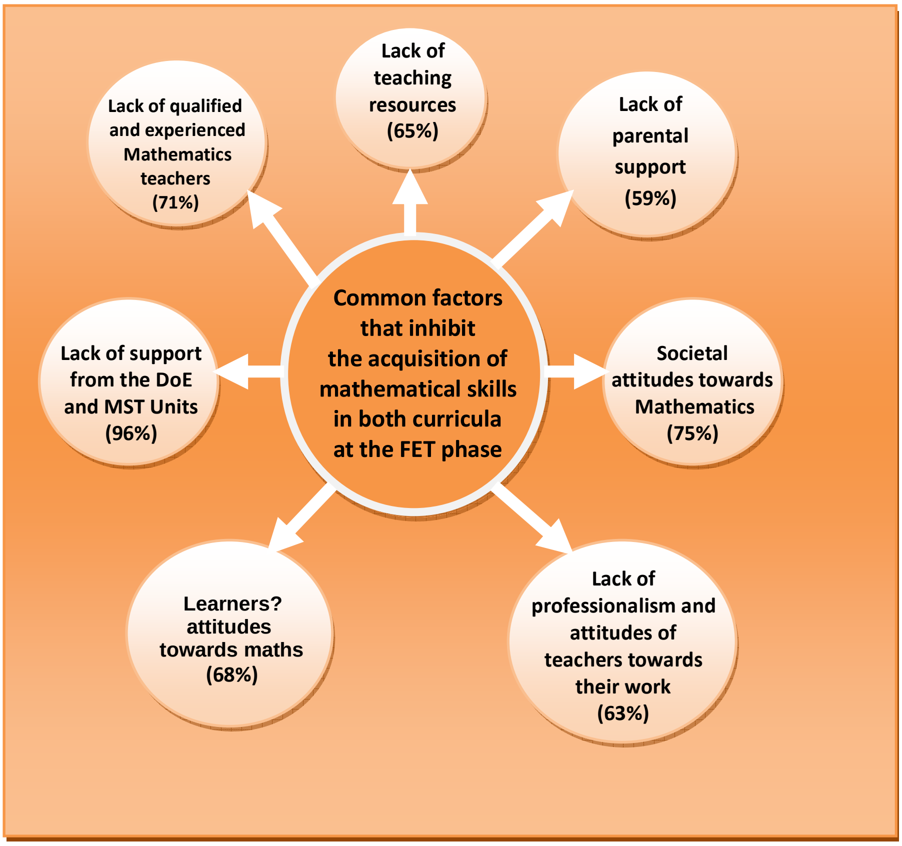

Figure 10. Common factors that inhibit the acquisition of mathematical skills in both curricula at the FET phase.

Characteristics of the Mathematical Literacy Curriculum Which Will Make a Significant Difference in Enhancing the Acquisition of Mathematical Skills

The study has shown that one of the strengths of the mathematical literacy curriculum is that it puts emphasis on both context and content. However, the use of context outweighs the emphasis on contents in the teaching and learning of the mathematical literacy curriculum. The contexts used in the learning and teaching of mathematical literacy are derived from the learners' socio-economic, cultural and political and everyday activities. Learning experiences are derived from the learners' community activities. The teaching and learning of mathematical literacy is, therefore, authentic in the sense that it is based on the day-to-day experience of learners. In mathematical literacy, learners are involved in problem-solving and collaborative forms of learning.

The teacher acts as a mentor whose role is to promote and encourage decision-making among the learners, at the same time, promoting critical thinking (see Figure 12). Assessment in mathematical literacy takes a variety of forms. The advantage of carrying out a variety of assessments, which can include, project work, self-report assessment, observations, simulations and research project, is to cater for individual differences of learners.

Conclusions and Implications of the Study

The study has identified some similarities between mathematics and mathematical literacy curricula in that both have the same learning outcomes and emphasize both contents and contexts. These findings support what has already been identified by PISA (2003) that the mathematical literacy is driven by both contexts and content. In terms of differences between the two curricula, the mathematical literacy curriculum contents are driven by contexts derived from everyday life experiences of the learners, while on the contrary, the mathematics curriculum contexts are driven by the content derived from mathematical operations, algorithms, algebraic manipulations and representations. The latter is also in agreement with what is said by PISA (2003). Assessment standards in mathematics and mathematical literacy were very different in orientation. In mathematical literacy, the assessments focused more on the use of contexts, whereas, in mathematics, the assessment standards put more emphasis on contents.

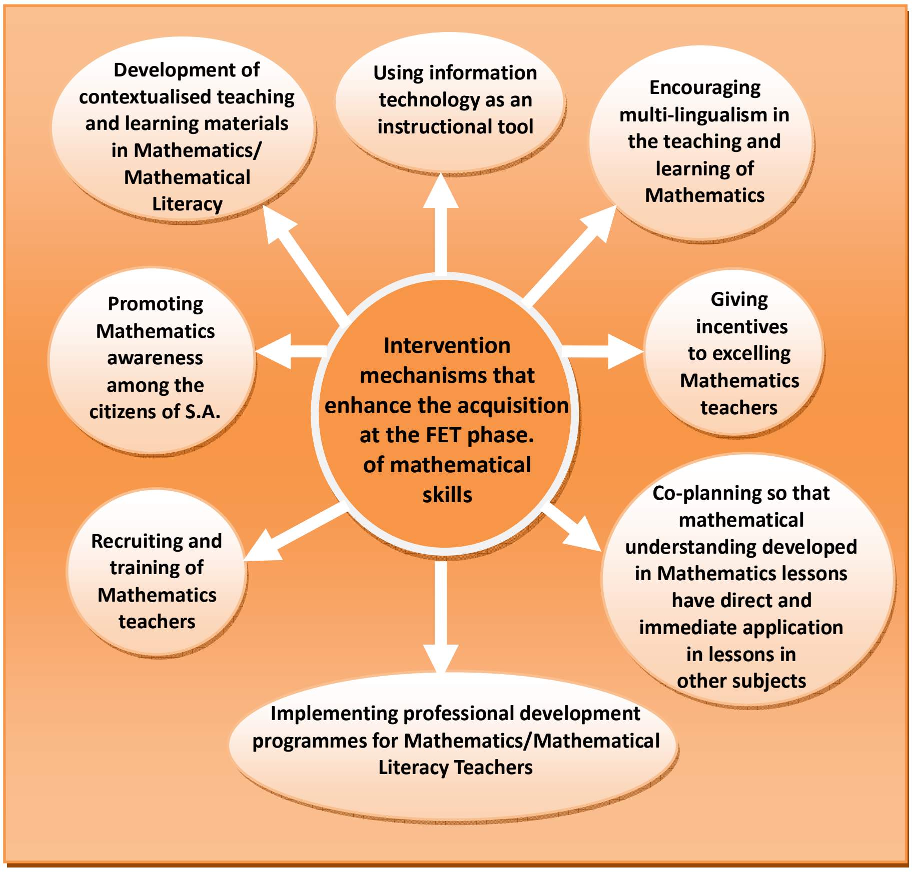

Figure 11. Summary of possible intervention mechanisms that could enhance the acquisition of mathematical skills at the FET phase apart from those offered by mathematical literacy.

The study has also shown that there are problems associated with the teaching and learning of mathematics and mathematical literacy in schools. Some of the problems are quite familiar within the education system of South Africa as indicated by AMESA (2003). These problems included: lack of qualified and experienced mathematics teachers, lack of relevant teaching and learning materials and lack of professional development programmes for teachers among others. In view of the latter problem experienced in the teaching and learning of mathematics in schools, the study suggested intervention mechanisms to enhance the teaching and learning of mathematics in high schools. These intervention mechanisms include: developing contextualized teaching and learning materials, promoting the use of information technology as an instructional tool and retaining mathematics teachers in the teaching profession by introducing a fair system of rewarding long service and excelling teachers just to mention a few.

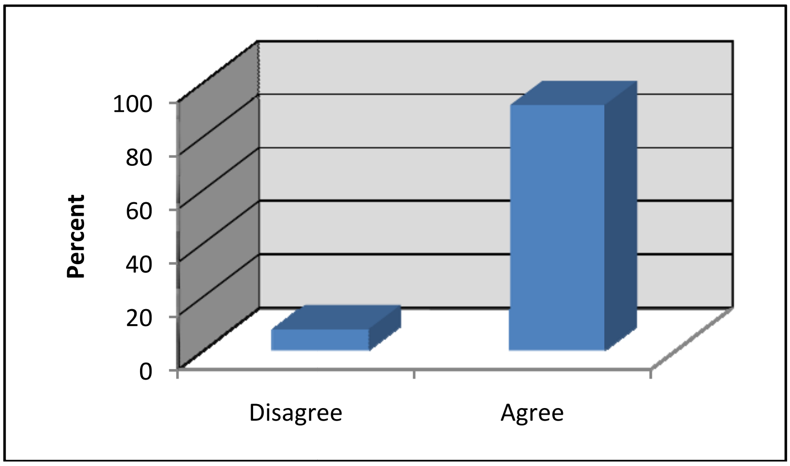

Figure 12. In mathematical literacy, the teacher acts as a facilitator who encourages independent learning.

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