THE RESEACH REPORT

University of Witwatersrand

Name of the candidate: Thandeka Tilana

Student Number: 9501845J

Proposed degree: M Ed

Department: School of Education

Title of the Thesis: The selection and uses of context-oriented tasks within grade 10 Mathematical literacy classes

Supervisor: Prof. H. Venkatakrishnan

Date: 5 September 2011

Table of contents

Acknowledgements

I would like to acknowledge my supervisor, Hamsa Venkatakrishnan, for her determination in ensuring that I complete the research, her commitment and support that she gave me from the beginning of the study until the end. Her constant encouragement and believing in me made it possible for me to write this report.

Wits University gave me the opportunity to come and study at their institution and help me develop the skills and gain the knowledge that I have used to complete this report. Thank you.

The teachers who agreed to be part of the study, without them this study would not been possible.

My colleagues at work who during the writing of the report supported me and encouraged me I would like to say thank you. Those who were my editors, Govender and Makda, thank you.

My family, my mother (Jeanette) and Father (Makutuse), my sisters and my brother, thank you for your support and understanding. To Simphiwe's care giver, Nomonose, for understanding, and for helping me with my daughter, especially towards the end of the report, sleeping with her some days, taking walks with her in order to give me the opportunity to work. Thank you.

My friends, we lost our time, but you came and stayed with me and helped me to find the information, when I could not. Thank you.

Most of all I would like to give thanks to my partner, Jacob, who believed in me, supported me and when I wanted to give up he encouraged me. Thank you for your patience and understanding at all times.

To my daughter Simphiwe, I had to leave her at night and went to finish my work, came late from the library. I would like to say thank you for adapting to the situation and allowing me to do this report.

I would also like to thank God for the wisdom that he gave me, as without him this would not be possible.

Declaration

I hereby declare that this report is my own unaided work; it is submitted for the degree of Masters in Education in the University of Witwatersrand, Johannesburg. It has not been submitted before to any other institution.

_____

THANDEKA TILANA

_____day of _____2011

Abstract

The National Curriculum Statement (NCS) for Mathematical Literacy (Maths Lit) states that the approach to Maths Lit teaching has to be contextualized – focusing on context-driven problems that relate to everyday lives. In this report I attempt to identify how teachers select and use context–oriented tasks for their grade 10 Mathematical Literacy classrooms. Data was gathered using a case study of four teachers, using interviews and analysis of various documents (work schedule and sample of learners' workbooks). Vygotsky's theory of mediation was used to analyze the findings in relation to the Maths Lit goals and principle of contextualization. The agendas from Graven and Venkat (2007) were used as the tool to analyze the tasks in the learners' books. A continuum based on these agendas was used as a descriptive tool of where teachers fit in relation to the context/content spectrum. The study concluded that teachers mainly used the work schedule and text books to select the context-oriented tasks for their learners. Teachers' selections of tasks were guided by the mathematical content to be taught. Most of the tasks' contexts lacked authenticity and the tasks consisted of pure mathematical content. The teachers mainly used the context to introduce the content to be learned. The tasks that were used promoted mathematical goals and were not context-driven. The level of authenticity promoted within the Maths Lit curriculum and its disseminated support documents such as work schedules, therefore needs to be investigated further.

Chapter 1

1.1. Introduction

Mathematical Literacy (Maths Lit) was introduced in grade 10 in South Africa in 2006. According to National Curriculum Statement (DoE,2003), AMESA (2003) and Brombacher (2007), Maths Lit is a subject driven by life related applications of mathematics (DoE, 2003, p9) and focuses on building confidence and competences which will enable learners to develop numerical ways of engaging with the world. Maths Lit is viewed as a new learning area due to its teaching and learning strategy. The teaching is contextualized and the tasks that learners engage with have to be based on real life contexts. This study is based on my interest in the concept of contextualization within Maths Lit grade 10 classes. This interest has been driven by what is outlined in the Mathematical Literacy Subject Assessment Guideline (SAG, 2008) and National Curriculum Statement (DoE, 2003) policy documents that the format of tasks given to learners should be contextualized and relevant to their everyday life situations:

> "Tasks should be contextually based, that is, based in real-life contexts and use real-life data" (Subject Assessment Guideline, 2008, p7).

The contextualized tasks are to be formulated by teachers in their classrooms.

In this study, a case study of four teachers was used to investigate the teachers' selection of context-oriented tasks for their learners. Interviews and documents such as learners' books and work schedules were used as the tools for collecting data. The 'agendas' from Graven and Venkat (2006) were used as the basis for analyzing the data from the interviews and the sample of the learners books. Typological and inductive approaches were used to analyze the data.

1.2. Aim of the study

This study focuses on the concept of contextualization in Mathematical Literacy for grade 10 classes. The study aims to investigate teachers' selection and use of contexts in Maths Lit in order "to improve the educator's self knowledge and practices" (Hitchcock and Hughes cited by Opie, 2004, p.11). As an educator and a teacher developer I hope to better understand this concept and to use my findings within ongoing implementation work.

Upon introduction of Maths Lit within the South African curriculum, means and measures were put in place to equip teachers with the necessary skills to be able to implement the subject effectively and efficiently during delivery in their classrooms. One of the mechanisms used for Maths Lit teacher development was workshops. Workshops were conducted where teachers were shown how to design context-oriented tasks for their classrooms. This was done in compliance with Maths Lit policy which advocates the use of contextualized tasks.

In my personal experience, as a workshop facilitator, in most of these workshops the emphasis was placed on how to design contexts related tasks, interpreting and understanding the NCS and SAG policy documents' requirements and implementing contextualized tasks in classroom. During these workshops teachers were given activities based on real life situations i.e. sending mail, the cost of using a Telkom public phone etc. (Teacher training manual, 2006). In each activity teachers were required to identify the context and content on which the activity is based. This was done with the intention to inform, suggest and equip teachers with skills relating to the kinds of contextualized tasks that should be used during teaching, learning within a Maths Lit classroom. The policy documents suggested that tasks should be based on the context selected and the context has to enhance and support the acquisition of knowledge, skills and values that are advocated as outcomes within the SAG (DoE, 2008), and NCS (DoE, 2003) policy documents. These include mathematically oriented knowledge and skills alongside citizen oriented competences.

In these workshops, teachers frequently expressed uncertainty in relation to contextualization in Maths Lit, and questions such as the following were commonly raised:

- *what defines the 'relevance' of a context?*
- *what sort of a yardstick can one have to measure that the task created has served and met the needs of Maths Lit learners?*
- *what effects does this context have in terms of knowledge, skills and values acquisition for learners?*
- *if the context is found to be relevant, how do teachers then use it to effectively address the learners' needs as advocated by the policy documents?*

From these questions it emerged that context selection for learners was an issue, and teachers did not know what criteria to use to select the relevant context. As such, this led to my investigation of context selection in Maths Lit. Specifically, the study seeks to ascertain '***what informs teachers' selection and use of contexts for their tasks or activities in Mathematical Literacy classroom'.*** My intention was to find out about the contexts teachers select and use for their

grade 10 Mathematical Literacy classes, and about the teachers' understanding of contextualisation as advocated in the NCS policy documents. I also wanted to gain some insights into the extent to which a contextualised teaching approach is used in Maths Lit. My focus was therefore on the following research questions:

.1. What types of contexts have a sample of teachers selected for their tasks in grade 10 Mathematical Literacy across term 1 and in term 2 in the year 2009?

.2. How do the contexts selected relate to the advice and examples in Mathematical Literacy policy documents?

.3. What goals inform teachers' selection of context for their tasks?

In policy terms, the context selected has to promote the Maths Lit goals. According to the NCS (2003) the context should be based on issues that focus on social transformation, and supporting development of productive workers, critical citizen, self managing person, citizenship, environmental issues e.g. context could be global warming and also look at the percentage of carbon dioxide emission in SA and other countries and provide solution on how to reduce the carbon emission. Furthermore, engagement with contexts could lead to a survey of learners who arrive late at school, or on teenage pregnancy. The context selected should require learners to use mathematical tools and then interpret the answer in relation to the context.

Research findings have suggested that the issue of contextualisation is still not addressed adequately, and researchers have identified contributing factors that could make it difficult to address the issue. The issue of pedagogic demands – teacher's practices, teachers' "agendas" as Graven & Venkat (2007) put it in their investigation of the emerging pedagogic agendas in the teaching of Mathematical Literacy, focusing on a spectrum of pedagogical agendas that arise due to the "absence of precedents of what pedagogy and assessment should be like [within a Maths Lit curriculum and classroom]" (p.67). Meaning that pedagogical agendas refers to some kind of knowledge, content, context and values that teachers want to convey or teach when selecting a task. Teachers teaching could be driven by mathematical content only or content and context or context only, and these could be the teacher's pedagogical agendas. According to Graven & Venkat (2007) these agendas arise due to teachers interpreting the Maths Lit curriculum in a range of ways, and then presenting lessons according to their interpretation. In their discussion there is an indication that teachers need to include context in their selection of tasks as this is the predominant orientation

of the curriculum. This leads to openings to work in either 'context driven' or 'content and context driven' ways, but these authors noted that some Maths Lit teachers were also working in mainly 'content driven ways – which runs counter to curriculum advice. These agendas may be one of the aspects informing teachers' selection of tasks for their grade 10 Maths Lit classes.

The other issue is of teachers' preferred contexts. According to Julie's (2006) analysis, teachers prefer contexts that are local in nature and which do not conflict with their pedagogical ideology. These could relate to teacher's goals that inform them on how to select and use context within their Maths Lit classes. Furthermore, Graven & Venkat (2007), and Skalicky (2005), argue that authenticity and context cannot be separated when it comes to Mathematical Literacy. Since selecting an authentic context for tasks is not only about context but also about understanding in context, the ways in which teachers present and explain contexts, and contexts in relation to maths content is also of interest. The inclusion of authenticity when coming to context selection is viewed in the curriculum statement as not only central to the achievement of the Maths Lit curriculum goals but also as improving learner participation and performance.

The argument that arises within this study is that context in Maths Lit play an important role in the way teachers select tasks and the manner in which they present the selected tasks within their grade 10 classes. This argument manifests itself from the literature introduced regarding Maths Lit, as highlighted above. Together, this literature reviewed and the policy document can further be viewed in relation to the research questions posed and be classified into three categories – contexts in relation to:

1. Goals of mathematical Literacy as advocated in Maths Lit SAG and NCS policy document compared with the goals of mathematical literacy teachers

2. The meaning and implications of contextualization as reflected in the SAG and NCS document vs. the teachers understandings of contextualization

3. The selection and use of context as suggested in the SAG and NCS policy documents and the teachers' perception on selection and use of context within Maths Lit classes

These categories are considered in details in the literature review in chapter 2.

1.*3. Theoretical framework*

Vygotsky's theory of mediation is used in this study (Vygotsky, 1978). This theory focuses on the mediation of the relationship between the subject (Maths Lit teacher) and the object (goals of Maths Lit). This mediation takes place via the use of the meditational tools that the teacher selects and uses in order to achieve the Maths Lit goals. In terms of this research, the selection and use of tasks, and specifically, context-oriented tasks is considered as one of the tools the teacher uses to reach the Maths Lit goal as envisaged in the NCS and interpreted by the teachers. Vygotsky's model has been modified by borrowing from Engestrom's (2001) method in his activity system based-theory; this method allows a theoretical approach that compares the NCS policy goals and advocated tools in relation to contexts for Maths Lit with the teachers' goals and tools. It envisages that teachers could have their own goals and tools of achieving them (goals) within their Maths Lit class, which could be either aligned or in contrast with those (goals) of policy. Thus, the study aims to understand the mediating tools used by the teacher in relation to the tools proposed by the policy makers to be used i.e. Maths Lit activities in the teachers guide, contexts suggested in the assessment guide. By using this theoretical framework, I will be able to analyse the findings and discover if teachers' in their classroom are promoting Maths Lit goals as indicated in the NCS Policy document and if not, to understand their own goals that drive their selection of contexts.

1.*4. Location of the study/ methods*

This study took a form of a case study of four teachers teaching in four different schools located in one district. These teachers are currently teaching grade 10 Mathematical Literacy, within their schools. The district consists of two types of school categories that is Ex-Model C and Ex - DET schools. The teachers were selected according to these categories (2 in each school type) and according to their experience in teaching Maths Lit. In terms of their experiences the following qualities were taken into consideration – teachers who have taught Maths Lit before 2009 (the year that data collection occurred) and those who were teaching Maths Lit for the first time in 2009. The data were collected using teacher interviews and the analysis of a sample of their learners' workbooks. The data was analyzed using typological and inductive approaches. According to Hatch (2002) typological analysis is an approach where data is divided into groups or

categories based on predetermined typologies/frames. He further indicated that "Typologies are generated from theories, common sense and/or research objectives" (P, 153) – the typology came from categories derived from the literature reviewed. The typological analysis follows up on pedagogical agendas of teachers understanding of Maths Lit and their preferred contexts in ways that relate to policy and literature. But inductive followed the emergence of themes outside of this frame; this means that the data is analysed using themes that emerge from the data rather than from the predetermined literature (Hatch,2002). However on the ground, the teachers in this study made frequent common reference to the districts' work schedule and maths Lit textbooks as sources of ideas about context and their uses. These tools were incorporated more inductively. The data collected had to be viewed in line with both these approaches to establish to what extent these factors really affected contexts selected and use, and how they related to what is advocated in the Maths Lit policy documents (SAG & NCS) with regards to contextualization with Maths Lit grade 10 classes.

1.*5. Summary*

Contextualisation is a fairly new approach of teaching within the South African context, but there are other countries which have started implementing similar approaches. In these countries, the research done reveals that there are pros and cons in the use of this approach i.e. Skalicky (2005) reveals that context selection has to be authentic, with the tasks for assessment and having to assess understanding in context. Skalicky (2005) provides tools that can be used to check if these conditions are met. Within the SA context Julie (2006) has researched the issue of selecting context in relation to whether they are local in nature or context which teachers are comfortable teaching them as they will not interfere with the teachers' goals. On the other side Bowie and Frith (2007) look at the structure of the curriculum and its influence on how teachers might interpret the document and select tasks which are going to be in line with what is indicated and dominating in the document. This range of influences on context selection and uses are discussed in details within the literature review chapter.

The literature provided noted that teachers' could have their own goals which they could implement and achieve in relation to Maths Lit. Meanwhile, in the literature reviewed, it appears that Maths Lit policy also has its own goals. The theoretical framework adopted will reveal how these goals interplay within the Maths Lit classroom. Vygotsky's (1978) theory of mediation will be used to see

how the teachers mediate the Maths Lit goals and/ or their goals using the mediated tools available to or selected by them and these are further discussed in chapter 3. Chapter 4 focuses on the research design, where I discuss the instruments used to collect the data such as interviews and documents. I elaborate on how these tools were used to collect data and the method used to analyse the data. I also discuss the method of triangulation which assisted in ensuring that the data collected is valid. Chapter 5 focused on findings, and the analysis about the four teachers' general understanding of what Maths Lit is, and the degree to which their understanding relate to the concept of contextualization that is linked with everyday life application of Maths. I reveal some contradictions and contrasts between the interviews, reviewing of learners' workbooks and the work schedule. Within this chapter the findings were analysed using the literature that has been reviewed and interpreted using the theory of mediation. Finally, in chapter 6 I present the conclusions with recommendation and referring to areas of further research.

Chapter 2

Literature review

2.1. Introduction

Context in Mathematical Literacy tasks is viewed in the curriculum statement as the driving force in acquiring Maths Lit skills, knowledge and values: ”contexts are central to the development of Mathematical Literacy in learners”(Doe,2003,p42). To ensure that these skills, knowledge and values are acquired, an appropriate context has to be selected. This leads to the question of the bases of deciding whether the context selected is appropriate, what criteria have been used to identify or select the context? Based on these issues, teachers also ask this question: how do I know if I have selected relevant contexts? This last question led to my investigation of context selection in Maths Lit, specifically: **what informs teachers' selection and use of contexts for their tasks in Mathematical Literacy classroom.**

Mathematical Literacy (Maths Lit) is a new subject in South Africa introduced in 2006 in the Further Education and Training band (FET) as an alternative subject to Mathematics (Maths). In the past (pre-2006) “learners who could not do well mathematically in General Education and Training (GET) usually stopped studying Maths, contributing to the high levels of innumeracy” (DoE,2003. p.9). This situation in which Maths was compulsory to all school going children up to grade 9 only led to many learners exiting grade 12 without Maths, and without the mathematical knowledge and competences required in the working environment. The Maths Lit curriculum statement notes that the subject was introduced “to ensure that our citizens of the future are highly numerate consumers of mathematics” (DoE, 2003, p. 9). The structural reform at FET ensures that since 2006 all learners will have either Maths Lit or Maths as a subject when they finished grade 12.

Problems have been identified within the implementation of Maths Lit as a subject. Research has looked at issues related to pedagogy in Maths Lit including the kinds of contexts that teachers prefer; the relationship between Mathematics and Maths Lit and assessing Maths Lit. The selection and use of context in Maths Lit relates to all of these issues, since Maths Lit is characterized by the need to integrate context driven or contextualized tasks – a need which is clearly indicated within the policy documents:

> "the approach that needs to be adopted in developing Mathematical Literacy is to engage with contexts rather than applying Mathematics already learned to the context" (DoE, p.42).

Here a task selected has to be contextualized, and learners engage with the context. Furthermore, the tasks have to be located in authentic contexts and this is emphasized in the SAG (2008) with the use of words such as 'real-life' as stated below:

> "Tasks should be contextually based, that is, based in real-life contexts and use real-life data" (Subject Assessment Guideline (SAG), 2008, p7)

Therefore, the policy promotes the use of certain kinds of tasks (authentic and relevant) and also advocates that the pedagogy should incorporate the context. Literature in Maths Lit which considers the selection and use of context-oriented tasks (Brombacher, 2007) which focuses centrally on the following issues:

1. What is Mathematical Literacy?
2. What are the goals of Mathematical Literacy?
3. Contextualization in Maths Lit

These questions are used to structure the discussion of context within the literature review in this chapter.

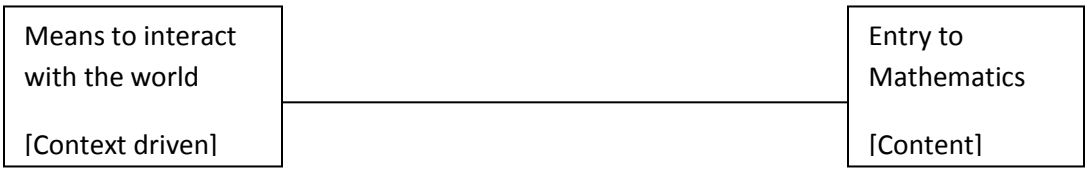
2.2. What is Mathematical Literacy (Maths Lit)?

Mathematical Literacy has been viewed or defined differently by different researchers and different words have been used to denote subjects with similar aims to Mathematical Literacy. Quantitative literacy (QL) is the name used for Mathematical Literacy by Steen,(2001),Wiggins,(2001) and Skalicky, (2005). Skalicky (2005) uses QL interchangeably with numeracy, while Julie (2006) also talks about Critical Mathematical Literacy and Kilpatrick (2001) uses 'Mathematical proficiency' interchangeably with the term Mathematical Literacy. These different terms of the subject share overlaps with the SA definition of Maths Lit. The key overlaps are that Maths Lit is a subject that is linked to everyday life situations and a quantitative gaze on the world.

The use of terms 'QL' 'numeracy' or 'literacy' could be because of the skills that are needed for practical life situation, such as the ability to read, write, interpret situation, solve problems related to real life situations and calculate. According

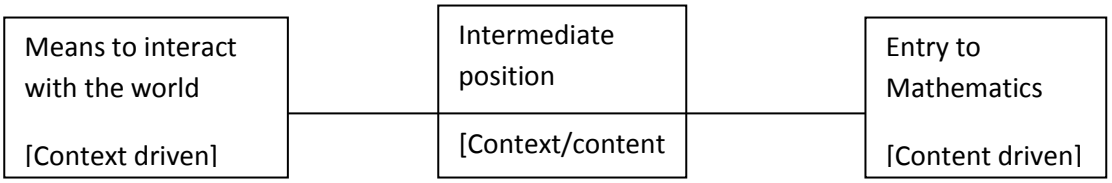
to Steen, 2001, Jablonka, 2007 and Skalicky, 2005, to be numerate is to understand better quantitative capabilities of both students and adults within their environment including practical use of numbers, that is handle numbers in context – thus these authors talk of “Mathematical skills” (Steen, 2001) and “number sense” (Jablonka, 2007, Skalicky, 2005). Steen, (2001), further defines literacy as suggesting “minimum capacity to read, write, and calculate and also as the characteristic of a well-educated individual” (p9). These skills emphasis the interaction with the world, still link to the overlaps indicated before. At the same time the use of different terms, lead to different interpretations by different authors.

These differences are indicated by Julie (2006) when he points out the range of ways in which Maths Lit can be interpreted: “Mathematical Literacy is viewed as entry into mathematics and at the other end as a means to interact with [the world]” (62). At one end, the emphasis is on Maths Lit being viewed as interacting with the world, but on the other side as an entry to Maths. This can be represented as a continuum:



Steen (2001) echoes these two positions, but provides a description of quantitative Literacy which contains the elements of the view of interacting with the world. Even though Julie (2006) pointed to only the two extreme views, the literature thus far reviewed, reveal that there is a third view, that is the hybrid or intermediate position – consisting of both positions- the Maths view interacting with the world view. Thus so far, some of the interpretations are in an intermediate position, while others are more world related and others are in a more mathematical orientation to Maths Lit.

The intermediate position relate to an interpretation that views Maths Lit as a subject that focuses on context/content relationship i.e. context driven by content to be taught. In contrast the entry to mathematical end is content driven, whilst the means to interact with the world is driven by context. Thus the diagram above consists of context on one end and content on the other end with context/content in the middle to depict the different interpretations of Maths Lit. Below is the modified continuum that depicts the positions including the intermediate position:



In this section I summarize the literature under the terms of Numeracy or Maths Lit or Quantitative Literacy that fit broadly with one or the other extreme and then identify descriptions that seem to operate on more intermediate position. I also indicate where the SA definition of Maths Lit is located. According to Steen, 2001, if it is called Maths Literacy - mathematics refers to what is needed for higher education – thus it is defined as a subject "which stresses the traditional tools and vocabulary of mathematics" (p. 17).In this interpretation Maths Lit will be depicted as content driven subject and be considered as an entry to mathematics. If it is called quantitative literacy, where quantitative refers to that ways quantitative skills are needed in life, then it is defined as "what stresses the use of mathematics and logical tools to solve common problems" (Steen, 2001,p.17). This definition focuses on curriculum (subject) that is contexts driven, looking at the means to interact with the world. Maths Lit, in this instance will be linked to the more mathematical orientation, quantitative literacy, is more inclined to the world –related orientation.

Kilpatrick (2001) and PISA (2003), their definitions have a more Mathematical orientation:

> "…capacity to identify the role that mathematics plays in the world" (PISA,2003.P15).

With Kilpatrick (2001), his definition on Maths Lit links to his explanation of 'mathematical proficiency', which consists of the five strands, that emphasis mathematical ability – mathematical concepts, procedural accurate, ability to formulate and solve mathematical problems. These definitions are focusing on Maths Lit as an entry to mathematics. Therefore, their emphasis will be on achieving mathematical goals. Furthermore, in their definitions, there is no reflection of the quantitative gaze of the world.

Meanwhile, Steen (2001), Skalicky 2005 and Julie (2006) provide descriptions that emphasize more of interacting with the world.

> "an ability to apply quantitative ideas, in a new or familiar contexts [in order] to participate fully in democratic society"(Skalicky,2005,p.1)

On the other hand some literature; do not provide a precise definition, as the researchers discovered that to define Maths Lit both ends have to be included. Gellert, Jablonka &Keitel (2001) defines a mathematically literate person as "a well-educated and well-informed individual" (p.59).This definition, include some of the qualities of being literate from Steen's definition of literate.

Similarly, within the South African curriculum, there is a notion that Maths Lit seems to lie within the intermediate position when interpreted. This view could be based on its nature and goals. But according to NCS policy documents, Maths Lit involves applying mathematical knowledge in new and unfamiliar contexts. It is about awareness, knowing when and how to apply this knowledge in every day situations. This is captured in the definition:

> "Mathematical Literacy provides learners with an awareness and understanding of the role that Mathematics plays in the modern world. Mathematical Literacy is a subject driven by life-related applications of Mathematics; it enables learners to develop the ability and confidence to think numerically and spatially in order to interpret and critically analyze everyday situations and to solve problems" (p.9).

This definition tend to shift the position of Maths Lit towards the 'interacting with the world' ends - as thinking numerically and spatially are more related to work place, and life related applications of mathematics with a focus on becoming a self-managing person i.e. reading a map, following bus or train timetables, or financial issues such as hire purchase. In rhetoric, its definition is more world related but the Learning Outcomes and Assessment Standards point towards more mathematical orientations. This is further indicated by Bowie and Frith (2006), Christiansen (2007) and AMESA (2003) in their commentaries about SA Maths Lit. These authors argue that the curriculum is presented in the Learning Outcomes as 'watered –down mathematics' (AMESA, 2003) and a remodeling of the old standard grade mathematics (Bowie and Frith, 2006), as the Learning Outcomes are similar to those of the pure Mathematics curriculum.

The rhetoric of Maths Lit within the SA context is also about awareness and understanding of the role Mathematics plays in the modern world. This part of the definition tells us that there is a focus on the changes that are happening in the world, which leads to the goals of Maths Lit., and these goals are further discussed in the next section. My study began with a focus on the approach of Maths Lit as envisaged in the South African Maths Lit policy document rhetoric, but I also integrated contributions from other researchers pointing to the contradictions within the documents. My study focused on the selection and use of context oriented tasks within grade 10 Maths Lit classrooms in relation to the

requirements or expectations within NCS. The notion of what Maths Lit is or how it is defined is linked to its purpose and goals of the subject. These are now elaborated with the particular focus on the SA Maths Lit curriculum and refer to broader relevant literature.

2.3. What are Maths Lit goals?

Goals could refer to outcomes, output or what is anticipated at the end of the learning process. Within the policy document there is an indication of the type of learner that is envisaged and what his/her contribution should be;

> "To be a participating citizen in a developing democracy," (DoE, 2003, p.10)
>
> "to ensure that our citizens of the future are highly numerical consumers of mathematics" (DoE, 2003, p.9)
>
> "to become a self managing person [and] a contributing worker" (DoE, 2003, p.10)

There are three types of goals that are explicitly stated in the policy documents and emerging from the statements above:

1. **Social goals**
    - Social transformation and environment awareness
    - Develop Critical citizen
2. **Life goals**
    - Self managing person
    - Productive worker
    - citizenship
3. **Mathematical goals**
    - Mathematical understanding

Here too, these goals put together a more mathematical and more world-related orientation i.e. social and life goals – world-related view; mathematical goals – entry to mathematical view. This reiterates the point discussed above that the SA Maths Lit is inclined to the intermediate position.

All these goals are to be reflected in the rest of the document, within the Learning Outcomes and Assessment standards. To effectively achieve these goals, learning outcomes should be integrated, as "attempt to achieve the Learning Outcomes, in the same linear sequence they are written is not very effective" (Learning Programme Guideline (LPG), 2008, p.14). It is emphasized within the LPG, that teachers should integrate LO in their teaching and learning so as to achieve the Maths Lit goals. Furthermore, integration is more applicable in contextualized situations.

Within the policy document, there are examples provided with the contexts to be used in the classroom to ensure that most of these goals are achieved i.e. self-managing – hire purchase, bond mortgage, and investments. Meanwhile in other instances, the examples are not clear – productive work, work-related formulae; read statistics charts; deal with schedules. Christiansen, (2007) and Jablonka, 2007, Steen 2001 in their studies looked at issues that are related to all of these goals in relation to Maths Lit curriculum specifications and how these specifications could promote, and at the same time hinder the process of successfully achieving these goals. Now I will discuss in detail each goal using the SA Maths Lit curriculum – with reference to the purpose, nature, Learning outcomes and the Assessments standards, and make comments using the literature reviewed.

2.3.1Social goals

In the NCS document social goals are discussed with reference to concern citizens – with an indication that individuals need to be aware of misleading data, " [and] acquired critical stance with regards to mathematical argument presented in the media and other platform"(DoE, 2003,p.10). Within the NCS, there are other goals that emerge which are promoting citizenship.

> "Contexts which have been highlighted are those related to the principles of the National Curriculum Statement, that is, issues which arise in **human rights**, **inclusivity**, health (HIV/AIDS) and **indigenous knowledge systems** (DoE, 2003, p.42).

In this statement there is no elaboration on how these could be achieved, they are just stated. This could imply that teachers may have a challenge when coming to context selection for their tasks. This means that the tasks selected, its context has to relate to human rights, link to indigenous knowledge and be inclusive (cater for different, race, abilities).

Referring to the Learning Outcomes and Assessment Standards, the examples that have elements that promote social and environment awareness tend to be highlighted under learning outcome 4, data handling. An example of this is:

This could mean that social goals can be achieved through the interpretation of statistics or reading mathematical argument presented in the media.

Furthermore, within the Assessment Standards, the concept of social awareness in highlighted under assessment standard 4.1 – which is about investigating situations in ones owns life such as social environment with the focus on substance abuse, water conservation, absenteeism from school due living conditions (squatter camps and houses) (DoE,2003). Thus, within the NCS policy document, the information regarding social goals is explicitly indicated in Learning Outcome 4.

Jablonka,(2007), in her article looked at elements of Maths Lit in general which could be taken into consideration and indicate their importance in relation to Maths Lit and the transformation that she argues has to take place within a school curriculum and the country. These elements have the characteristics of some of the goals. On the other side she indicated how some of these elements contradict themselves and how the need for change ignores some of the existing factors that will hinder the process of bringing about change. For instance, the need for environmental awareness and social change is crucial for mathematical literacy, but Jablonka argues that looking at the aspect of environment in the classroom does not "automatically make us see something of interest" (p.77). This means that looking at the statistic data about pollution, population growth, crime, HIV, does not automatically transfer to producing an individual who is an informed citizen and change perception of individuals who are not interested in global problems, but focusing on their economical situation, depleting resources and poverty strain.

Also the Assessment Standards do not sufficiently address the ways of overcoming economical issues, poverty etc. but address factors that lead to these issues i.e. crime; substance abuse; which could be some of the factors that hinder the process of bringing social transformation. Since the issues that promote social goals mostly appear on LO4, this could mean that the SA Maths Lit curriculum will not be able to meet their social goals effectively, as the issues that are raised in this instance are not indicated across all LOs. This could also mean that the Maths Lit curriculum, has organized the information in terms of LO, which could hinder the process of achieving the set goals. This limitation could make the teacher assume that the issues concerning social transformation will require one to focus on data handling. The SA curriculum, in its form right now

echoes the danger of making the same assumption as stated above by Jablonka, of assuming that if we present data in these different formats will automatically transfer individual to become critical citizens.

The social goals tend to be more inclined to the world-related view, looking at the interaction with what is happening in everyday life. The challenge is that teachers may struggle to translate these goals in their classroom, since the approach on how to teach them are not explicit. Jablonka, as discussed above, also indicates the challenge of focusing on the inappropriate context which could have an impact on the goals that are to be achieved. The explicit reflection of these goals in one Learning Outcome, could have a negative implication when coming to selection and use of context in the classroom by the teachers, as the teachers will assume that the only time they have to achieve these goals would be when they teach learning outcome 4.

Now that I have looked at social goals which are more linked to learning outcome 4, I move on and explore the Learning Outcomes in which the life goals reflect, if at all.

2.3.2. Life goals

Within the policy document the concept of self managing person is discussed under the purpose of Maths Lit and this is reflected as one of the purposes of Maths Lit. To elaborate further, there is a list of everyday life examples that an individual learner has to perform in order to be deemed to have achieved these goals.

> "Handle issues related to finances, such as hire-purchase, mortgage bonds, investments,…; have ability to read maps, estimate and calculate areas and volume; understand house plans and sewing patterns…; cooking, … use of medicine, requiring efficient use of ratio and proportion"(DoE, 2003,p.9)

At the same time the concept of productive worker is highlighted but there are limited examples that elaborate how the learners are to achieve this goal. There is generic reference to the skills that are perceived to be demanded when one is working i.e. deal with work related –formulae; read statistics (DoE,2003,p9).

Looking across the Learning Outcomes and Assessment Standards, life goals are not reflective of what is stated in the purpose as indicated above. What appears are statements related to the mathematical aspects of financial issues and not linked to issues of hire-purchase, mortgage and investments. For example, within Learning outcome 1, Assessment Standards 1-3 across grade

10-12 talk about finding percentages by which quantity was increasing, interpret fraction parts of answers, solving simple and compound interest problems, income and expenditure etc. (DoE, 2003, p16). In view of these examples, there seemed to be a contradiction between what is stated on the purpose, and what appears in the Learning outcome and the Assessment Standards in relation to the life goals.

According to Christiansen (2007), this contradiction exist due to the fact that many Assessment Standards were not obviously everyday life or mathematically driven. There is a significant amount of examples that are focusing on this kind of learning, less examples that lead to everyday life or mathematically oriented (Christiansen, 2007). This means that the Learning Outcomes are less driven by everyday application than implied by the stated purpose (Christiansen, 2007, p97).

Christiansen, (2007) and Jablonka (2003) argue that being mathematically literate does not mean that individuals will become productive workers when they leave the school. They indicate that the principle of transfer does not automatically take place. Christiansen argues that the examples given in the classroom are not the same as those used in the working environment, and they do not value the diversity of workplace culture. Thus “graduates of school do not automatically apply the mathematical techniques they have been taught, they invent or use techniques that meet the purpose of the task [within the work place]” (Jablonka,2007,p. 82).

The NCS document has tried to provide examples, which may be used to ensure that these goals are achieved. Some of the examples cannot be directly transferred to everyday life application as they are not explicitly reflected in the policy document, even though they have the same elements of everyday life, i.e. bond mortgage for self-managing person; the calculations will not benefit the learner outside as when they go to the bank, a computer will do the calculation and even the sales person or the banker does not even know what formulae was used (Christiansen, 2007). Some of the context can be directly transferred such as the concept of hire purchase, Christiansen, (2007), indicates that “if the learner works explicitly with such a topic, transfer is likely to occur” (p95.)

The goals as stated in the purpose of the curriculum document are focusing on the world view. Even though when looking at the work given to learners these are not reflective of the world related view. The examples within the Assessment Standards are not easily transferred to the everyday life. This could mean that the teachers might also find it difficult to achieve these goals and may not select the relevant context that will ensure that learners achieve these goals. As the

principle of transference may not be possible in this instance, may be it could take place when dealing with Mathematical goals.

2.3.3. Mathematical goals

Explicit mathematical goals are explicitly stated in the NCS policy document, but the guidelines on how to achieve them are not clearly specified. These goals are reflected across the four Learning Outcomes and Assessment Standards i.e. talking about 'commutative', 'distributive' and 'associative' laws, working with positive exponents, ratios (LO1, As 1) (DoE, 2003,p.14). While in learning outcome 2 there is a reference to simultaneous relationship, quadratic functions which are mathematical concepts which learners are suppose to deal with. Furthermore mathematical goals are reflected in the way the Learning Outcomes are written, that is in a mathematical way and these Learning Outcomes are the same as those in the mathematics curriculum "Function and relationship', 'Data handling' 'Space, shape and measurement' (DoE,2003). This means that the focus on these Learning Outcomes is mathematical, in spite of the advice to teachers to link mathematical content to relevant contexts.

Christiansen, 2007, argues that these goals seems to imply that teachers are well informed of the role played by mathematics and there is an assumption that teachers will easily facilitate these goals i.e. mathematical understanding. She further indicates that within different situations different strategies are used to solve "what [teachers] may well perceive as a mathematical problem in their everyday setting" (93). This means that the context in the task may not always be realistic or authentic it may even be contrary to the other goals such as developing critical citizenship and mathematical understanding, even though it is stated in the policy document that these mathematical goals are to be achieved through the use of context-oriented tasks within a Maths Lit classroom.

Summary

Teachers are to select contexts which should adequately address these goals. With such broad goals it can be anticipated that teachers may have difficulties combining these goals within the tasks they design, as these goals are not effectively reflected in the Learning outcomes and Assessment Standards that teachers are suppose to refer too when selecting the tasks and context. Moreover, what is dominating within these Assessment Standards are mathematical concepts i.e. simple and compound interest, volume, percentages and conversions. This could be one of the teachers' challenges when it comes to selecting contexts for their tasks. Teachers may prioritize' mathematical goals

over social goals and thus select tasks which focus on developing mathematical skill with the goal of promoting mathematical understanding, such tasks may be less socially oriented and even less authentic. The literature on the interpretation of teachers' goals within Maths Lit is covered in the following section.

2.3.4. Teachers' Maths Lit goals

Teachers' goals are likely to be linked to how they interpret the policy document. Christiansen 2007, Bowie and Frith 2007, AMESA ,2003 indicate that the NCS policy documents is structured in such a way that it is dominated by mathematical examples and the Learning Outcomes are framed similarly to those of mathematics. This can guide teachers towards teaching approaches that could still be mathematically inclined. Christiansen, (2007) stated "Maths Lit is less driven by everyday applications than implied by its purpose, [and that] many of the Assessment Standards were not obviously everyday…driven" (p.97). Thus, teachers could focus on promoting mathematical skills and knowledge. This could be evident in the contexts selected for the tasks which promote mathematical skills i.e. interest rate as a context and focusing on the calculation of interest using the simple formulae $A = P(1+i)^n$, and working with quadratic formula $(^+b +\sqrt{b^2-4ac})/2a$ to establish relationships between variables. These kinds of examples will not be used by learners' in their everyday life.

This kind of interpretation arises from the contradictions inherent in the documents. On the one hand the document states that learning must be contextualized, and that content must not be the driving force, and at the same time, it indicates that the teachers have to follow the Learning Outcomes and Assessment Standards provided, which don't always provide context but provide mathematical content (DoE, 2003). This means that there is limited synergy between the Assessment Standards and the purpose of Maths Lit as written in the NCS policy document, and this is further evident when one reads the Assessment Standards.

> "Solve problems in various contexts, including financial contexts, by estimating and calculating accurately using mental, written and calculator methods where appropriate, inclusive of: working with simple formulae (e.g. A = P(1+i)n); using the relationships between arithmetical operations (including the commutative, distributive and associative laws) to simplify calculations where possible; working with positive exponents and roots" (DoE, 2003, p.14).

When interpreting this assessment standard there is a significant amount of content specification (underlined parts), in relation to context specification which

may lead a teacher to veer towards a more mathematical interpretation to select a task.

On the other hand, teachers when selecting a task and its context might have some kind of content, knowledge and pedagogical ideas that they want to convey or teach. Graven & Venkat's (2007) investigated the emerging pedagogic agendas in the teaching of Mathematical Literacy. Whilst their study focused on teaching (which is not part of my research), their findings are relevant to my study especially when looking at what drives teachers' selection of context and task for their learners, and also looking at the tasks selected by the educator if they are contextualized or consist of pure content. Their focus is on the spectrum of the pedagogical agendas that arise due to the "absence of precedents of what pedagogy and assessment should be like [within a Maths Lit curriculum and classroom]" (p.67). In their discussion there was an identification of a range of pedagogic agendas with regards to the teaching of Mathematical Literacy'. According to Graven & Venkat (2007) these agendas rose due to teachers' interpretation of Maths Lit curriculum in a range of ways, and they present lessons according to their interpretation. Graven &Venkat, (2007). They identify a variety of agendas that teachers could possess working with Maths Lit:

1. *Context driven (by learners' needs)*
2. *Content and context driven*
3. *Mainly content driven*
4. *Content driven (Graven & Venkat, 2007, p. 75)*

In this paper, Graven & Venkat suggest that agendas 1 and 2 are more aligned with the goals of the Maths Lit curriculum. When they were analyzing their findings in terms of the agendas they were able to first indicate which agenda is more Maths Lit inclined (agenda 2), and secondly, they identified that the tasks selected within this agenda should be scenario based "involving exploring a context/ scenario" and thirdly, the context/scenario should "deepen the understanding of context". Furthermore, they made a distinction between 'scenario' based tasks and 'word problems' (Graven & Venkat, 2007, p.77) and they also brought in the notion of context selection in terms of authenticity. Therefore, "a certain degree of authenticity in relation to context should be built into these agendas" (Graven & Venkat, 2007, p. 80) as according to their findings, teachers' tasks could be more inclined to the third agenda. As these tasks are in a form of word problems, the context in the tasks is in service of mathematical content e.g. cell phone contract tasks focus on teaching straight line graphs, calculates the area, volume in context free set up, and not effectively

integrated back to the content. They argue that this is not Mathematical Literacy rhetoric goals inclined, and instead, lean towards the more mathematically-oriented viewed of Maths Lit which has also figured in the section.

Teachers' work becomes complex, as they are required to ensure that these goals are promoted and encountered by the learners. Teachers have to have a creative character for them to meet the goals of Maths Lit. i.e. identifying local contexts for their learners, select the appropriate contexts in relation to the curriculum's content-focused demands, and the problems given have to focus on a range of different contexts.

These tools could also reveal how the teacher use context in order to achieve the Maths Lit goals (as stated in the policy document), or their Maths Lit goals which could manifest due to the variety of interpretation of the policy document and the teachers preferred context when teaching Maths Lit. Thus a match between the teachers' interpretations and the Maths Lit goals needs to be established, so as to ensure that the Maths Lit goals as described by the policy documents are mediated appropriately.

Different interpretations of the above Maths Lit goals as suggested within the policy documents could affect contextualization within the Maths Lit classroom. Jablonka (2003), Skalicky (2005), Julie (2006), Graven & Venkat (2007), indicate a range of interpretations that can arise in terms of Maths Lit goals. These different interpretations of Maths Lit goals may then lead into different selection and use of context in Maths Lit.

2.4. Contextualization in Maths Lit

Contextualization refers to the use of realistic everyday life situations within the classroom – the use of contexts to solve life related problems (DoE,2003). Contextualization focuses on the world-related view of Maths Lit and encourages the teaching approach that would lead to the achievement of social and life goals. The idea of contextualization could be achieved if certain guidelines, principles and elements are taken into consideration when selecting and use tasks which are context-oriented within the Maths Lit classroom. In this section I will look at the literature that looks at these issues and how they affect and enhance the concept of contextualization and what implications they have in the teachers' selection and use of context oriented tasks within the Maths Lit classroom.

Skalicky (2005) discusses the Tasmania curriculum in relation to assessment, where her focus is on two major elements of Quantitative Literacy (QL) "(1) quantitative skills and concepts being applied, and (2) the contextual element within which they are being applied" (p.1). This combined focus on content and context makes her findings useful for investigating issues related to Maths Lit in SA which also has this hybrid orientation. In her article, she highlights issues relevant to the kinds of context that should be selected for Maths Lit assessment and tasks. She advocates that these tasks be authentic and the context selected should be about understanding in context, since understanding is inseparable of its context. In her article she emphasizes the importance of selecting an authentic context for the task as this will encourage the development of mathematical understanding. Skalicky (2005), citing Wiggins (2003), highlights that in order for "assessment to be authentic it must reflect the context" (p.6). She provides guidelines to evaluate if the tasks selected by teachers for their learners are authentic:

1. *It[task] asks the [learners] to use knowledge and skills to solve an unstructured problem*
2. *It requires judgment and innovation*
3. *It reflects the context in which adults are tested in the work place, personal life and civic life*
4. *It allows appropriate opportunities for feedback and revision*

Moreover, she points out that context should not be selected just for the basis of understanding the skills to be assessed; it should also be about understanding in context. Brown (2006) supports this point by Skalicky (2005), but takes it even further by indicating that when learners are solving the problem its "solution [should be] situated in the context, as opposed to the application of an abstract mathematical concept to the context" (p.48). This supports the rhetoric in the stated goals within both the curriculum statement and the SAG of Maths Lit and puts an emphasis on Maths Lit in context. Thus, Skalicky (2005) suggests that the following six faceted view of how understanding in context manifests itself, needs to be considered when examining context in a quantitative literacy.

1. *Can explain*
2. *Can interpret*
3. *Can apply*
4. *Have perspective*

5. *Can empathize*

6. *Show self-knowledge* (Skalicky, 2005, p. 8)

This implies that for one to say that learners understand in context they need to be able to explain – make sense of what they are experiencing when engaging with a contextualized task; interpret the context in relation to their personal experience; apply what they know to different situation/assessment tasks, have a perspective of what it require of you; can empathize – "find value in what others do not" (Wiggins,2001,p132) ; and show that there is mathematical knowledge embedded in the context through the use of calculations.

According to Skalicky (2005), QL focuses on unfamiliar contexts and contexts which are relevant to the learners and to which they need to apply mathematical concepts or qualitative ideas This suggests that context's main focus is not on acquisition of mathematics concept only and principles but on skills, knowledge and value applications with context and conceptual understanding. Learners should be exposed to different real world contexts in which they will be able to apply these skills as part of their learning process. This approach is similar to that of the South African Maths Lit, which indicates that learners need to engage with familiar and unfamiliar contexts, even though the NCS puts more emphasis on local contexts (which tends towards more emphasis on the familiar). This is emphasized in the following statements from the NCS policy document DoE, 2003:

> "…it is very important for the teachers to incorporate local and topical issues into the programmes that they design" (p.42)
>
> "The teacher… should be aware of and use local context…" (p.38)

Here it appears that Maths Lit could be more linked to local context within the SA curriculum. The NCS policy document also indicates that the learners should be exposed to different real-life situations to be able to engage with the context:

> "The approach that needs to be adopted in developing Mathematical Literacy is to engage with contexts rather than applying mathematics already learned to the context" (DoE, 2003, p.42)

This is similar to what Skalicky, 2005 has stated above, about engaging with the context rather than focusing solely on acquisition of mathematical concepts.

Graven& Venkat (2007) within their discussion around the agendas, touched on the same point that is indicated by Skalicky (2005) in the last sentence above. To discuss the point further within the agendas they split their discussion into different issues such as:

- Driving agendas
- Pedagogical demands
- issues arising and
- assessment

For the purpose of this study, I will focus on their discussion around pedagogical demands and issues arising in relation to these agendas. They discuss a range of goals related to teachers' pedagogical ideology in relation to Maths Lit context, since these issues relates to context that are relevant to my study. Even though these agendas focus on the nature and extent of a link between content and context their discussion under pedagogy and issues arising can contribute to this study. They raise issues that have implications for Maths Lit teachers when it comes to their practices and selection of context to be used. "Teaching needs increases discussion of context and critical engagement with them and the Mathematics embedded in them, and might require understanding of the context" (Graven & Venkat, 2007, p.76). In this statement there is an emphasis again on understanding in context. They also indicate the importance of Authenticity of context in order to meet the Maths Lit goals.

Within their discussion about context and authenticity, they alluded to the implications of the selection of context in view of the agenda that the teachers are using, for instance, if the teacher is using agenda 3 & 4 context will be selected to promote mathematical goals. This could imply that one way which guides the teachers' selection of the context will be based on the kind of agenda the teacher is focusing on.

The agendas are some of the conceptual tools that are used in this study to establish what guides the teachers in selecting the context for their task within Maths Lit. These also assist in analyzing the context the teacher selected for his/her grade 10 learners and categories the tasks and context in terms of the agendas i.e. does the tasks and its context promote agenda1, which is about context driven by learners needs, if the agenda is mainly content driven as in agenda 3, then context could merely be selected just for the "basis of understanding the skill assessed"(Skalicky, 2005,p.8). In her paper as discussed, she addresses the impact on mathematical understanding in context, which was not the focus for Graven & Venkat (2007).

Additional contextualization aspects highlighted in the policy documents relate to issues of life goals. From the discussion thus far, understanding in context has been emphasized as one of the principles that govern contextualization, the use

of authentic context is also indicated. This authenticity is related to learners' real life situations which lead us to the discussion about familiar and unfamiliar context, and local context.

> "The teacher and other educators should be aware of and use local contexts, not necessarily indicated here, which could be more suitable to the experiences of the learner" (DoE, p.38).

Teachers are advised to use local contexts, which is one of the issue that could have an impact on the selection and use of context in the Maths Lit classroom. This issue of local context is further discussed in Julie's (2006) article on teachers' preferred contexts for Maths Lit and Vithal (2006) in her article on developing Mathematical literacy through project work also addresses some of the issues that focus on the contexts that belong to learners' daily lives; and also on the conflicts that arise when the teacher select the tasks that are relevant to learners daily lives. In Julie's (2006) findings it is suggested that teachers preferred contexts which are local in nature, contexts which are related to learners' socio-economical background and those which will not conflict with their (teachers') personal pedagogical ideology. This is similar to what Vithal (2006) indicated in her article that the problem selected for the learners has to be known by the broader range of learners and belong to their daily lives (p. 38).Instead of looking at all contexts, Julie (2006) argues that teachers preferred contexts which are local in nature and view them as the appropriate contexts, while the less preferred contexts (which are not local) are dismissed by teachers with indications that learners are not ready to deal with these contexts. The context teachers rejects are "perceived as impediments to teaching and [teachers feel] that dealing with these [unfamiliar context] will deflect from what is expected to be taught [in terms of the mathematical concepts] and thus encroach on the time available for teaching and learning" (Julie, 2006, p.53). Vithal (2006) also indicates that the teachers preference could also be due to conflict between the teachers' interest and the learners interest, which could be created by the "tension of the authority of the teacher to teach mathematics … and learners tend to choose what is deemed to be easier" (p.39) In contrast to these arguments, there are other studies that reveal that learners prefer these less local contexts to be used in their Maths Lit tasks (Julie, 2005).

It is apparent that the policy gives rise to a range of interpretation on what is to be done in the classroom when it comes to contextualization. These could be because the policy provides a curriculum specification which is contradictory to its goals. At some points the NCS indicates that learners have to be introduced to unfamiliar context, and at the same time indicates that the contexts selected should be localized. These are not explained, and these can be interpreted as

local context, with such contradictions and different perspectives of Mathematical Literacy. Jablonka (2003) points out that these views on Maths Lit always tend to promote particular cultural goals: “It is not possible to promote a conception of Mathematical Literacy without at the same time implicitly or explicitly promote a particular social culture” (p.75).

Bowie and Frith (2006) in their article also reveals some of these contradictions in relation to what is written in the policy document, and how these could have an impact on how teachers select the tasks for their learners. The first contradiction is in relation to Learning Outcomes which are similar to those of Mathematics. Secondly, they raises the notion of context-content interplay where, in the NCS document there is more content example than context example i.e. linear, inverse proportions, quadratic function, and distributive law. Thus teachers could interpret that they need to focus on the mathematical content, and select the tasks that will focus on promoting mathematical goals.

What is raised in this section could be part of what informs teachers’ selection and use of contexts for their tasks or activities in Mathematical Literacy. There is an indication that teachers’ preference for local contexts could determine the type of context that will be selected and used in the Maths Lit classroom. The range of goals that are related to teachers’ pedagogical ideology could influence how teachers select the context for their task, the type of goals they may lead them to promote a particular social culture or goal. It suggests that teachers’ conception of contextualization will depend on which Maths Lit goal they are interested in or focusing on. It could be a mathematical goal, as the content that appears in the assessment guide is more mathematical and then the context selected might be authentic, familiar and unfamiliar and promote mathematical understanding.

The curriculum therefore, does not provide sufficient descriptions and exemplification for selecting context for Maths Lit; so needed to look at this issue in the literature. Furthermore, this information will be used during data analysis, as it will assist in explaining some of the answers that are merging with reference to the research questions. The agendas will contribute by giving clarity on the pedagogical demands that teachers have when selecting their tasks and the context.

For the goals to be achieved teachers should have the mediating tools that they use. These tools could be from their own interpretation or from the policy document. These would be highlighted in the next chapter, the theoretical frame work.

Chapter 3

Theoretical Framework

3.1. Introduction

In this study the focus is on teachers' selection and the use of context-oriented activities in relation to the teaching of Mathematical Literacy (Maths Lit). I will consider this selection and use in relation to the kinds of contexts advocated for use in the Maths Lit policy, and the goals highlighted. In this instance, goals can be defined as things that are perceived as needing to be achieved in order for learning to occur. The focus will be teachers' selections and uses of context in relation to the Maths Lit goals that have been indicated in the NCS policy and described in chapter 2, and the ways in which the policy suggests how these goals should be achieved in relation to pedagogy, task selection and use. Vygotsky's theory of mediation (1978), which conveys the notion that goals are achieved via mediating tools, will be used. This theory studies the interaction between the subjects (ML teachers involved) and the object (their ML curriculum goals), and the contextual tools used for mediation within this relationship. This theory will be useful in my study as it provides a means of exploring Maths Lit goals from the policy document and the mediating tools advocated for teachers to use in order to achieve the goals. Furthermore, this theory will shed light on the teachers' constitution of Maths Lit goals and how the selection and use of contexts in Maths Lit teaching mediates the process that leads to the achievement of these goals. There will be a comparison between policy goals/ tools and teachers goals/ tools.

3.2. Vygotsky's Mediation theory

The notion of Vygotsky's theory of mediation (1978) is that "all intentional human action is goal-directed and tool-mediated by cultural artifacts or tools" (Venkat & Adler, 2008, p.127). This theory focuses on the relation and interaction between the subject, object and the tools. The subject is considered to be an individual who will be interacting with the tools in order to achieve what they perceive to be goals of the activity.

The concept of mediation within Vygotsky's writing (ibid) is depicted in the diagram below:

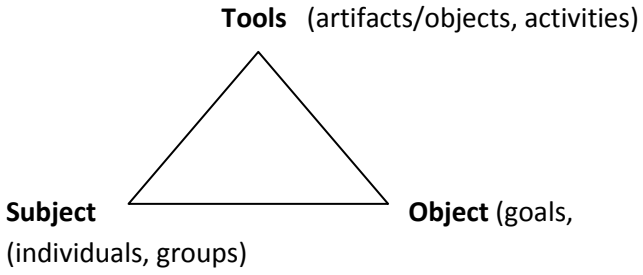


Figure 1. The basic triangular representation of mediation: **(***Borrowed from Engestrom's methods in his Vygotsky-based activity theory)*

This diagram represents the nature of subject-object relations. The term 'artifact' is used in other literature to replace tools, even though the original model (Vygotsky, 1978) uses tools. Tools according to Vygotsky, as described by Daniels (2001) are" devices for influencing the mind and the behavior of oneself or others" (p.15). These tools are used as the means by which the interaction between the subject and object are mediated. The use of these tools will vary in terms of the context and its function and the subject's development (Daniels, 2001). This variation could also be influenced by the fact that there are three classes of mediators that Vygotsky identified: material tools, psychological tools and other human beings (Daniels, 2001, p.17). Psychological tools are the tools used to influence or direct the mind and behavior; material tools are mostly referred to as physical/technical objects that are used to bring about change, the "form of labour operations" (Vygotsky, 1991; cited by Daniels, 2001, p.16). In this study I will focus on contexts selected and tasks created as the material 'tools' being used to mediate Maths Lit teaching with particular kinds of goals in mind.

Daniels (1993) states that "Mediation[al] means always empower as well as restrict human action in specific ways; they influence the form interaction take and thereby the goals that emerge in the interactions" (p.79; 112). This suggests that the tools selected to mediate the interaction – open up different possibilities for Maths Lit learners' goals in classrooms. The NCS policy indicates the type of contexts that might be considered appropriate and the tasks the learner should engage in, in order to promote policy formed goals.

Mediation takes place between the subject and the object, where the subject is the individual in action, and the object being its motivating force (Daniels, 2001). In the literature that surrounds this theory, the motivating force is described as the goal that the individuals want to achieve at the end of the activity.

In this study my focus is on tasks and how they are used. According to Cole and Engestrom, (1993) “Tools are the auxiliary means by which interactions between the subject and the object are mediated” (p.16), therefore, they mediate the subject-object relationship. The function of the tools is to “serve as a conductor of human influence on the object activity; it is externally oriented” (Vygotsky, 1978, p. 55). They influence the human activity that leads to the attainment of a goal or outcomes.

3.3. The application of the mediation theory

In order to analyze the relationship between tools and goals promoted within Maths Lit classes, I will use Vygotsky’s (1978) model of Mediation (figure 1).The model looks at the relationship between the three components of Subject, Object and Tools. However, this triangle helps me to understand the relationship between the object and tools within the teacher level, but gives no explicit format for comparing with policy goals and tools. Thus, in this instance I have extended the model to include a second triangle which will then help me to compare and contrast the information from the teacher level and the policy level.

To create the two triangles I have adapted Vygotsky’s (1978) mediation model by borrowing from Engestrom’s (2001) method in his Vygotsky-based activity theory, a theoretical way of comparing policy and practice. This method of comparing policy and practice has been used by Venkatakrishnan (2007) and is described in Venkat and Adler (2008)

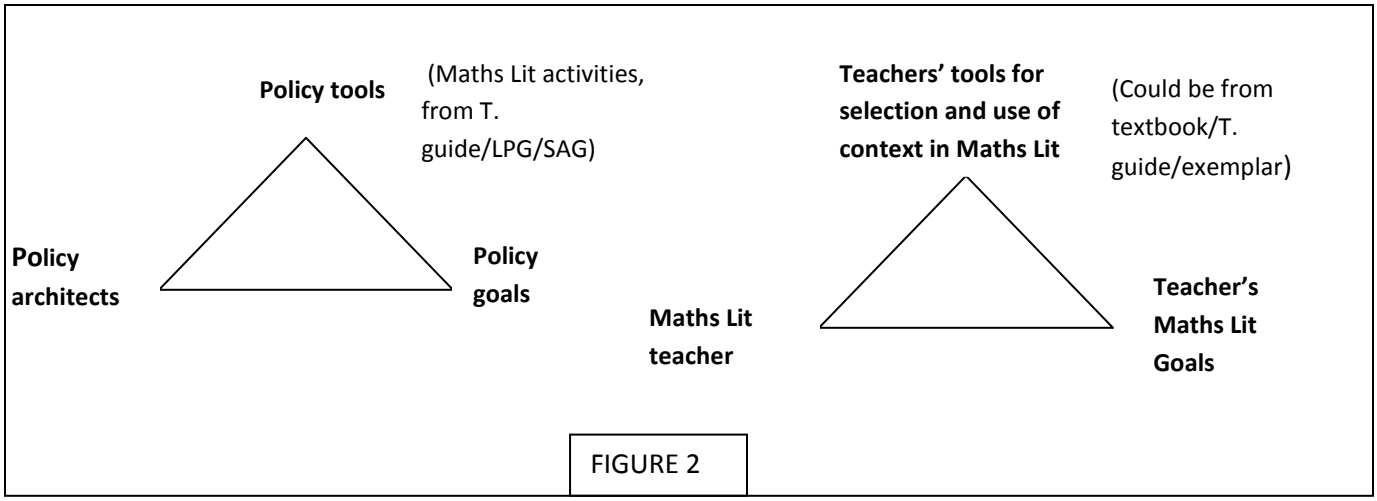


FIGURE 2

I have varied from the Engestrom model in order to allow for different goals across policy/practice. Engestrom’s model focuses on the interaction of multiple

collective activity systems that have to align their activities. My research problem is focused on understanding the degree to which individual teachers' select and use context as aligned with what the ML policy advocate. Because my focus is on individual teacher's activities rather than on collective activities, I borrowed Engestrom's principle of interacting systems, but retain Vygotsky's focus on individual action. The principle of having two triangles with the same variables is what I will use. In my study I will be comparing and contrasting the two triangles.

In this model the first triangle looks at the Maths Lit policy and the second triangle looks at the implementation of Maths Lit policy by the teacher. When looking at the two triangles, the policy goals refer to the Maths Lit policy goals, Policy tools refers to the ways in which policy documents advise that these goals can be achieved, with specific attention to the nature and range of contexts suggested for use.

In this model the Maths Lit policy tools could be viewed as the mediating tools advocated within a policy document, while the teachers' tools refers to the tasks they have selected for use in their classroom. "The main thing which distinguishes one activity from another is the difference of their object (Leont'ev,1978; cited by Daniels,2001, p86) In this scenario the Maths Lit goals change their role due to the fact that the subject and tool has changed. That is why Lee (1985), and Vygotsky(1981) cited by Daniels (2001, p.16) describe the tools as means that "alter the process of a natural adaptation by determining the form of labour operations" (Vygotsky,1981), and "tools [that] are externally oriented towards a goal, [are] a mere instrument in the hands of its user who controls it (Lee, 1985). In terms of the models, the policy developers are the subject in the policy triangle and the tools selected will be related to the contexts advocated to achieve the goal that is to be achieved (Maths Lit goals), while in the teacher triangle, the subject is the teacher, and the contexts form the tools the teacher selects, which are oriented towards their Maths Lit goals. In comparison to policy goals, (Maths Lit goals) these could be social, life and mathematical goals.

In the last chapter, I outlined Maths Lit policy goals at the level of rhetoric: social goals, life goals, and mathematical goals. At the broader level policy rhetoric suggests that context selected (tools) should be drawn from everyday life and authentic situations. However curriculum specific is also a tool that mediates mathematical goals where context selection (tool) should be guided by the mathematical content to be learned. The Assessment standards are predominantly consisting of mathematical content and Learning outcomes are mathematically framed. There seems to be a contradiction within the Maths Lit policy, at the goals levels the emphasis is on contextualization mean while on the

tool levels the emphasis is on mathematical content. There is no synergy between the tools at the purpose level and on the curriculum specification.

In terms of what I indicated above the Maths Lit context and tasks developed from contextualization could be considered as the tools as they describe how the relationship between the subject (teacher) object (teacher's Maths Lit goals) is promoted within Maths Lit classes. Maths Lit tasks used as described in the NCS policy document, states that teachers should promote the Maths Lit goals through the use of context in their classes. In this description there is an inter-dependency relationship that is portrayed between the Maths Lit tasks used, Maths Lit goals and the teacher.

I have chosen this model because I want to use it to establish how the components (Teachers Maths Lit goals and context selected to achieve them; Maths Lit policy goals and the Maths Lit tasks) that I have identified will interplay in the teaching of Maths Lit. In the literature covered in the last chapter, Graven & Venkat (2007), Jablonka (2003), Jablonka, Gellert & Keitel (2001), Julie (2006) and Skalicky (2005), suggested that teachers may not be effectively merging their pedagogical activities with the Maths Lit goals, and that they may be having their own pedagogical agendas. Furthermore, there could be contradictions between their views and goals in relation to Maths Lit and the Maths Lit policy goals, and the nature of the tasks they select to achieve them i.e. in relation to use of authentic tasks and promotion of social transformation and self managing person/ other. The literature, further reveals that these contradictions could occur due to the teachers interpretation of the policy goals, i.e. assume that the focus should be on the mathematical goals, and not on social and life goals. There is also evidence from the literature that the teachers' tools also contribute to the contradiction, as they choose them based on the inherited interpretation of the policy. Lastly, the literature reveals that the teachers' contradiction could exist due to the way the policy is written. It consists of contradictions, where the Assessment Standards and the Learning Outcomes don't explicitly reflect the goals of Maths Lit as stated in the definition and the purpose. The Learning Outcomes and most of their Assessment Standards are mathematically presented, and this could imply that the goals that are to be achieved will be more mathematical inclined – focus on mathematical skills, than on competences on how to interact with the world.

In my analysis I will compare teachers' practices with policy-advocated practices and analyze the extent to which they complement each other/ contradict each other. Within the policy, there are expectations that the Maths Lit goals from the policy and the teachers' selection and use of tasks have to match each other for Maths Lit to be implemented appropriately.

This theory plays a vital role in this study, as it provides the means for me to analyze my data, such as the notion that the tools and goals may change due to the context presented, and the goals will depend on the type of tools the teachers used. My study focuses on the selection and use of context for tasks in the Maths Lit classes, the way teachers select the context and use depends on the goals they have and their pedagogical means. At the same time this theoretical framework will assist in providing answers to the research questions. When analyzing the teachers' responses and the learners' books, I will be able to view each in terms of the goals and the tools that underline the tasks used in grade 10

Chapter 4

Research methodology

4.1 Introduction

The method of data collection plays a crucial role in research, as it assists in the gathering of relevant information that will answer the research question and to some extent also provide information not anticipated. My research question is to investigate a sample of teachers' use and selection of context oriented tasks for their grade 10 Mathematical Literacy learners. I used both qualitative and quantitative methods to gather data and analyze it. I administered different data collection tools, such as interviews, and analysis of documentary evidence in the form of learners' workbooks. For validation purposes the method of triangulation was adopted during data gathering.

The interpretive paradigm was used in this study, where reality is constructed and the research processes "give equal status to participants and welcome diversity of perspectives" (Burton, 2008.p. 61). Using this paradigm enabled me to be able to construct information from multiple sources i.e. interviews, learners' workbooks and work schedules. This contrasts with a positivist paradigm which operates with a "clearly defined parameter, following a pre-determined procedure" (Burton, 2008, p. 61).

To strengthen and deepen my argument I used both qualitative and quantitative approaches in my study – a qualitative approach was used to describe the events and offer explanations (Burton, 2008). This was used more in the analysis of the interviews, where the teachers' description and explanations were analyzed. When analyzing the learners' books and the work schedule, a quantitative method was used "measuring the amount and providing an indication of the scale of an issue" (Burton, 2008, p.61). The same quantitative method was useful in the identification of emergent categories. Quotations were used to exemplify themes and offer insight into the analysis of the interviews and to be able to identify trends in relation to contextualization.

4.2. Empirical setting and Sampling

This study took the form of a multiple case study, in which four teachers from different schools were interviewed and samples of their learners' workbooks were analyzed. I have chosen to use a case study because I want to "investigate a contextualized contemporary phenomenon within specified boundaries" (Hatch, 2002, p.30). The Mathematical Literacy principle of contextualization is relatively new in South Africa, with the notion of 'themes' and 'relevance' associated with Curriculum 2005 in the GET band some 10 years ago, within the mathematical frame and incorporated in Maths Lit with social, life and mathematical frame. To engage in an effective investigation I had to have a specific boundary, that is focusing on four teachers teaching Maths Lit in grade 10. The individual teachers were selected on the basis that they were teaching grade 10 Maths Lit, and on the basis of differences in their knowledge and experience of Maths Lit. My sample of four teachers consisted of two sets of teachers; two teachers who have taught Maths Lit before and two who were teaching it for the first time, with all teachers willing to participate in the study having given their informed consent. I used this criteria based on the assumption that the teachers who had taught Maths Lit before would experience fewer problems with the concept of contextualization within Maths Lit and bring greater awareness of Maths Lit goals. In contrast, I expected that the teachers who had not taught Maths Lit would be less knowledgeable with Maths Lit principles and goals, and that their background knowledge might be more mathematically inclined as they were previously teaching pure Mathematics. At the same time, I wanted to investigate whether teachers who were teaching Maths Lit were able to select and use contextualized tasks in their classroom regardless of their teaching backgrounds and prior experience.

This data was collected during July 2009 (the first interviews) and September 2009 (Second interview) from four teachers who were selected from different schools; two schools are ex model C school, located in suburban areas and two are exDET schools located in the same district. Below is a table that summarizes the four teachers and Maths Lit teaching experience:

classification	Teacher 1	Teacher 2	Teacher 3	Teacher 4
Type of school	Ex-DET	Ex – model C	Ex –Model C	Ex – DET
Location of the school	Township	Suburban	Suburban	Township

Experience of teaching Maths Lit	Started from 2008, it was his second year	It was her first year in 2009 of teaching Maths Lit	It was his second year of teaching Maths Lit started in 2008	It was her first year of teaching Maths Lit in 2009

This table provides a breakdown about the teachers and their experience as Maths Lit Grade 10 teachers, indicating which teachers had prior experience of Maths Lit teaching and which were teaching it for the first time. It also indicates the type of school and the area where each teacher was located. I have chosen these schools as a sample that represented the type of schools that exist within the focal District. I chose this differentiated sample, not as the central focus of my research questions, but because there is an assumption that Ex model C teachers are better qualified, or are more knowledgeable that those in the ex DET schools, and that the quality of education offered is different based on this distinction. Whilst not central to the study, the teacher sample allowed me to gain additional insights into this issue.

The study was approached with the assumption that all these schools – given that they all fall under the Department of Education, - and which are therefore supposed to be implementing the same policy, aiming for the same ML goals would be organizing teaching and learning in their Maths Lit classroom in context driven ways, and thus, that the tasks selected should be contextualized. The study was also approached through, with awareness from the literature, that context driven teaching was likely to be present to different degree and with different agendas.

In each school the selected grade 10 teachers were interviewed and samples of their ML learners' workbooks were collected from three learners in each teacher's ML class. Overall therefore, I had a sample of 12 learners' books. The teachers were requested to provide 1 book from a high performing learner in their class, 1 book of the learner who was an average achiever and 1 book from the learner who was struggling. The rationale behind this criterion was to provide a window both into the nature and range of tasks (contextualized and non-contextualized) that learners had covered, the extent to which context was engaged with in learners' work with tasks, and to see whether there were differences in both these aspects based on learner attainment. I assumed that the inclusion of high performing learners would allow me access to most of the tasks that had been set, whilst the other two learners might have covered less.

Looking at learners' workbooks gave me an overview of the ways in which tasks presented by the teacher were solved by learners in the class – with the sampling, allowed me to see whether the same work was set across the class or whether the higher achiever received different work or additional work. In each book, I looked at the activities that were done in term 1 and 2, based on the fact that these were the two completed terms at the time of data collection.

My focus was on the tasks covered in terms 1 and 2. I selected terms 1 and 2 on the basis that many teachers in grade 10 do more work in term 1 and 2, with this reflected in district level work schedules also (GDE,2009). This did mean that by the time of collecting the data, term 3 and 4 work was not yet covered The focus on term 1 and 2 only does represent a limitation in terms of the data gathered for this study, in the sense that I could not have a complete picture of contexts used across a grade, but as stated already, work schedules showed more work being completed in these terms than later in other terms. To try and address this limitation, and given recurring reference to the district-level work schedule by participating teachers, the work schedule was analyzed as an emergent data source so as to be able to give the picture of the contexts that were advocated to be used throughout the year This schedule was provided to schools by the facilitators as part of planning and as one of the tools that teachers should use to assist them in teaching Maths Lit, by providing the topics to be covered, the context/ content to be used and the Learning Outcomes that are to be covered.

In the work schedule I looked at the organization of the Learning Outcomes across the terms, and looked at the contexts included or provided for the teachers and how the work to be completed was distributed across the terms. This assisted in establishing if the principle of integration across Learning Outcomes was implemented and related to contextualization. It also provided information about the content that needed to be taught in Grade 10 Maths Lit classrooms.

I interviewed each teacher twice. In the first interview, relatively open semi-structured questions were used focusing on their understanding of Maths Lit, the context selected and used in the classroom, and the tasks given to the learners. In the second interview more structured questions were used with the focus on probing what had been seen in the learners' books.

4.3. Data collection instruments

Three data collection instruments were primarily used in this study, the two interviews, analysis of the district work schedule and the review of the sample of

learners' workbooks. The interviews were carried out with the teachers before and after the learners' books were analyzed. The interviews were structured in two parts, firstly I had semi-structured interviews followed by structured interviews after I had reviewed the learners' books.

The semi-structured initial interviews were used to find out what contexts teachers select and use in their classes and why, and also to find if they have any preferences within their selection. I also wanted to explore their understanding about the use of context, and contextualized tasks in Maths Lit. I then proceeded to evaluate the learners' workbooks and investigated the degree of contextualization within the tasks and looked at how these supported what the teachers had said in their first interview. After evaluating the learners' books I then did a follow up interview based on what I had seen appearing from the learners' workbooks.

4.3.1.1. Interviews

Interviews helped with gathering information about teachers' understanding of Maths Lit, their goals in relation to contextualized tasks, how they select their context, what goals guide their selection of these contexts for their tasks and also on the type of contexts they have selected, and how they use these contexts in their Maths Lit teaching. I then used the learners' books to examine what the teachers said in relation to what appeared in the learners' workbooks. Thereafter, I did a follow-up interview with the teachers based on the findings in the learners' workbooks and to find out more about the teachers goals, assuming that these goals informed their selection of contexts. I also explored the alignment of contexts selected with those suggested in policy documents. Furthermore, I tried to establish how the teacher used these contextualized tasks within the classroom. Whilst observations may be appropriate in this instance, my interest was on finding out about teachers' aims for the use of context in their task – a feature that I feel is hard to get at, unless you ask the teacher about his/her actions. Whilst there were contradictions at some point between what teachers said and what appeared in the learners' workbooks in relation to their goals for the use of contextualized tasks, I feel that my analysis of a sample of learners' workbooks gave me some insight into such contradictions – which were then subsequently followed up with a further interview.

Interviews made it easier to analyze the data, as the main questions were used as "categories" or "frames" as Hatch (2002) puts it in her explanation of a typological analysis. This provided an initial framework for analysis (Opie, 2004, p.119). At the same time, however, I remained open to following up on teacher

responses in my analysis, as this enabled one to cover the data that emerged from the information collected which were not the main questions or "not completely determined"(Opie, 2004, p.119) – they emerged due to the probing. According to Hatch (2004), the researchers' predetermined agenda which arises from the structured interviews, lead to predetermined categories, which will limit the researcher to being able to identify other important dimensions. Thus, the use of semi structured interviews addressed part of this limitation or weakness within the typological analysis.

The first interview questions were focused on gaining information on the teachers' understanding of Maths Lit, the types of tasks they had selected for their learners and the context selection for those tasks and how these contexts were used within ML teaching. The second interview focused again on their ideas of what Mathematical Literacy is about, and the sources of these ideas, and what helped them to develop these ideas about Mathematical Literacy. It also focused on the type of tasks they had given their learners, with teachers being asked to explain how they selected specific tasks seen in the workbooks and what guided them to select these tasks and contexts.

As part of data analysis, the data from the interviews was presented in table form, to enable a comparative summary of what each teacher said during the interviews. The categories used here originated from the research question, and interview questions used across the interviews and the work schedule analysis. This was done to provide an overview analysis of what each teacher said in relation to each category.

The data from the interviews were first classified according to the categories that originated from the interview questions such as: understanding of Maths Lit; context selection in Maths Lit; and the use of context in the classroom. In each category, the data were analyzed using the literature reviewed – linking it to the concepts of Maths Lit seen in the literature; the goals of Maths Lit and contextualization in Maths Lit, by critically analyzing if the data reflected goals of Maths Lit and applied the principle of contextualization as discussed in chapter 2. Furthermore, the Agenda's by Graven & Venkat (2007) discussed in chapter 2, were also used to analyze some of the categories i.e. the tasks selected in Maths Lit and the context selected in Maths Lit by linking them to specific pedagogic agendas. I then used some of the literature to support the argument of classifying the data in terms of the agendas.

The same interviews were further analyzed using the theoretical frame work to analyze and explain teachers' selection of particular contexts or content for their

classrooms as mediating tools to achieve their goals. These goals could be in line or contrary to the goals in the policy document.

4.3.1.2. Work schedule

Due to the fact that the work schedule was referred to by all four participating teachers, as one of the documents used to select the context and the tasks they gave to the learners, I decided to include the work schedule as a data source and analyze it so as to have a clear picture of how the use of this work schedule influenced the way teachers select and use context oriented tasks.

The district facilitator of Mathematical Literacy provided a work schedule to all the schools that fall within the focal District to follow (see appendix 4). The emblem and the title suggest that this document has been provided by the Provincial Department of Education. This document consisted of the following headings;

- Dates on which the topic should be started and completed
- Topics that have to be covered within a stipulated time frame e.g. rounding and estimate, perimeter, loans
- The content/ context that has to be covered for each topic e.g. draw graphs –point by point plotting of data, buying property, distributive law, cell phones etc.
- Learning outcomes and Assessment Standards that are covered in each topic
- Assessment, focusing on the formal assessment that the learners have to complete for portfolio purposes and on which topic those assessment tasks are based and
- Date completed the topic

An extract from the 2009 work schedule in shown in figure 3 below:

PROVINCE
MATHEMATICAL LITERACY – WORK SCHEDULE – GRADE 10

DATE	TOPIC	CONTENT/CONTEXT	LO/AS	ASSESSMENT	DATE COMPLED
TERM 1					
14/1 - 16/1	Rounding and estimation		10.1.2		
19/1 - 23/1	Scientific calculator, fractions and decimals	• Working with formulae by hand and with a calculator • Associative, commutative and distributive laws • Decimals: Addition, subtraction, multiplication, division	10.1.1/ 10.1.3		
26/1 - 30/1	Percentage		10.1.3		
02/2 - 06/2	Ratio and proportion	Direct and indirect	10.1.2/ 10.1.3		
09/2 - 13/2	Simple interest	Annually, half-yearly, quarterly, monthly	10.2.1		
16/2 - 20/2	Compound growth	Annually, half-yearly, quarterly, monthly	10.2.1		
23/2 - 27/2	Loans	E.g. BUYING PROPERTY • Bonds and Transfer Fees • Monthly Repayments • Actual Costs • Reducing Cost of Loan • Which bank, which bond? • Interest Rate Changes		Investigation	
02/3 - 06/3	Entrepreneurship		10.2.1		
09/3 - 13/3	Conversions	Units of measurement and convert measurements within the metric system (*km* to *m*; mm^3 to *litre*; km^2 to m^2; cm^3 to m^3)	10.3.2		
16/3 - 20/3	Currencies	E.g. CELL PHONES • Cell phone billing • Contract vs. Prepaid • Calculating VAT/tax • Credit Cards	10.2.1		
23/3 - 27/3	Test				

[figure 3]

The work schedule was analyzed using some of its headings i.e. topics, context/content and LO/AS (Learning Outcomes/Assessment Standards). The topics were analyzed using categories which emerged from the literature. These categories emerged from viewing the degree of emphasis on either the mathematical/situational. This links with Julie's (2006) identification of the range of interpretations of the nature and purposes of Maths Lit, of the topics specified and described in the schedule. Thus the words 'mathematical' and 'situation' were used and the topics were classified as either more mathematical or situational, with an explanation of my indicators placing topics in one or other category indicated in the table below (table 1.3):

Mathematical and situation topics

	Mathematical	Situation
Explanation	Topics which are mathematically focused, without relevance to a context or situation	Topics which involve some kind of situation, with embedded mathematics
Example of topic tittles from the work schedule	Distributive law, working out fractions Ratio, simple interest	loans, entrepreneurship and currencies

The context/content and LO/AS headings were analyzed using the literature reviewed and the policy document. The LO/AS heading was further analyzed in terms of their sequence and links within topics in the work schedule. Lastly, there was a comparison between the number of topics per term and the number of topics which address each Learning Outcomes. This was linked to the concept of integrated contextualized and mathematically oriented topics.

4.3.1.3. Learners' work books

The learners' work books were included as a data instrument to understand how teachers' comments about Maths Lit and use of context relate to what learners had recorded in their books. This data source provided triangulated evidence on the selection of context oriented tasks by the teachers and to investigate the degree of contextualization within the learners work. 12 learner workbooks were reviewed and their work was classified in groups i.e. work of the learners in school 1 for teacher 1 their work was labeled LG1 (learner group 1). Each learner group work was looked at and information from term 1 -2 was viewed and analyzed.

The learners' workbooks were analyzed using a continuum originating from Graven & Venkat's (2007) work which talks about the 'agendas' that look at the nature and extent of the link between content and context in teaching. In this instance I used this continuum to look at the learners' work on the tasks, rather than Maths Lit teaching which is what the original work did. The continuum from Graven and Venkat' (2007) started from content-oriented and ended with contextualized tasks. The learners work was classified according to it. Furthermore the learners' solutions were analyzed to establish the degree of attention to context and context authenticity and relevance to the learners' everyday life. The elements indicated by Skalicky (2005) in the literature

reviewed were used to strengthen the argument about context and its authenticity during the analysis process. Moreover, some of the examples from the learners work book were analyzed using the policy goals of Maths Lit of social transformation, mathematical goals, and life goals and whether they promoted the concept of using localized context as indicated in the policy documents. In terms of the theoretical framework, I investigated how the tasks mediated the Maths Lit goals as envisaged in the policy document or whether they were more on the side of promoting the teachers Maths Lit goals, (where teachers' goals and policy goals were misaligned).

4.4. Tools for recording data

In my research I used both methods of tape-recording and note-taking within the interviews. Note-taking was useful when I was conducting the semi-structured interviews, as the notes gave me an opportunity to immediately ask a follow-up question to the interviewee based on their response and to gain clarity on contradicting ideas. Tape-recording provided repeated access to the overall data set – which was useful for in-depth subsequent analysis (Opie, 2004).

In both types of interviews (structured and semi-structured) I used the method of tape recording even though note-taking was also done in the semi-structured interviews. This assisted in limiting the bias and the questionability of the status of the data.

Given that the focus of my research is on teachers' selections and use of contexts within ML, I needed additional data to check whether what teachers said about these issues, was mirrored in their practice. Observation could have been used as another method of providing the additional data, but it could not offer insights into why things were done in a particular ways. Also observations mostly provide data that focus on teacher-learner interaction, revealing the behavior and characteristics of the group. In my research the focus is on the selection and use of contextualized tasks in the learners' books. These documents were able to provide evidence on this issue, to provide evidence of what tasks a learner had access to 'taken away and revise from' out of their Maths Lit. According to Wiggins cited by Skalicky (2005) an authentic task should ask learners to use knowledge and skills to solved unstructured problems, and utilize knowledge and abilities as they would be utilized in the real world (p. 6). This kind of information, observations; tape-recorder interviews will not be able to provide. Subsequently an analysis of learners' workbook was able to provide such information, as learners' work allowed insights into whether the tasks and the contexts that were

used within the class were authentic or realistic, based on what the learners had written and their solutions. Documents also provide unwitting evidence that is information, which the teacher did not knowingly include, reflecting a particular reality (Burton, 2008). Thus, through this documentary analysis of workbooks, I would be able to see not only how the teacher had interacted with the learners, but see if the learners were working in context with the context selected, or whether they were more focused on the content the teacher wanted to teach.

Interview 1 was able to provide an answer to the first research question, which focused on the type of contexts the teachers selected, and the learners books provided more evidence on how the contexts selected by the teachers had been executed, and how learners were expected to engage with them. The use of documents thus provided nuanced and detailed evidence for my research (Burton, 2006). The inclusion of the work schedule as a data source, provided evidence and insight about the Learning Outcomes addressed and the proposed contexts that teachers had to use which partially answered the question that focused on the teachers' goals for selecting a particular context. The learners' books and the second interview also assisted in the collection of the data that provided answers to the question that focus on how the context selected relates to the advice given in the NCS policy documents, as the teachers were asked questions based on the work they had given learners and on what guided them to select the types of contexts and tasks they gave the learners. Meanwhile the learners' workbooks also showed the ways in which the contexts selected aligned with/contradicted the Maths Lit goals, in relation to the use of real life context, and problems with their solutions provided insight into the degree to which reflects the Maths Lit goals and tools as listed in the Literature review were evidence.

4.5. Reliability and Validity

In terms of ethical practices, I planned the time and venue to administer the interviews. I ensured that the conditions were conducive and there were no interruptions and that the interviewees were aware of the aim of the research, its purpose and how the data generated would be used. Also as suggested by Opie (2004, p. 116) "the method of recording… negotiated in advanced", this was to avoid on the day of interview to be requested not to use the tape-recorder as the respondent might feel intimidated. To ensure validity of data, the method of triangulation was used to bring together data from "different sources by means of different method reflecting different perspectives" (Burton,2008.p. 170). The different methods were teacher interviews evaluation of the learners' workbooks

of learners taught by the same teachers, and thereafter, re-interviewed the teachers again, thus strengthening the trustworthiness of the research process (Burton, 2008). The use of documents became useful as it allowed for reliability checking; since one could reanalyze the data as it will still be in its permanent form (Burton, 2008)

4.6. Ethics

Within my study, there were ethical issues that I had to address, before collecting the data, such as the issue of confidentiality and participation with informed consent. All participating teachers were provided with an information letter (see appendix 3) which informed them about the research study, and which requested permission to collect data from the school. Within the information letter, the teachers were informed about who would have access to the information they provided; as teachers might hesitate to disclose all the information and provide honest opinion with fear that they might put their school in trouble and their job may be affected, as they do not know who will have access to such data. I also detailed the issue of information dissemination, as the teachers may have hesitated to participate, if they were not sure if they and their schools were "sufficiently protected" (Opie, 2004, p. 31). Concerns on how they were going to be presented in the research report, as it might damage their self-esteem and it may have other implications (Opie, 2004) were also discussed with the teachers.

To address the issues stated above, teachers and learners were given information forms requesting them to participate in the study, and stating that they had the right to withdraw from the study at any given time. Guarantees of anonymity were given, and this was exercised in the research writing where their names were not used and instead, abbreviations such as T1 have been used to represent the teacher from school 1and LG1 to represent the work of the learners from school 1. The information they provided were kept confidential in terms of the names of their schools. Furthermore, within these forms, it was stated how the information they have provided would be used. Permission for the study was also gained from the provincial Department of Education forms as I requested authority to conduct the study within the four institutions. Lastly, Wits Ethic clearance forms were completed and submitted. In all these forms, the issues of confidentiality, honesty, dissemination of information and requesting permission to access information was addressed in details to ensure that teachers and learners have been sufficiently protected.

Chapter 5

Findings and analysis

5.1. Introduction

In this chapter, findings from each data source are discussed and analyzed using the literature reviewed and the theoretical framework. To begin this chapter I present a summary of what each teacher said from both interview 1 and 2. This was done to provide a picture and tell the story of each teacher from their perspectives. Within each teacher's story, there were some recurring references which emerged. In some cases, these were due to the nature of questions which were asked during the interviews, but in other instances, categories emerged from the nature of teacher responses. These references led to the identification of the categories which were used to discuss and analyze the findings across all four teacher interviews. These categories were then used to go back and analyze each data source more rigorously in comparative ways i.e. interview 1 and interview 2. The work schedule was included as a data source, due to the fact that teachers kept on referring to it during their interviews, and it therefore seemed to be an important influence on how teachers selected and used context oriented tasks within their grade 10 Maths Lit classes. To conclude the chapter, I look across the separate analyses of all data sources and note the overlaps and contradictions presented across them, and comment on how looking across a range of sources can inform both further research and teacher development work for Mathematical Literacy.

5.2. Background

Teacher 1

Teacher 1 was a male from a township school. He had been teaching grade 10 Maths Lit since 2008. Previously, he had taught Mathematics. He stated that what he found interesting about Maths Lit was that it involved application of Mathematical problems in real life situations. He added that he sensed that it (Maths Lit) was not abstract like Mathematics.

In his first interview, he indicated that Maths Lit is about basic Maths where everyday objects and situations are used in order to understand content.

"…So one time when I was introducing fractions I had to buy some apples, take an apple as a whole then develop my lesson from there…"

He stated that the use of context as an introduction to the content helped learners understand content and made Maths easier. Later, in the same interview though, he indicated that Maths without context was also important, that sometimes thus you have to teach content then apply the content in the context.

"Personally I start with content that learners have to know then apply this to everyday life so as to make sense to them"

At the very least, there appears to be an indication that sometimes Teacher 1 works from context into content and other times from content into application in context. An example he gave indicated his use of a sequence beginning with context and leading into mathematical content is:

"Initially, I used every day examples to introduce interest, what interest is, like I used 'mashonisa' [money lender] before I could even go to the banks, then explain it from there, then link it to the term interest"

In both instances an underlying implication that emerges is that the teacher's focus on the content, with context acting in the service of content.

Within this first interview all tasks that Teacher 1 described were located in Learning Outcome 1. He talked explicitly about tasks related to Simple and Compound interest, Loans, Percentages and Fractions.

In interview 2, he talked about how helpful the textbook, work schedule and the policy document where when it came to his selection of tasks and contexts to use in the classroom.

"In Maths Lit there are guidelines that learners should know about this from the work schedule, where they will have the content, on the other side have the application items… I also get ideas from the policy documents, and from how best I can deliver this lesson…. Lately I use 'Successful Maths Lit', 'Oxford Mathematical Literacy', then 'Spot On' is used as it's more simplified for my learners"

These comments suggest availability of range resources, and at least some level of active reference to the resources available, also reference to the need to 'simplify' the mathematically-oriented topics that he explicitly refers to predominantly.

Teacher 2

Teacher 2 is from the school located in the suburban area. She had been teaching Mathematics and Natural sciences before teaching Maths Lit and 2009 was her first year of teaching Maths Lit. She stated that she liked Maths Lit and gave reasons based on the fact she felt it was about everyday life - "things that are happening in our everyday life". This comment alludes to her sense that the tasks covered are relevant. She noted that she liked Maths Lit even though the subject involved a lot of reading. She stated that she viewed Maths Lit as the Maths that makes things 'easy' for the learners, and that learners understood it better than Mathematics. When introducing a task she stated that she worked from context to content. This is explicit in her example of how she introduced the context of recipe:

> "Recipes are about measurements - they put things together if I want to do this, what is it that I need to do? First I must have the ingredient, and for those ingredients how many for each ingredient, what will be the measurements; so they know grams and kilograms things they see everyday …"

In this statement, the idea of engaging the learners with the context is emerging, making them think about what is happening in their every day lives

She emphasized that she preferred to work from content to context when selecting the task, and that she looked for contexts that would be suitable for the content she wanted to teach and she believed that these contexts would help learners to understand the content better. This suggests that in her case content determines context selection, with contexts selected based on what will make the mathematics accessible to the learners. This is expressed in her statement below:

> "so they know grams and kilograms, things they see every day unlike building, they know about it, but it is not as easy as recipes where we talk about grams and kilograms. And the other thing is that they are able to bring it in class and be able to see those things so that's how I chose it [context]… for example if we talk about sugar, then one can see the measurement of it. These ideas I get them from the book [Classroom Mathematical Literacy], and when I read it I found it very appropriate."

When asked about where she sourced her tasks and contexts, she responded that she used the work schedule for selection of topics, and then selected the task related to the topic from the textbook:

"First to select the task I have to go to the work schedule then I take it from there, then to see which task am I going to do, by using Classroom Maths Lit tells me a lot because I am able to select the tasks according to the work schedule"

The tasks described within interview 1 were located in Learning Outcome 1 and 3.

She commented across both interviews (1&2) that teaching Maths Lit requires different resources like newspapers, television, recipes, grocery slips. She emphasized that learners needed to be engaged with the context that is used in the classroom and participate actively i.e. when dealing with recipes, learners had to bring their own recipes and look at the measurements and convert them to the appropriate units such as kilograms or milliliters.

In her discussion above, the idea of bringing relevance to the learners' lives when selecting tasks, resources and context was a recurring feature; this is seen from comments such as 'accessible to learners' lives'; 'they are able to bring into class and see it'

Teacher 3

Teacher 3 is a male teacher from a school located in a suburban area; he was in his second year teaching Maths Lit in Grade 10, and previously he was teaching Maths and Physical sciences. He commented that he found Maths Lit interesting as it could be related to everyday situations and learners were able to see it and relate it back to the work done in the classroom. He commented in both interviews that he understood Maths Lit as 'application Mathematics', whereby learners apply what they have learned in everyday life. He stated that he considered context to be doing 'practical work', where learners go outside and apply the things they have learned in class or in the textbook. When coming to designing tasks and selecting contexts, he stated that he mostly depended on the prescribed textbook, and within the textbook looked for tasks and the contexts that would be simple for learners. He argued strongly that Maths Lit learners lacked basic skills.

"you try to look at the simple things that students could do, you know students have problems basically with Maths Literacy, each time you teach them its like you are beginning from grade 1 and 2 , if you have to explain 10% of R100 is quite something. Basically they don't know the basic operations. They don't have the basic content, there is no content. But when selecting the context it depends on the teacher's preferences on what he is thinking I won't say there is a guideline…"

He argued in interview 1 that he focused on more content related tasks because learners were not interested in context related tasks, and that this resulted in him doing the work on his own because of lack of participation from the learners. He stated that most of the tasks that he administered in class were content focused, and this was mostly dictated by the learners i.e. by their lack of basic content, and their interest in being taught content.

Most of the tasks that he described were based on learning outcome 1 and 3.

The thought of Maths Lit being relevant to learners' lives is raised, but with more emphasis here on teaching 'basic maths'. The idea of context being in service of content also comes out in his comments, even though it is not explicit.

Teacher 4

Teacher 4 is a female from a township school; she understands Maths Lit to be 'basic Maths' which requires the learner to calculate minor problems without any difficult Maths. She was teaching Maths Lit for the first time in 2009, and she used to teach Mathematics. She stated that she liked Maths Lit as learners were not required to engage with a broad range of mathematical skills and calculations – e.g. trigonometry and algebra were not required. She then compared Maths Lit to Mathematics, suggesting that Mathematics was more difficult compared to Maths Lit.

She commented that textbooks and other resources helped her understand Maths Lit. This teacher selected the contexts based on the content she wanted to teach, and then related the content to the contexts. She said that when she taught in her class she started with real life situations, and then brought in content. This means that the selection is based on content, but the order of teaching begins in context.

> "Let's say we are dealing with calculations, for instance, this money you have to buy some thing, you know like loans. Then I will tell them to go to any bank or shop where they make loans, and then they must give me calculations on how they have calculated their interests. They must find those things on their own. After that I bring it into the content so that they understand it - that there are some other interests that are charged"

In both interviews she also mentioned that for her Maths Lit was about learners discovering what is happening in their everyday life. Thus she remarked that she

made them look for information on their own, and that in class, tasks discussed consisted of content with the focus on context.

> "Tiling was my example, like for instance when we used this tile thing we were calculating the length times breadth. Let me say when we have fifty something of the tiles we calculate the square meter of the tile then calculate the length of those tiles inside the classroom and then the breadth of the tile inside the classroom, then we find the exact amount of how many tiles exactly are needed in the classes" (Interview 1)

In her discussion in interview 1 about the tasks she had used in her classroom, her descriptions of taskssuggested a mix of context-led working and content-led working based on Learning Outcome 1, 3 and 4. She talked about loans, tiling, and data handling measuring the height of the learners in the classroom. The example of tilling and loans could be interpreted as context-led meaning that these topics focused on context , and her data handling as content-led, since the heading is more mathematically inclined and it is found as a mathematics topic with a focus on mathematical content such as mean, mode, median.

At some points though, she appeared to contradict herself by stating that learners still had to do Maths without context. This was in spite of her argument that Maths Lit was about real life situations. She also indicated that she viewed Maths Lit as brought in to the school curriculum so that learners would be able to do basic Maths, and in her descriptions, stated that they needed to do Maths without context in some instances.

> "Learners should be able to calculate Maths whereby they have to be able to use bodmas rule, here we are talking about Maths, learners should be able to calculate percentages, and learners should be able to calculate maybe ratios…"

The idea of relevance to learners' lives is not consistent with teacher 4, and what surfaces as she elaborates her thinking was the idea of engaging with basic Maths, with the context interpreted as being in service of content. This suggests that in some instances the context need not be relevant

5.3. Technique used to analyze the data

Analytic categories

Emerging commonly from the two interviews with each teacher were the following features: how teachers understand the notion of Maths Lit in terms of content/context working order; what resources are needed in order to teach Maths Lit and the nature of coverage of context and of tasks that are given to the learners. At the same time evidence of the goals of curriculum were highlighted and the purpose of Maths Lit. Analytic categories were drawn from common features referred to across the interviews. Most of them were from the interview questions which originate from the research question frame, while others emerged as themes from across the interviews. Respectively, these are:

From interview questions:

- Teachers' understanding of Maths Literacy
- Tasks selected by teachers in Maths Lit classes
- Context selection in Maths Lit classes
- The use of context in Maths Lit classes

From across the interviews and the work schedule:

- The Learning Outcomes addressed in the Maths Lit classes
- Sources for selecting tasks

Presentation in the table below is a comparative summary of what each teacher said under each category. The details of teachers' comments within some sections suggested the need for some sub-categories as incorporated below:

Categories	T1	T 2	T 3	T 4
1.Teachers' Understanding of Maths Lit	It is about basic Maths which is used in everyday life	Maths that makes things easy	Application of mathematics in day to day life	It is basic Maths not a difficult Maths
1a.Teachers' Understanding of context	It is when you bring every day objects to illustrate the concept to be	Use of different resources from everyday life situations i.e.	Practical application of what is taught in the classroom	Examples of everyday objects that can help learners

	learned	newspapers, TV etc.	(content)	
1b.Tools used to understand Maths Lit	Textbook, policy document and work schedules	Work schedule and textbook	Textbook and work schedule	Textbook
2. Tasks selected by teachers	Based on fractions, simple and compound interest, percentage	Based on exchange rates, conversions , measurements-volumes	Based on measurements – area, volume, percentages	Based on measurement – area, simple and compound interest
3.What guided teachers' Selection of context	Based on the content to be taught	Textbook and work schedule	Textbook and work schedule	Based on the content to be taught
3a.Context selected	Mashonisa, loans	Recipes, grocery slips	Painting a class	Tilling the class, loans
4. Use of context	Use the context to help learners understand the content .As an introduction to the content (Maths) to be learned	Use the context to teach the content and apply it to every day life	Used to assist learners in understanding the content To introduce the content that is to be learned	Use it as an activity in which learners apply the Maths learned in every day situation
5.Sources for selecting tasks	Work schedule	Work schedule and textbook	Textbook and the content (from the work schedule)	Content I want to teach and the context which I think is relevant to the learners
6.Learning outcomes addressed	LO 1	LO1 and 3	LO1,3	LO1,3,4

The numbers 1-6 represent the bullet point categories that emerged from the interview questions or from teacher responses. These categories and their sub-categories are linked to the literature reviewed with regards to Maths Lit and are also linked to the theory. Categories 1 and 3 relate to understanding with reference to the Maths Lit aim and purpose and its nature of contextualization. This is also link to the goals of Maths Lit. The sub-categories refer to the nature of tools the teachers used to understand Maths Lit and mediate the teachers

Maths Lit goals. Categories 2, 4, 5 and 6 seem to relate to the Maths Lit goals and the tools used for mediation to ensure that Maths Lit goals are achieved.

Henceforth in this section I have separated the data from different sources into the theory-related categories just described. This allowed me to provide a detailed analysis of what the teachers said in relation to these specific categories, and to see if there was any consistency between what the teachers said in the interviews and evidence provided in the learners' workbook in terms of teachers' selections of tasks in classroom. This analysis also assisted by providing a clear and in-depth picture of the teachers' understanding of Maths Lit's notion of context, and the selection and use of context oriented tasks within their classroom.

5.4. First Interviews

In this interview teachers in the study sample were asked a variety of questions to get a sense of their understanding of what Mathematical Literacy is about. They were also asked about how they select the tasks and the context for their learners, the uses of context within their classroom and the tasks given to their learners.

5.4.1. Understanding of Maths Literacy

When asked about their understanding of what Mathematical Literacy is, the teachers responded in a range of ways. A feature that emerged across all teachers related to the idea that Maths Lit was related to every life:

> "…has to do with day to day living" (T1)
>
> "…is based on the things that are happening in our every day life,… its about things they see every day" (T2)
>
> "I think it is called the application of mathematics whereby they apply what they have learnt in day to day life" (T3)

As teacher 2 and 4 expanded on their understanding, there was a common shift within the first interview to the notion of 'easy Maths' –

> "…Maths that makes things easy for the learners" (T2)
>
> "…learner to calculate minor things" (T4)

In this discussion there seem to be an understanding amongst the teachers that Maths Lit is about everyday life. This is similar to what appears in the NCS document (2003), and what Steen (2001) suggests, about QL, is that Maths Lit is about learners being able to solve problems related to everyday situations. As Saywer, (2006) puts it "[Maths Lit is about] applying Mathematical learning to the solution of real life problems" (p. 650). Vithal, (2006) adds to this, indicating that the problem has to be "known by the broad range of learners and belong to their daily lives" (p38). Graven & Venkat (2006), stress this point by stating that "[Maths Lit has] to be linked closely to real-life" (p. 17). Overall there is a reflection across the teachers that Maths Lit is focused on the problems that are centered on the learners' everyday life.

As the discussion continued on the understanding of Maths Lit the idea of a contrast to Maths appeared in the comments made by three teachers (T1,T2, T4) with the suggestion of Maths Lit as a watered-down version of Maths –

> "ability to understand basic Maths…"(T1)
>
> "…it is much better than the Mathematics…" (T2)
>
> "…basic Maths which requires the skills of the learner in order to calculate minor things, that is not exactly a difficult Maths" (T4)

However, the notion of everyday life receded into the background for two teachers, where they shifted to referring to Maths Lit as 'easy' or 'better' or 'basic' Maths. In some cases references to easy Maths was made in relation to the 'other' Maths.

According to Saywer (2006), teachers' shift from the notion of everyday life, to 'easy' Maths, could be based on the notion of performance, which looks at tests, and learners' ability to do Maths. The tests are often based on more mathematical frames, than on everyday life frames. This notion of comparing Maths Lit to Maths could also arise from the definition of Maths Lit from the NCS Mathematical Literacy document which indicates that Maths Lit is about "…life related applications of Mathematics. It enables learners to think numerically and spatially…" (p.9). which could be interpreted as looking at the ability to do Maths, but in the teachers' case numerically could represent 'easy' Maths.

In the discussions within the interviews, there was evidence that the majority of the teachers understand Maths Lit as involving low level Maths and this was evident from the use of words such as 'basic Maths', 'simpler than Mathematics', 'learners who used to fail Maths now can pass Maths Lit'. This kind of

understanding could be linked to what Bowie and Frith (2006) indicated in relation to the specification of Maths Lit, that it is the remodeling of old standard grade Maths curriculum. The notion of everyday life tended to fade away as we moved further with our discussion. Teachers started focusing on mathematics, and its application to everyday life. Their shift was to indicate that Maths Lit is about applying the learned concepts to the context.

This kind of interpretation had already being discussed as a possible danger in AMESA's (2003) critique of the Maths Lit curriculum statement, where they warned that Maths Lit, should not be considered as "easy/ and applied mathematics, standard grade Mathematics, and watered down mathematics" (p. 3) and Steen (2001), also warned against this kind of view of Maths Lit, Steen's argument was that this route should not be followed even though there might have been statements within the curriculum of using the same terms that are in the Mathematics curriculum such as 'statistics', that does not mean that they are the same, or Maths Lit is a water-down version of Mathematics, and that they[Maths Lit & Mathematics] need not to be compared as they are different in nature and approach. Across these references, AMESA (2003), Bowie and Frith (2006), there is an acknowledgment that this interpretation could have risen due to the fact that the curriculum statement of Maths Lit is framed in the same manner as the curriculum of Mathematics i.e. the Learning Outcomes are the same in both Maths Lit and Mathematics e.g. Data handling, Space, shape and measurement.

Many critiques such as AMESA (2003), Bowie and Frith (2006), and Venkat and Graven (2006), have argued that the Maths Lit curriculum statements consist of mathematical content; that most of the Assessment Standards are more content-led than context-led and focus more on mathematical skills than on context that needs to be demonstrated. These features help to explain teachers' shifting toward the notion of comparing Maths Lit to Mathematics and shifting away from everyday life to basic Maths and applied Maths. This kind of approach also had implications for how the teachers selected the tasks they give to the learners. This is further discussed in the next categories.

5.4.2. Tasks selected in Maths Lit

When teachers were asked about the tasks they had given their learners with reference to their understandings of Maths Lit, in their description they gave examples involving both content and context. These examples included fractions, percentages, exchange rates, loans, Financial Maths – simple and compound interest, volume and conversion from grams to kilograms. When talking about

these content foci teachers identified the context that could be used, such as newspapers, till slips, baking recipes, television, loans, and banks. Teachers' understanding of Maths Lit appears to be related to the content taught and consist of a mixture of basic Maths and context.

> "I am doing fraction, percentages, financial Maths that affects ones life…" (T1)
>
> "We used different resources, like now we are dealing with exchange rates, then when it comes to that one they have to cut clips out of the newspapers wherever they see them. They must even look at the television news where they talk about exchange rates and then take it from there so that they can see what's happening in real life" (T2)

It seems like the tasks are content-driven with context selected being in service of the content as they are related to real life.

Three teachers noted that they selected tasks based on work schedule provided by the district. This prevalence of the work schedule is addressed later in this section.

What emerged from this category was that teachers appeared to understand that tasks given to learners had to include content with context. Tasks selected seem to blend Maths topic (fraction, percentages etc) with everyday life (newspaper, television etc)., There is an interplay in which content related tasks have to be supported by context, with the focus on content. This is similar to the argument raised by Graven & Venkat (2007) that there seemed to be more content in the NCS curriculum document than context and this contradicts the statement that there need to be a balance between context and content.

Furthermore, Venkat and Graven (2006) stated that "the mathematics curriculum [Mathematics] has been 'pruned' significantly in order to produce the [Maths Lit] curriculum" (24). According to this statement, there is an implication that Maths Lit comes from Mathematics, which could mean that Maths Lit can be considered as a subset of Mathematics (Vithal 2006). This kind of view could be one of the contributing factors to the way the teachers selected and used their tasks, that is selecting them using a mathematical approach. The other factor as stated by Vathal (2006) could be the "structure of the discipline, classroom and the obligation to teach mathematics, even if it is contextualized mathematics" (39). In the NCS, the structure (framing or organization) of Maths Lit Learning Outcomes is the same as Mathematics as already indicated in the category above. Within this frame, teachers are likely to feel pressure to follow the more traditional approach of teaching content oriented tasks, and thus select tasks with more content than context. This approach also contradicts what is stated in the

NCS curriculum statement, which states that the tasks given to the learners have to be contextualized.

What emerges from this discussion according to these teachers is that Maths Lit is less driven by everyday life applications. This is in contrast with what the teachers initially stated in the above categories, which indicated that Maths Lit has to do with solving problems related to real life situation, not content related problems. Thus this could suggest that the tasks selected by teachers could be classified under Agendas 3 and 4 of the Spectrum of agendas by Graven & Venkat (2007). These agendas focus on the "nature and degree of integration of context with mathematics…" (p. 75). Agenda 3 and 4 focused on tasks that are mainly content driven and content driven respectively. According to these two agendas, teachers believe that learners have to learn Maths [basic Maths] and then apply it to different context. According to Graven &Venkat (2007), Maths Lit purpose is more inclined to agenda 2 than agenda 3 and 4 as it has been proposed in its NCS Mathematical Literacy document (2003):

> "the approach that needs to be adopted in developing Mathematical Literacy is to engage with contexts rather than applying Mathematics already learned to the context" (p.42).

The initial responses from the teachers suggested understanding of Maths Lit which is in line with the Mathematical Literacy NCS policy document, which states that it involves applying mathematical knowledge in familiar and unfamiliar contexts, and that the tasks should be based on real life context and real-life data (Subject Assessment Guide, 2008, p.7). When elaborating on their initial comments though, it shifted towards more content-focused understanding of Maths Lit.

The NCS policy document indicated that teachers have to engage with context rather than more exclusively on mathematics content. This means that teachers need to use tasks which are context driven, in line with the initial understandings that were communicated. The kinds of context teachers selected for their tasks are discussed in detail below.

5.4.3. Context selection in Maths Lit

Teacher 1 and Teacher 2 had difficulties in understanding the term "context" within the 1st interview. When they were asked the question about the kinds of context they had used in their classroom, they could not respond immediately. They needed more explanation on what context meant.

> "could you be specific, may be to elaborate, I don't understand. I do not want to get out of line" (T1)
>
> "Err… context, content, not sure can you elaborate?" (T2)

Even when I elaborated, T1 still struggled to provide the answer relating to context - instead an answer relating to teaching aids, and everyday objects was given:

> "…So one time when I was introducing fractions I had to buy some apples, take an apple as a whole then develop my lesson from there, cut the apple and explain when we say half is like this…" (T1)

Three of the four teachers (all except T1) seemed to be familiar with the idea of context and its prevalence in the curriculum document and in spite of their struggle with the terminology or the meaning of the word "context", their responses still showed evidence of understanding of context as linked to everyday life:

> "We used different resources, like now we are dealing with exchange rates then when it comes to that one they have to cut in the newspapers where they see even look at the television where they talk about exchange rates then take it from there so that they can see what's happening in real life…" (T2)
>
> "we have used the chalkboard method, at times, to do practical work, where we go out and apply some of the things that are in the textbook" (T3)
>
> "Like what we did we were doing volumes and prisms, but what I did was to give them examples on how this will help them, for measuring tiles so what we did we measured our tiles inside the classes" (T4)

In these statements, the teachers identified contexts which are related to real life situations such as tilling, and everyday life resources that could be used to understand the mathematical topics addressed i.e. newspapers. The idea of practical work is associated in this instance with context, in the sense that there is an application of mathematics that is learned 'practically'. The notion of mathematical concepts or content being applied in a context tends to imply that context is identified based on the content or concept to be taught. This kind of understanding could have arisen from the way the work schedule is structured – topic followed by context. The topics consist of a significant amount of mathematical content. This suggests that one needs to first know the content they need to teach, then the context follows. Similarly, the same structural representation of information appears in the NCS policy document, where it starts with the Learning outcomes which are followed by the Assessment

Standards. The Learning outcomes are mathematically represented i.e. data handling, functional relationships and the Assessment Standards attend to context after mathematical content has been identified.

Within teacher's selection of contexts, Julie's (2006) findings that teachers work with contexts they [teachers] are familiar with was supported. Local contexts such as 'mashonisa' (money lender), familiar contexts such as painting a class, tiling the class and recipes, seemed to be the contexts that the teachers selected. The idea of relating resources that would be familiar to learners as a tool used to engage learners in the context selected seems to be prevalent. This supports Julie (2006) and Vithal (2006), who argue that the teachers teach the context that they are comfortable with and what they think is relevant for the learners. In some literature it has been revealed that in most instances teachers' and learners' interests are constantly in conflict, as learners are more likely to be interested in unfamiliar contexts, and in some instances not interested in context but in content focused teaching i.e. T3's learners, who were exposed to a content focused teaching approach .

Vithal (2006) indicates that the idea of local context and familiar context could be due to the fact that learning has to be around the learners' daily lives. Thus teachers avoid selecting unfamiliar contexts as Maths Lit learners may not be ready for those types of context and problems (Julie, 2006). This kind of teaching approach could be leaning towards social transformation and awareness but could be in contrast with one of the Maths Lit goals, that is, to create critical citizens.

Another factor that makes teachers select local context and familiar context could be the perception that Maths Lit learners "display a rather low level of mathematical competences" (Christiansen, 2006. p. 46); and Maths Lit is viewed to be at a lower category of Maths and less complex (Venkat and Graven, 2006). This is likely to result in the teachers focusing on giving learners work that would require the development of mathematical skills.

When asked about how they selected the contexts for teaching and the tasks given to the learners, teachers stated that they were guided by the textbook topic and the work schedule. The work schedule in general was used to provide the topic and context in some instances and the textbook provides the tasks. For all four teachers, their context selections were guided by the work schedule. For instance, the context of a loan is provided within the work schedule under the 'topic' column. In some instances they were guided by the content listed in the work schedule:

> "Personally I start with the content so that learners have to know then how it can be applied in everyday life so that it makes sense to them. As at the end of the day Maths Lit is more about application to real life. Other wise they may end up being Mathematics and divorced from every day life. Normally I start from the content that guides me to select issues in real life and that's how I approach it" (T1)

> "from the content that I want to teach, Loan is a real life situation; we are faced with it every day in our lives so they need to know how to calculate it. So I see it as it is going to be important to them" (T4)

Two teachers (T2, T3) of the four, selected the majority of their contexts based on the textbook they used, in consultation with the work schedule. Teacher 2 indicated that the textbook is a prescribed book and that they had to follow the units in the text book in order. When coming to designing or selecting the task and context for their learners they used the same tools, the textbook and the work schedule to guide them and provide the tasks with context for them. As Teacher 2 put it:

> "First to select the task I have to go to the work schedule then I take it from there, then to see which task I am going to do, I use classroom Maths Lit which tells me a lot because I am able to select the tasks according to the work schedule"

Teachers' selection of contexts seems to be guided by the content that they want to teach, so it could be applied in everyday life. This perception links to NCS policy document, which states that the learners that are envisaged have to be highly numerical consumers of mathematics.

Teachers use this approach of selecting context based on the work in the work schedule, which is similar to what was done for Mathematics in the past; where the framing was stronger and teachers were told what to do and in what order. The district work schedule used by these teachers gave direction on what to teach. Furthermore, the work schedule was structured according to the Learning Outcomes from the NCS policy document – and therefore, is largely driven by a content-based frame. Now, I look at the ways in which the context selected was used in the classroom, with an interest in whether the context is driving the learning process as stated in the policy document?

5.4.4. The use of context in the classroom

When looking at the use of context when teaching, teachers predominantly used the context as examples that assist in understanding the content that has to be taught; T 4 indicated that for learners to use the context; she had to first teach them some content that will be required within the context:

> "I first hear their [learners'] views [on loans], then take them all and bring them together and discuss them and then I tell them what we mean by loans. I then give them an activity, like Thabo borrowed R50 and they want it with 3% interest and then, remember they need to first know how to calculate the percentage as they can not do loans without doing the percentages. Let me say I first remind them on how to calculate percentage and then after that we do loans where they then find out the 3% of the loan"

As for learners' participation and acquisition of the knowledge about context and content, teachers argued that the context helped the learners understand the concepts taught, and to relate them to their everyday life. Furthermore, T1 indicated that it also helps learners to see that Maths done in the classroom is not divorced from their everyday life and their community.

Teachers used context as an introduction to the content that has to be taught, and two (T1, T4) out of four described interactions where numbers were involved in context. The other two teachers (T2, T3) gave examples that involved contexts with no mathematical working involved. Examples introducing context with numerical focus included the following examples:

> "initially we were talking about 'Mashonisas' [money lender] , talking about what they know, I said to them supposing you went to Mashonisa and borrowed R500, and that you are going to return it as R500 after two months, they said no maybe as R750, or what. Then in business that money that is added on is called an interest, so I tried to use what they know then I went to banks, and look at what do they do if you are borrowing or investing" (T1)[content with context focus]

> "Tiling was my example, like for instance when we used this tile thing we were calculating the length X breadth. let me say when we have fifty something of the tiles we calculate the square meter of the tile then calculate the length of those tiles inside the classroom and then the breadth of the tile inside the classroom, then we find the exact amount of how many tiles exactly are needed in the classes" (T4) [content with context focus]

Introducing context described with a 'pure context' focus:

> "We used different resources, like now we are dealing with exchange rates then when it comes to that one they have to cut in the newspapers where they see even look at the television where they talk about exchange rates then take it from there so that they can see what's happening in real life…" (T2) [Pure context]

The use of context as an introduction to the lesson appeared as the dominating model among teachers. The teachers seem to be using the context with the focus on the mathematics to be taught. The aim of the teachers was to teach

content, thus when the contexts opened up opportunities for learners to engage with the content teachers seem to work with a practice described by Venkat (2007) as: "reject the [context] in favour of the 'made up' [problems]" (p. 81). The teachers focused on the tasks that involved mathematical procedures, and that were more content focused. In these instances, teachers' concerns were based on the mathematical agenda and on mathematical concepts (Venkat, 2007) i.e. 'calculating the area (length X breath)' (T4) and 'they need to first know how to calculate the percentage' (T1).

So far, the use of context in the classroom by teachers seems to be more inclined to agenda 3 – where context is selected and used to provide opportunities to apply mathematical content already learned and to support mathematical learning (Graven & Venkat, 2007). Learners do not meaningfully engage with the context to solve the problem and in some instances the contexts seem unrealistic or lack authenticity. This kind of learning is likely to promote mathematical goals, but tends to downplay the social goals and life goals mentioned in the curriculum statement. Since lack of engagement with context and uses of unrealistic context could minimize the opportunities of being a productive worker – as the context used in class and the work environment are not similar.

The context could prevent learners from seeing the underlying mathematical concepts that are found in the situations (Venkat, 2007). Thus teachers resort to using the context as an introduction to the teaching of the mathematical concept.

According to Christiansen (2006), teachers' use of context as an introduction could be linked to the way the Assessment Standards are written in the NCS documents, which do not encourage a deep understanding of the context, but expect learners to engage with the context at a simple level. This does not provide awareness of the real use of mathematics in the society and its impact in their real life i.e. in a simple exercise of reading graphs, in the context of global warming, or the drawing of graphs in the same set of axis within an AIDS and Malaria. In these instances learners do not engage with the real issue of global warming, AIDS or Malaria and thus compromise the achievement of social goals – where social transformation and environmental awareness are not sufficiently addressed.

5.4.5. The Learning Outcomes addressed

All four teachers illustrated contexts based on learning outcome number 1 (Number and operations in context) and LO 3 (Shape, Space and measurement).

There seemed to be some commonality of sequence which the teachers were following, and in their discussions three of the four teachers had similar contexts and examples. Furthermore, within their examples there was little or no evidence of integration across the Learning Outcomes. For LO1 they focused on loans (simple and compound interest), LO 3 focus on conversion (recipe) and Shapes (area and volume)

> "Like what we did we were doing volumes and prisms, but what I did was to give them examples on how this will help them, for measuring tiles so what we did we measured our tiles inside the classes" (T4)

Only one teacher attempted to integrate learning outcome 1 and 3.

> "Food on budget, how to calculate the **price if there is tax** [LO1] and how to calculate those things we have done collecting the slips for groceries, then the recipes for food to deal with **measurements there they have to convert the measurements** [LO3], if they are given maybe a recipe for two people then they have to, maybe reduce it or enlarge it from two to four people" (T2)

Overall there was little integration within the Learning Outcomes, across the Learning Outcomes and with other learning areas. According to Vithal (2006), when the problem that has to be solved is more contextualized, with a focus on societal relevance, then the idea of integration within other learning area, and across Learning Outcomes should be entrenched. In such instances teachers would not need to focus on one Learning Outcome at a time, and this would "open possibilities for linking mathematics in authentic ways to other [learning areas and/ Learning Outcomes]" (2006. p.40). Evidence of a lack of integration could then link to the fact that teachers' were not using authentic contexts, and were not engage with contextualized tasks that would challenge them to work across the Learning Outcomes and across the Learning areas.

Summary

There is a trajectory across the interviews, from a shift from the emphasis on everyday life to a more content oriented view. Within their explanation of tasks given to the learners and the contexts used, three of the teachers (T1,T3,T4) seemed to place an emphasis on the content that the learners have to learn like how to calculate volume, area and perimeter. As one of the teachers indicated, once the context has been discussed, then the text book provides the calculations and the textbook is more content oriented, thus it provides exercises for calculations. Steen (2001) argues that if the teacher maintains such an approach where skills are learned free of context, then the outcome is often "skills devoid of meaning and utility" (p16). Thus the skills have to be taught and learned within the context, and the context should not be used as an introduction

to the content to be learned or skills to be learned. Maths Lit skills must be learned and taught in a context that is meaningful and memorable (Steen, 2001).

The notion of using local contexts seemed to link to the teachers' understanding of Maths Lit, focused on their (learners)' everyday life and immediate problems. At the same time, it is in contrast with the Maths Lit goals to create critical citizens, who have to solve problems beyond their immediate environment. This tension exists within the NCS document, where it is indicated that learners have to be introduced to unfamiliar context, and at the same time indicates, that the contexts selected should be localized.

The teachers' shift from context focused tasks to more content focused tasks, was linked to the fact that they were following a work schedule which consisted of more mathematically oriented topics than contextualized, as detailed earlier and elaborated in section 5.5 below. Steen (2001) states that teachers need to remember that Maths Lit (qualitative literacy) is "inseparable from its context" (p.17) and that mathematical content are not the focus of Maths Lit. He points out that subjects like QL/Maths Lit do not have their own special content but inherit content from the context (Steen, 2001).

This shift from a contextual position to a more content oriented position could be due to the way in which the teachers view Maths Lit as a lower level of Mathematics, which means that they emphasize a focus on promoting mathematical knowledge and skills. Given that the Learning Outcome of Maths Lit, are framed similarly to those of Mathematics, and that the majority of their Assessment Standards are more mathematically inclined, this kind of framing could be interpreted as requiring teachers to continue to teach procedures and mathematical skills as opposed to developing mathematical attitudes (Venkat and Graven 2006; Bowie and Frith, 2006; Brown, 2006).

5.5. The work schedules

The work schedule was one of the documents that teachers used to select context for their classes. The topics that were listed could be classified as more content-led or more context-led and located respectively at the more mathematical extreme or the more situational extreme in terms of their orientation using the description given by Julie (2006) of the two positions. Examples of these are given below. I then list the topics in the work schedule:

- **Mathematical topics**:

Fractions, decimals, conversions, perimeter, area and volume, straight line, Simultaneous equations ratio and proportions, simple interest and compound interest, distance, speed and time etc.

- **Situation topics:**

*O*nly three topics are mathematical literacy oriented; Loans, entrepreneurship and currencies.

From this classification, it seems that in the work schedule there is a significant number of topics that are mathematical in nature and a small number which are situational. The mathematical topics are expressed in a more mathematical way and there is no blending of context within them. The situational topics are more life related and context oriented i.e. loans and entrepreneurship. The same Mathematical topics appear in the NCS policy document, which simply implied that the work schedule was designed following the same structure as that of the NCS policy document.

Under content and context, there is again more content based information than context based i.e.

- **content listed**; *distributive law, point by point plotting of data, from equation to graphs, perimeter and area of polygons and circles, volume of right prisms*, theory of Pythagoras etc.
- **Context listed**; *buying property, cell phones, substance abuse in the school, water conservation*,

Within each context/content there are examples of context that the teacher could use which relate to everyday life situations i.e. (the circled section in the extract from the 2009 district work schedule)

PROVINCE
MATHEMATICAL LITERACY – WORK SCHEDULE – GRADE 10

DATE	TOPIC	CONTENT/CONTEXT	LO/AS	ASSESSMENT	DATE COMPLED
TERM 1					
14/1 - 16/1	Rounding and estimation		10.1.2		
19/1 - 23/1	Scientific calculator, fractions and decimals	• Working with formulae by hand and with a calculator • Associative, commutative and distributive laws • Decimals: Addition, subtraction, multiplication, division	10.1.1/ 10.1.3		
26/1 - 30/1	Percentage		10.1.3		
02/2 - 06/2	Ratio and proportion	Direct and indirect	10.1.2/ 10.1.3		
09/2 - 13/2	Simple interest	Annually, half-yearly, quarterly, monthly	10.2.1		
16/2 - 20/2	Compound growth	Annually, half-yearly, quarterly, monthly	10.2.1		
23/2 - 27/2	Loans	E.g. BUYING PROPERTY • Bonds and Transfer Fees • Monthly Repayments • Actual Costs • Reducing Cost of Loan • Which bank, which bond? • Interest Rate Changes	10.1.1	Investigation	
02/3 - 06/3	Entrepreneurship		10.2.1		
09/3 - 13/3	Conversions	Units of measurement and convert measurements within the metric system (km to m; mm^3 to $litre$; km^2 to m^2; cm^3 to m^3)	10.3.2		
16/3 - 20/3	Currencies	E.g. CELL PHONES • Cell phone billing • Contract vs. Prepaid • Calculating VAT/tax • Credit Cards	10.2.1		
23/3 - 27/3	Test				

Under context/ content there is a combination of content and context, where they provide the content that has to be learnt and the context that can be used i.e.

> - compound bar graphs[content] to show the abuse of different substances [context], pie chart [content] to show the relative proportions of learners who have flu [context], use grid maps [content] in order to determine locations and plan trips [context]

Again, in content/context column, there is a significant amount of content as compared to context. In some instances there seems to be a same amount of emphasis on content and contexts.

But when looking across the topic and the context/content columns there seemed to be a contradiction in some of the situational topics i.e. within the currencies topic the context is cell phones billing, contract vs prepaid. There seems to be no correlation between 'cell phone billing' and 'currency' (unless you are looking at roaming charges). Maybe when looking at 'credit card', there could be some association if one is buying from another country using the credit card. Furthermore, there is an inclusion of entrepreneurship, but no content or context provided. One could assume that the planner wanted to include some contextualized topic to ensure that this document was in line with the Maths Lit goals. In some topics there was a correlation between the topic and the contexts i.e. loans. Meanwhile in the more mathematical topics there is no context

included, only content to be taught. In such instances the word context is just included for the sake of compliance, but not of implementation.

The Learning Outcomes and Assessment Standards are presented in numerical manner, not in words i.e. 10.2.3, 10.1.1., without explanation of what each number represents. This representation of Learning Outcomes has an assumption that teachers have access to the National Curriculum Statement (NCS) document for Maths Literacy to refer to the Learning Outcomes being addressed.

A further breakdown was undertaken focused on the split across LO s to see if there is any integration across them. This is useful as it will indicate if the planner and the teachers are implementing the Maths Lit goals. Moreover, where there is integration there are opportunities for authentic contextualization. The topics and context/content seem to be arranged according to the Learning Outcomes. The first 2 terms work' start with LO1 followed by LO2 then LO3, LO4 is not included. The table below indicates the sequence that is depicted in the work schedule in relation to the Learning outcomes and the topics covered each term:

		number of topics which address each Learning Outcome			
Term	Number of topics per term	LO1	LO2	LO3	LO 4
1	10	7	2	1	0
2	8	0	6	2	0
3	5	0	0	1	4
4					

From the table there is evidence that the work is arranged according to Learning Outcomes, as one can see that in term one (7 out of 10) of the work focus on LO1, in term two (6 out of 8) of the work is based on LO 2 and in term three (4out of 5) of the work is based on LO 4, in term 4 according to the work schedule is time for revision, where learners revise work from all Learning outcomes.

Within the work schedule this structuring according to LOs means that there is no evidence of integration of Learning Outcomes within the work that is done, meaning that in term 1 the first seven topics that are covered are based on LO1, and the eight and the 10th topic, is based on LO 2. According to Steen (2001), the

learning program or the works schedule should focus on mathematics in context, where the context provides meaning and the problem solving strategies, mathematical tools and the Learning Outcomes all should depend on the specific context. Therefore, each topic or context will consist of at least two of 3 or 4 Learning Outcomes integrated to create a meaningful learning.

The work schedule was used by three of the four teachers (T1, 2 and 4). Teacher 3 was also provided with the same work schedule but the school had created its own work schedule based on the prescribed textbook for the learners. The work schedule from teacher 3 school had dates similar to the District work schedule, but no Learning Outcomes listed or stated. In his case there were contextualized headings such as: *food on budget, travel and tourism, managing money, world measurement, shape of the world, Lets take a chance* etc. These headings are similar to those in the Classroom Mathematical literacy grade 10, which is a prescribed book in this particular school. In referring to the book, I discovered that these headings were the same as the units in the Classroom Mathematical Literacy Grade 10.

The table below indicates the topic-source for tasks sequential by the four teachers:

Teachers	T1	T2	T3	T4
Topic-source	Work schedule	Work schedule	Textbook	Work schedule

Most of the examples given by the teachers were based on the topics in the work schedule; they indicated content such as fractions, percentages, simple and compound interest and then context such as loans. The tasks selected by the teachers are content led as the work schedule consists of more content led topic. Steen (2001) argues that the expression of Qualitative Literacy (Maths Lit), should consist of topics that serve primarily personal ends and with some serving the goals of a democratic society for examples topic such as ‘understanding the effects of compound interest’; ‘estimating how to split a lunch bill three ways’ etc. These are not the type of topics that appear in the work schedule – where topics tend to veer towards a more traditional mathematical topic orientation.

5.6 Learners' workbooks

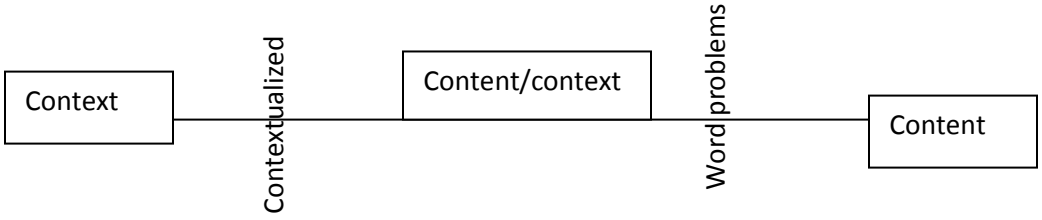
In deepening my understanding on the selection and use of context oriented tasks by the teachers, I further looked at a sample of the learners' work books to identify if the tasks the teachers selected and used in the classroom were indeed the same as what they expressed in the interview. This investigation also established if teachers' understandings of Maths Lit as discussed in the section above were transmitted to the learners in their classrooms.

What I saw in the learners' books, were generally mathematical solutions – calculation procedures with little evidence of contextual engagement. There were few instances where learners wrote explanations, interpretations of the solution and justifications, and some solutions were situated in context as opposed to application of content to the situation (Venkat, 2007). There were few examples where questions and their solutions had context supported by content and the same content used to explain/interpret the situation. In some instances there were mathematical objects for example, graphs related to real situation i.e. train routes. There were also questions and answers where context was used to approach the content to be learned and not focus on the context.

From these, there are categories that are emerging such as:

- Pure content
- Word problems
- Context-content
- contextualization
- context

Using the literature to analyze the learners' solutions, the learners' work ranges across a content and context continuum:



This is a flow that allows for an analysis of learners Maths Lit written work on tasks that links the two extremes of Julie's (2006) positions of mathematical (content) or situational (context) orientations to Maths Lit with the idea of the continuum expressed in Graven & Venkat's (2007) pedagogic agendas that look at the nature and extent of the link between content and context.

When reading the continuum from right to left starting from **content** moving along it to the left until the **context**, the problems move away from being mathematically and to being more situational. The **content** extreme refers to mathematical problems which contain Mathematics i.e. Bodmas problem (2x3 +5-2), where this kind of problem solving is linked to agenda 4 – context does not feature. As one moves along to **word problems** the mathematical problem starts to have some form of context but the focus is on content, this relates to agenda 3 – selection of contexts where mathematics can be applied. There is very limited authenticity here. At the middle we find the **content/context category** where the problem consists of some content and context, this is linked to agenda 2 – to explore context to understand mathematics and learn mathematics to understand context. **Contextualized** problems contain some content but the focus is on context, this is agenda 1 – to explore context that learners need. Then the **context** at the extreme left the problem contains pure context with no content (no mathematical working out) i.e. [banks make money through the use of loans and bonds (LG3), this is more extreme, than agenda 1as there is no need to engage with mathematical content explicitly. I include this agenda given the South African evidence of mathematics sometimes being sidelined within the need to bring in integration in Curriculum 2005 (Adler, Pournara & Graven, 2000)

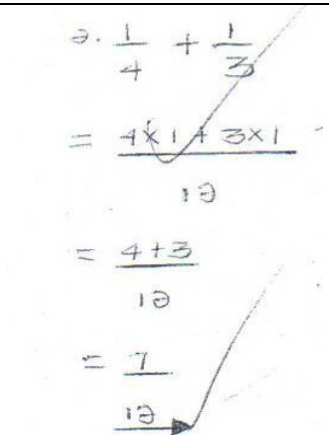
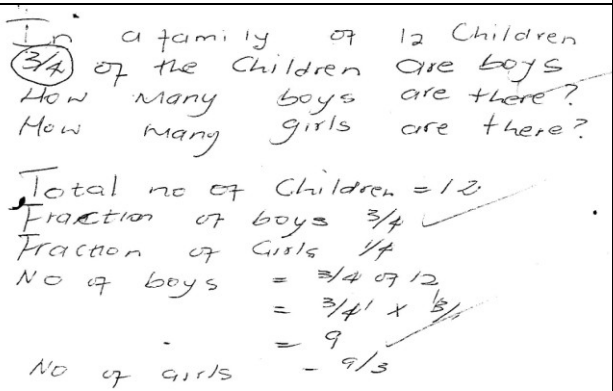
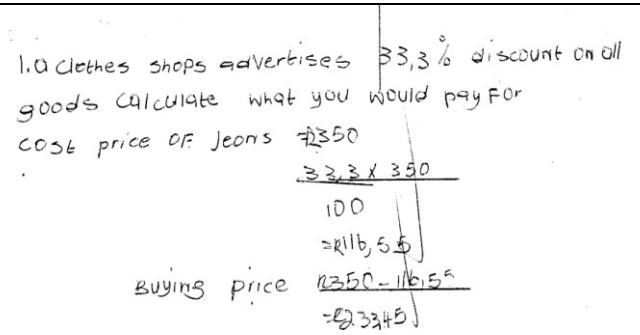
5.6.1 Content-context continuum

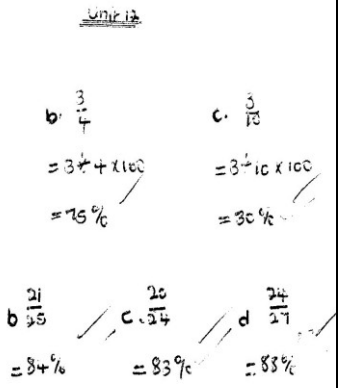
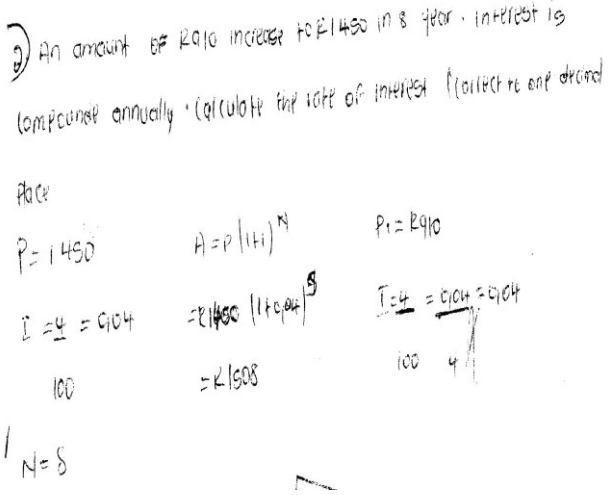
The learners' work was categorized using this continuum and it was found that most of the learners work predominantly ranged from the content, to word problems and contextualized problems. There was little evidence of pure context and content/context, thus these were not indicated on the table below. I have selected contextualized over content/context in my table because contextualized refers to links with reality (present, past and future) (Vithal, 2006). Meanwhile, content/context refers to the use of context to reveal the underlying mathematics while using mathematics to make sense of the situation (DoE, 2006). In my data what appeared predominantly were examples which focused on contexts. Thus I have included contextualized examples on the table. A word problem in this instance refers to questions or solutions using context mainly to pursue

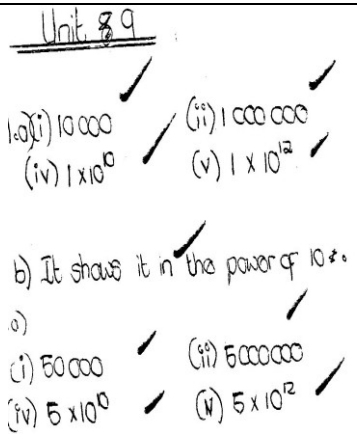
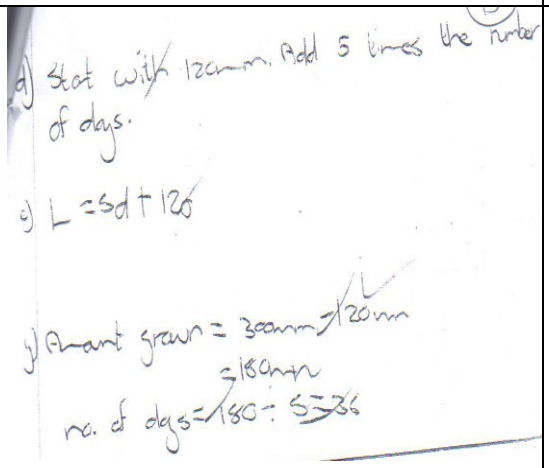
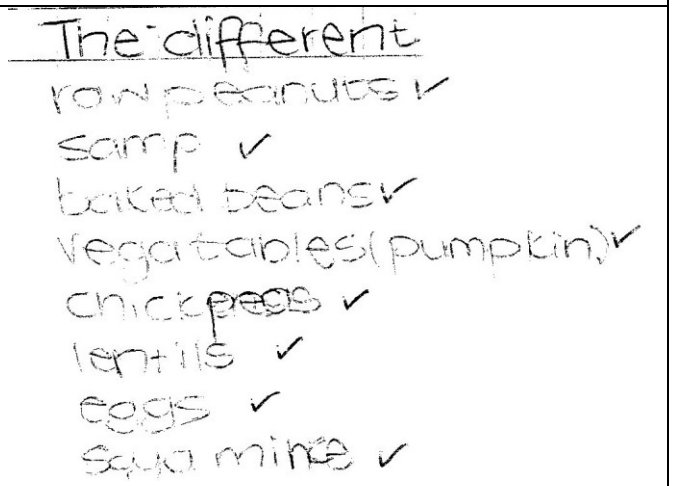
mathematical outcome, and the context is not central to the problem (Graven and Venkat, 2007). This means that these types of question are more mathematically inclined than context, since there is no emphasis on context, but lead and direct to the mathematical working. The examples that appear in the learners books and categorized under word problems have similar characteristics.

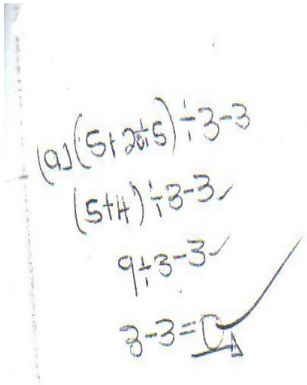
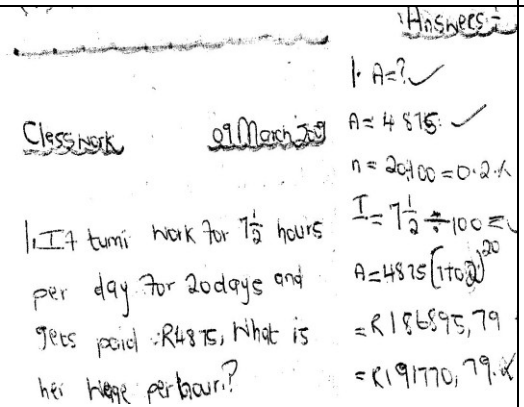
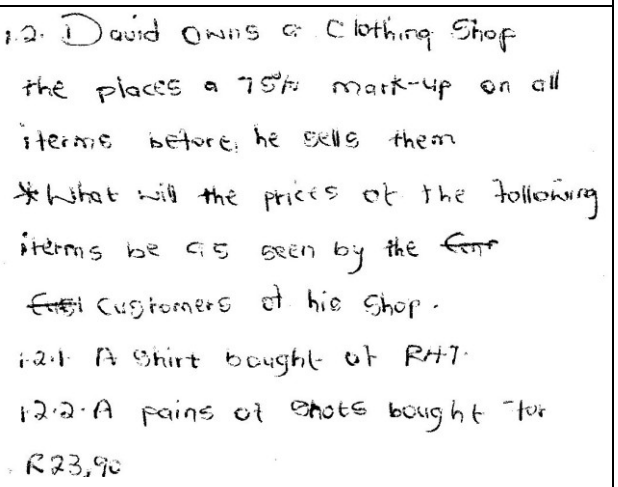
Across all four classes, there was very little difference in terms of coverage across the workbooks of the three learners selected. Thus in this analysis workbooks were dealt with as groups associated with the teachers i.e, Learner Group 1 = LG1, for teacher 1's learners' workbooks.

Below, is the table where the work of individual Learner groups is evaluated using the categories. The table indicates the number of tasks that are in the learners' work book within each category. Take note that a task in this instance consists of a number of activities or exercises. This means that for simple interest most learner workbooks contained about 10 activities but the concept addressed is simple interest. Similarly, the loans task could consist of 7 activities but all of them based on loans.

Learner Group 1	Content	Word problems	Contextualized
Number of tasks (14)	7	4	3
Tasks based on	Fractions, conversion, equations, area, proportion, square roots, bodmas	Simple interest, percentage, perimeter, ratio	Investments, discount, electricity charges
Examples from learners books			

Learner Group 2	Content	Word problems	Contextualized
Number of tasks (18)	11	2	5
Tasks based on	Rounding off, bodmas, decimals, fraction, percentages, Pythagoras theorem, proportion, equations, graphs, area	Compound interest, simple interest	Shopping list, recipes, value for money, world of measurement, cell phone calls
Examples from learners books			8. Read through the shopping list. Discuss with a partner whether the items Gertrude buys are the same or different to the items you have at home. If they are different, talk about why they are different. If they are the same, talk about what other things you would like to add to the shopping list. 9. Talk about your favourite meal at home. List the main ingredients needed to make it. 10. a) Calculate how much all the groceries on Gertrude's shopping list cost. b) Calculate how much of her R800 she has left over after buying all the groceries on her list. c) Work this out as a percentage of the R800.

Learner Group 3	Content	Word problems	Contextualized
Number of tasks (18)	10	1	7
Tasks based on	Rounding off, bodmas, decimals, fraction, percentages, Pythagoras theorem, proportion, equations, graphs	Patterns	Shopping list, recipes, value for money, world of measurement, cell phone calls, oversea visit
Examples from learners books			

Learner Group 4	Content	Word problems	Contextualized
Number of tasks (14)	9	3	2
Tasks based on	Bodmas, fractions, decimal, percentage, conversion, graphs, perimeter, area, scientific notation	Simple Interest, compound interest, rates	Investment, discount
Examples from learners books			

There are more content focused tasks across all four learner groups, but the skew is more extreme for LG1 and 4. Meanwhile with LG2 and 3 the number of contextualized tasks within the learners' books is higher than LG1& 4 which have a total of 5/14 they have a total of 12/18. Even though the difference is not that much there was evidence of an attempt to include more contextualized tasks in the learners' books. As Steen (2001), Wiggins (2001) puts it, Maths Lit is inseparable of its context, and these results in more textual writing rather than the symbolic writing which is associated with traditional algebra. This means that the contextualized tasks incorporated more writing in them than the algebraic tasks,.

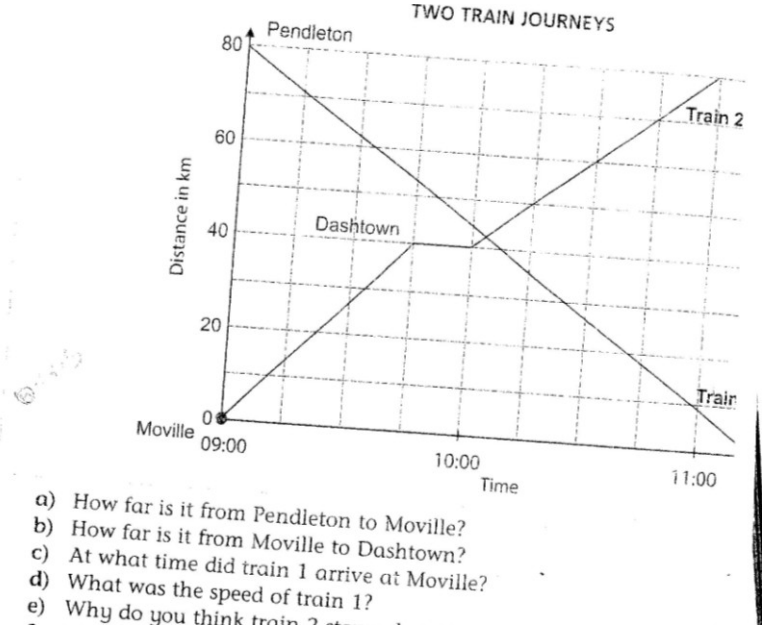
Wiggins (2001) and Skalicky (2005) indicate that contextualized tasks should be realistic, and applicable to real life situation. The tasks that are solved should reflect the context in which adults are tested in the work place, personal lives; and it should create situational awareness and require learners to be innovative and judgmental.

Looking at the contextualized tasks – for LG 2 and LG 3 the contexts indicate situational awareness, reflects adults' personal lives i.e. cell phone calls, shopping list, recipes and have the potential to encourage innovation and judgment. Looking at the questions and some solutions presented in the same learners groups the questions are leading learners to explain contextual meaning; they are also required to interpret the questions and answers relate to their own lives i.e. talk about favorite meal time; and required to effectively use what they know in different situations. These learners' work has some of the six facet elements that are listed in chapter 2 i.e. explain; interpret; apply; have perspective etc. LG 2 and 3'scontextualized work reflected 4 out of 6 of the elements (explain, interpret, apply, have a perspective). Meanwhile, LG1 and LG4's examples reflected 2 out of 6 elements (explain, interpret).

5.6.2. Localization and Authenticity

When looking into the LG2 and 3 workbooks, there are comparatively more contextualized tasks and fewer content focus tasks. All the tasks that appeared in LG2 and 3 were taken from the same text book (Classroom Mathematical Literacy). There was evidence that tasks were used 'directly' from the textbook with no evidence of adapting to local context:

"The graph below shows the journeys of two trains traveling towards each other on different tracks. Train 1 from Pendleton, and travels towards Moville without stopping. Train 2 leaves Moville, stops for 1 minute at the station of Dashtown and then proceeds to Pendleton. How far is it from Pendleton to Moville?"(LG2)



a) How far is it from Pendleton to Moville?
b) How far is it from Moville to Dashtown?
c) At what time did train 1 arrive at Moville?
d) What was the speed of train 1?
e) Why do you think train 2 [illegible]

Some learners might not know where Moville is, and some might have not seen the train. In such instances Steen (2001) and Julie (2006) would argue for the use of local contexts, with tasks based on the issues that are important to their everyday life and work, like how to read a bus and train schedules.

With LG 3, in the work books there are only answers to the tasks from the textbook and from the answers one can assume that the tasks were contextualized and some were word problems.

> "Banks make money from doing transactions so they charge more to sell foreign currency" (contextualized)
>
> "two cans of Pilchards can serve 10 people. Therefore 1 can of Pilchards can serve 5 people. 5 cans = 5x5= 25 people" (word problem)
>
> "It shows the answer in standard form or scientific notation, the number part must be either 1 or between 1 and 10. It has one digit before the decimal" (No context).

Within the learners' books there are also page numbers and unit numbers to indicate where the work was found.

The other tasks from LG1, 4 are based on financial Maths, looking at simple and compound interest and part of percentages. These financial tasks, are taken from the text book, and I could say they are contextualized i.e.

> "Vusi borrowed R2000 for 8 years at 5 % per annum. How much will he return after 8 years?" but some for them are not contextualized example, "calculate the simple interest if R2000 is invested at 6% for 10 years". (LG1)

Some of the tasks which are contextualizedmay not be familiar to learners with contexts such as:

> "Fred went on an outdoor survivor course and complained that he had lost 7% of his body mass, how much did he lose?" (LG1)

Learners may not know what an outdoor survivor course is; they could interpret 'outdoor' in a literal sense and find the context irrelevant to their everyday lives. Contexts such as training for soccer or rugby may be more familiar.

When looking at LG 4 there were more word problems than content and contextualized problems; and most of these are based on financial Maths i.e. compound and simple interest.

When analyzing some of these examples, the context may not be authentic, or realistic and Bowie and Frith (2006), state that this kind of "pseudo-contextualization need to be avoided" (32). At the same time they argue that the teachers and the textbook could have inherited this kind of approach from their interpretation of the NCS Maths Lit assessments standards which consist of some of these inauthentic, supposedly real-life examples, which in turn are more like word sum problems than genuinely contextualized problems. According to Sawyer (2006), tasks which are more content-led focuses on learners' "performance on traditional [mathematical procedures], which may not represent an authentic measure of mathematical literacy, but simply evidence of [learners'] ability to do mathematics (p.651)", meaning that these tasks are focusing on computation and word problems rather than on contextualized problems drawn from real life problems.

Looking at all four learner groups' work there is a picture which shows that there are a higher number of content tasks (37) than contextualized tasks (17 tasks). The learners' tasks are more content-driven than context-driven. Even within

those tasks which have contexts, the contexts tends to be in service of content and in the few tasks where the context continued to be reflected at the end of the tasks, the tasks still seem to be mathematically organized. Most of these tasks came directly from the textbook and, thus, most are not locally relevant. The tasks in the learners' work books are following the order depicted in the work schedule, especially teacher 1 and 4. Meanwhile with teacher 2 and 3 the tasks are similar to those in the work schedule but not following the order.

5.6.3. Integration

There is lack of integration of LOs in the learners' workbooks, The work that is dominating is from LO 1 i.e. percentage, interest, fractions, addition of numbers etc, even though they also did work from LO2 and 3. These Learning Outcomes are not integrated within the tasks. LG 2 and 3 showed some integration across LO1 and 3 within tasks, even though the integration is minimal. LG1 and 4 their work started from the LO1 followed by LO2, then LO3 there is no integration at all i.e. started with fractions, percentages, interest then graphs. On the other hand LG 2and 3 started with LO3 integrated with LO1, and their work is guided by the context in which there are working with, after that they continue to focus on LO 1, followed by LO3 then LO2. In their books integration was seen within work where they started with a recipe which looked at conversion and measurements, followed by addition of numbers and comparing prices.

In terms of integration Bowie and Frith (2006), argue that the framing of the curriculum into four Learning Outcomes is powerful, but it could be difficult to expect the teachers to abandon their old traditional way of working in a sequential form and create connection and integration within and across the Learning Outcomes. Thus teachers may not give learners tasks which have more than one Learning Outcomes. The other reason for less integration could be arising from the contradiction that is presented within the Mathematical Literacy Subject Assessment Guidelines (2008), which indicates the assessment breakdown of the Learning Outcomes for the examination in the form of percentage; this could be interpreted, to mean that each Learning Outcome was viewed independently of the others. "This encourages assessment practices that [do not] encourage integrate assessment of Learning Outcomes under the study of relevant context" (Bowie and Frith , 2006, p. 32). Thus teachers could use different contexts for each Learning Outcomes and in relation to the percentage

indicated in the guideline, which then could have led the teachers to give work to the learners focusing on one Leaning Outcome and avoids integration.

According to Wiggins (2001), Maths Lit asks learners to stay in context while working on the task and the tasks have to be relevant to their everyday life. However there is a contradiction in terms of assessing in context, where there is a watering-down of the context in favour of content. This is done in order to accommodate learners from diverse backgrounds who might not cope with the contextual problems they might not be familiar with. This means that these tasks may not be realistic. Skalicky (2006), Venkat and Graven (2006), and Christiansen (2007), would say the problems should be authentic for them to meet Maths Lit goals. Authenticity and realism are associated with contextualization and integration (of LOs) within the Maths Lit curriculum. The issues of assessment where learners are going to be tested or write a common examination contribute to complexities within wanting to focus on context-led tasks. Wiggins (2001) points out that context-led tasks often need more time, and with the pressure of time to finish for the exams teachers resort to more content-led tasks. In the common test, "test items [questions] are decontextualized by design" (p. 125) and in the South African context the structure of these tests also follow the sequence of the LOs e.g. question 1 consist of questions focusing on LO1. There is less integration and within such a frame, teachers are more likely to engage learners in more content-led tasks within their class activities to prepare them for the tests (assessment). Thus, within the learners' books there were more content-oriented tasks than context oriented tasks and less LOs integration within the tasks.

Summary:

What I saw in the learners' workbooks was in contrast to what the teachers said in the first interview. Their understanding of Maths Lit as involving everyday life situations was largely absent in the learners' workbooks and over shadowed by mathematical content, and mathematical procedures. The tasks that appear in the learners books were more content-led than context-led. This contradicts what some of the teachers said, that the tasks they selected were context-led. Within tasks that were contextualized, the context is not visible in the way the teachers discussed. This suggests that the teachers used contexts as an introduction to the content that has to be learned. This kind of approach is in contrast with the NCS Maths Lit policy document, which states that Maths Lit is not about

understanding the content to be learned but focused on use of the content learned within different contexts.

The work in the learners' workbook follows a similar pattern to what appears in the work schedule, for teacher 1 and 4, and the content that appears in the learners' book is the same as what is written in the work schedule. As discussed above the schedule consists of more content-led topics as in the learners' books. The work in the learners' books especially for teacher 1 and 4 starts from Learning Outcome 1 for term 1 and term 2 is more dominated by Learning Outcomes 2 followed by 3. For teacher 2 and 3 learning outcome 1 and3 were integrated at the beginning of term 1 and then as they continued to term 2, they followed similar patterns to teacher 1 and 4.

According to Venkat and Graven (2006), the concept of contextualization within Maths Lit creates blurred boundaries between everyday situations and mathematics. Furthermore, the content-led tasks could fall under Agenda 3 and 4, since in most of these tasks and from what the teachers have said "authenticity of context [was] sacrificed so as to meet Maths goals" (Venkat and Graven, 2006. p.76). This means that, the context the teachers used as introduction did not filter through to the learners' work and even when it did it was lost within the Maths that was to be learned. Thus most of the tasks in the learners' workbook are more content focused.

Moreover, the minimal appearance of context within the learners' books and from the discussion with the teachers in the first interview, and analyzing the work schedule could be due to the fact that in the NCS policy document there is more content as it progress to later grades, which could be interpreted by the teachers as meaning that context is not important as we progress and thus there is no need to focus on it. Within the NCS policy document, there is a section where they indicate content that needs to be learned by the learners in each grade, but there is no list of context that teachers should use in conjunction with the content indicated. This kind of information presentation could mislead the teachers to assume that content takes precedence over context.

5.7. Second Interviews

In order to probe emerging findings further, and for reliability and validity purposes 2nd interviews were conducted. After viewing the learners' workbooks and analyzing them, there were some contradictions from what the teachers said in the first interview and what appeared in the learners' workbooks. This second

interview assisted by providing clarity on the issues. The following categories were used to analyze the data:

- Understanding of Maths Lit
- The selection and uses of pure content Task in the Maths Lit class
- Selection and uses of context in the Maths Lit class

These categories were created from the interview questions. In this interview, the early questions were based on teachers' understanding of Maths Lit, to establish if there was consistency from interview 1. The remaining categories were focused on understanding the reasons for the work that appeared in the learners' books.

5.7.1. Understanding of Maths Lit

The teachers generally seem to be maintaining their stand on their understanding of Maths Literacy, even though within their explanation they tended to shift towards a comparative explanation of Maths Literacy in relation to mathematics:

> Well, I take Maths Literacy as everyday Maths, Maths to do with life, Maths to do with things we meet everyday, in our personal transactions; business transactions, so you go to the bank, personal transaction, you are buying selling, we use money. It has to do with every day Maths, every day life, things that one can relate to. Unlike if we talk about Mathematics which is abstract, some times some of the stuff is abstract in Mathematics, but in Maths Literacy, its everyday Maths," (T1)
>
> "Maths Literacy, if I am right, is something to do with learners appreciating the basics of Maths and applying them and relate it to their everyday situations…, in as much as they are trying to do away with the abstract but they have to live with real life situations. That's what they have tried to bring in" (T3)
>
> " "understand that Maths Lit they brought it so they can be able to know basic Maths, let's say, Maths Lit for instance a child wants to be a builder and knows nothing about Maths so it helps a learner to be able to do those things" (T4)

Across these quotes the notion of Maths Lit focusing on everyday life encounters or experiences is still indicated by the teachers, but when they elaborate their points they start to move into the idea of Maths Lit in comparison to 'Mathematics'', and ' other Maths' – abstract Maths.

According to AMESA (2003), there is no clear conceptualization of Maths Lit and unhelpful linking to the mathematics. This could be one of the reasons the

teachers in the sample continue to compare Maths Lit to Mathematics. The list of mathematical skills within the policy document and the information in the purpose statement such as “consolidate and extend basic mathematical” (DoE, 2003, p.9) could be another reason for this conceptualization. According to Jablonka (2003), a number of perspectives on Maths Lit promote this kind of understanding – ability to use basic computation or perform basic arithmetic operations, understanding of fundamental Mathematics, and developing sophisticated mathematical models.

One out of the four teachers, (T3), mentioned the use of the NCS Maths Literacy policy document as one of the sources that helped him understand Maths Literacy. He also indicated that the use of other resources such as newspapers, adverts, shopping list etc. helped him understand Maths Lit. Teacher 2 got help about the ideas and features of Maths Lit from other teachers who have taught Maths Lit before:

> “To be honest I have never gone through the training of Maths Lit, but going through the text books and reading and finding information from other people that has made me to understand Maths Lit because it was my first year teaching it, there is no one who trained me to teach it, but by getting help from other people has helped me” (T2)
>
> “Well from the National Curriculum Statement of Maths Literacy, and then secondly from the textbooks as well” (T3)
>
> “most of the textbooks that I am using are the ones that helped me, maybe Spot on Maths, Study and Master and Oxford, but in most cases I rely on Spot on Maths and some other documents, maybe from the banks, whereby they issue some things that show us how to calculate interest” (T4)

The textbook seems to be the resource that predominantly provided information for teachers and guidelines regarding Maths Lit, even though some teachers added that the NCS policy document and other teachers shed light with regards to Maths Lit. This kind of learning could be associated with teachers’ readiness to teach Maths Lit, meaning that teachers in the sample used mostly the textbook, to understand Maths Lit and to equip themselves to teach it. Steen, (2001) and AMESA (2003) have argued that this kind of preparation would not be sufficient and adequate as Maths Lit is a new subject, and not a watered-down Mathematics, and that “current teachers ...lack the capacity to connect their mathematics to real context, to see the internal connection between mathematical concepts”(p6) .

Steen (2001), also points out that experience of teaching mathematics, does not automatically mean that they will be able to recognize mathematics in real-life

situations, when it should be used and when it should not. This provides support for why teachers resort to text books for their understanding of Maths Lit. This could affect the way they select the tasks for the learners, as the majority of textbooks (except Classroom Mathematical Literacy, which is theme –based) are content driven and less context oriented and more so than the work schedule.

5.7.2. The selection and uses of pure content tasks in the Maths Lit classroom

When teachers were asked about how they selected the pure content tasks in the learners' work books, teachers referred to different tools. Teacher 3 indicated that his school used a prescribed text book, thus the task selection were basically determined by the text book. Even when one wanted to look at other tools, he indicated that it was not easy, as the learners at the end still had to solve the problems from the textbook. "... there and there you can select some items from other sources, but basically we follow the prescribed textbook".

Meanwhile teacher 1 selected his tasks based on the work schedule - which provided him with the topics, from the examination papers for Grade10-12 set up which are more content focus, and from the learners' lack of basic mathematical concepts thus some tasks are selected to help learners acquire basic mathematical knowledge required by the topic in the work schedule i.e. he will teach percentage separately as it is required in the topic of loans when they calculate the interest rate: "so in this instance there were more word problems for the topic I have planned for".

Teacher 2 and 4 indicated that they were guided by the work schedule, which provided the content, and then looked for contexts that would link to the content given:

> "to select the tasks I went according to the work schedule, in terms of the tasks I looked at the tasks that relate to everyday life so I could make it easy for learners to understand" (T2)

> "…I compare the context with the content so that's why I have selected those tasks so they can be related to real life situations as we know that Maths Lit contains real life situations its not about mathematics its all about learners learning about real life situations" (T4)

Three of the four Teachers (T1, T2, T4) had various reasons for including pure content tasks in the work they had given learners, which varied from the lack of basic mathematical knowledge (T1), across the idea that Maths Lit has Maths, so they need to do Mathematics problems (T2), and due to the claim that progression within Maths Lit as the grade progresses entailed the work becoming more mathematically and less contextual (T4). T3, indicated that the pure content tasks came from the prescribed text book.

Across all the teachers there seemed to be a sense of trying to bridge the gap when they included pure content tasks in the learners' books, due to the need to teach basic mathematical skills and concepts which learners needed in order to understand Maths Literacy:

> "in as much as Maths Lit is based on the idea of context, there are also instances where learners have to learn just to calculate the stuff then apply it, so I try to make a balance some times in the focused tasks and also marry them now, the concepts in the content task can now be applied in the context so they can relate to that". (T1)

The work schedule and the textbooks seemed to be the key tools that teachers used to select pure content tasks for their learners. The teachers also focused on pedagogical demands related to the need to teach learners mathematical content required in the exams and have the basic mathematical skills to cope with the exam structure (which from the exemplars given is highly mathematical). In such an instance, Steen (2001) argues that "teachers seem to be focusing on what learners need for education (mathematics) and not what is needed for life (quantitative)" (p.9). AMESA (2003), argue that teachers' approaches will be influenced by the way the NCS statement for Maths Lit is written – that the statement is written in a way that will promote an approach that focuses on algorithms. This approach could make it difficult for teachers to achieve the Maths Lit goals, since teaching Maths Lit for critical citizenship requires knowledge from both Mathematical background and outside mathematics – real life situation.

5.7.3. Selection and use of context for Maths Lit classes

The teachers' selection of contexts appears to be guided by the topic in the work schedule; use the textbook to select the appropriate contextualized tasks which incorporate the content from the work schedule. When teachers were asked about the context in the work schedule, T1, indicated that he used it in passing.

Meanwhile, Two out of four teachers (T2,T3) seem to have used the context to support the content in their classrooms - they indicated that it makes things simpler and easier in the classroom. Teacher 4 used the content to support context.

In contrast, T1 prefers to use context to support content, even though in his case it is not always possible, as he is also guided by different factors such as the learners' level of understanding, the topic in the work schedule, and his understanding of the topic when it comes to the use of context in the classroom. Thus in some instances he used content to support context and visa versa.

Teachers indicated that one needs to know the content that has to be taught, and then think of the context it can be used in, in order for learners to be able to understand the content and see how it applies in their everyday life. Teachers seemed not to be able to design or identify their own context for their learners; they use the context from the textbooks, or get the ideas of the context from the work schedule.

Overall there was inconsistency from what the teachers said and what was in the learners' workbooks. Furthermore, teachers seemed to be constantly referring to the work schedule as one of the guiding documents that they are using in order to select the context and the tasks that they use in the Maths Lit classroom. There was a contradiction where teachers saw the work schedule as the guiding document for the selection of contexts, but do not use the contexts indicated in the work schedule. Three out of four teachers used the contexts from the text book.

When it came to their understanding of Maths Lit and its principles, teachers verbalized their notion of Maths Lit and its features as Maths that has to do with everyday life situations and the use of contextualized problems, but in practice (learners' work book and their examples) there is evidence of lack of everyday situations and emphasis on content and mathematical problems.

5.8. Theoretical Analysis

Using Vygotsky's (1978) theory of mediation, teachers' goals were linked to how they interpreted the NCS policy document. The teachers focused on promoting mathematical skills and knowledge, with a shift from everyday life to 'basic Maths'. The teachers' goals seem to be different from Maths Lit goals – as the

Maths Lit goals are to work with everyday life situations, but teachers' understanding of Maths Lit has shifted away from that, to teaching Mathematics. This kind of interpretation relates to the contradictions inherent in the NCS document. This document acts as a mediating tool, which as stated earlier could "empower as well as restrict human action in specific ways; they influence the form interaction taken and thereby the goals that emerge in the interactions" (Daniels, 1993, p.79; 112). In this instance the teachers used teaching Mathematics as a tool that will mediate their mathematical goals.

Another contributing factor to this shift appears to be the work schedule designed in such a way that it consists of a significant number of content driven topics and fewer contextualized topics. The framework of this work schedule seems to be guided by the Learning Outcomes found in the NCS policy document, which are more mathematically inclined.

With reference to the model proposed in chapter 3, the model reflected the ways in which my data suggested policy-practice interaction occurred in relation to tools used. Here the original model needed adapting to show that at teacher level, mathematical goals were predominating, and loss of other policy goals. Further, the strong presence of district level mediation via the work schedule with its largely mathematical frame also needed to be inserted.

The unanticipated dominance of the district work schedule in this study added a further level that needed to be taken into account in my consideration of tools. District level tools are therefore added in below, working between the national policy and teacher levels:

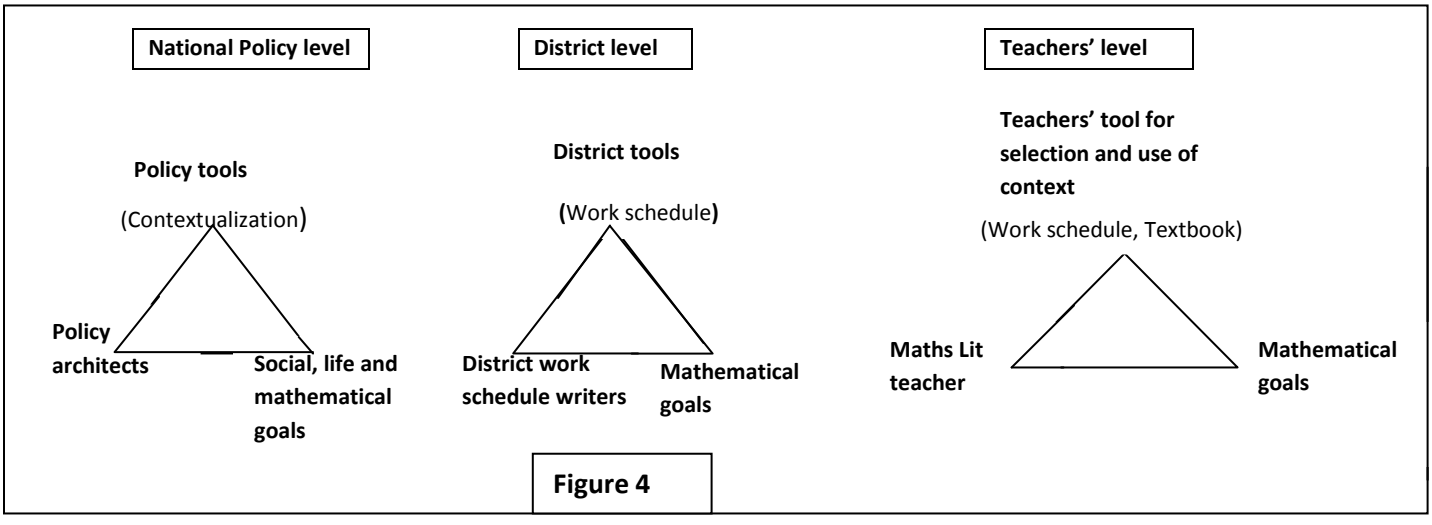


Figure 4

The work schedule from the district level was used as the tool to mediate the district goals, in this instance topics that dominated in the work schedule were mathematically inclined, and thus, it appeared that the work schedule goals were mathematically oriented. There seemed to be a tension between the district tools and the policy tools, as the district tool seemed not to align itself with the policy tools. This work schedule contributed to creating a disjunction between the teachers' practice and the national policy, as the teachers rarely followed the principle of contextualization as envisaged in the policy, but followed what was indicated in the work schedule. Thus in figure 3 above we have overlapping tools for district level and the teachers' level which are different from the policy. The work schedule was indicated by all teachers in the study as one of the tools which assisted teachers to understand Maths Lit. Teachers' viewed the work schedule as the tool "[which was]… used to influence or direct the mind and behavior" ((Vygotsky, 1991; cited by Daniels, 2001, p.16). Since it was framed in a more mathematical structure, it seems to have influenced how the teachers selected tasks and the way teachers' perceived Maths Lit – to be about the application of Mathematics, or as a watered-down version of Maths. Thus their goals were also directed towards promoting a more content-led learning which is the focus of Mathematics. Thus tasks selected are more content-led than context-led. It appears that the teachers' mediating tools seemed to be directing teachers' to achieve more mathematically inclined goals. This means that the teachers' end up with their own goals – that is to promote mathematical skills. This is in contrast to what the policy states, that the tasks have not only to be context led but the content has to be embedded in the context and be determined by the context in order to ensure that the social, life and mathematical goals are achieved.

The teachers used the textbooks as their material tools that will mediate the Maths Lit goal. The text book assisted in the selection of context for their tasks. The textbook tasks are more content focused, and the contexts are not related to the learners' everyday life. The textbook then does not explicitly accommodate the principle of localization and familiarization. This means that the Maths Lit – social and life goals are unlikely to be achieved.

The policy document provided examples of topics that teachers should focus on for their tasks, topics such as hire purchase, investment, mortgage bonds, ratio and proportion as encountered on daily basis, and cooking. These tasks topics are seen as mediating tools that will ensure that the Maths Lit goals are achieved as envisage from the policy documents. When looking at the learners' work books and referring to the teachers' interviews in relation to the tasks selected –

the tasks in the learners books did focus on financial Maths, but the topics were not based on what is stated in the policy. The focus was on loans and discounts. When looking at the ratio and proportion, in the learners' books, the focus was on basic calculations and not linked to everyday lives. There was a mismatch between the policy tasks topics and the tasks topics that are given to the learners. This means that the tasks used in the class room mediated different goals from those in the policy document. Furthermore, the topics that appeared in the work schedule are not in line with those stipulated within the purpose of Maths Lit. They seem to be mathematically inclined, and not linked to everyday life situations. The topics in the work schedule were used by teachers to structure their tasks, as the majority of the tasks that appeared in the learners' workbooks focused on similar topics. Overall therefore, the topics in the learners' workbooks and the topics in the work schedule leaned more towards mediating mathematical goals rather than social or life goals.

Chapter 6

6.1. Conclusion

In the interviews there is a general perception of what Maths Lit is about from all the teachers, which is mathematics that focuses on everyday life, and life-related problems. Within the discussion some teachers moved from the idea of mathematics that focuses on everyday life, to the application of basic mathematics in everyday life situations, and furthermore compared Maths Lit to Mathematics in terms of mathematical content that is simpler than what is in Mathematics. There was emphasis on application of basic mathematics to everyday life situations.

The idea of context varied among the teachers. Some viewed teaching aids as context, i.e. using an apple to teach fraction and the use of teaspoon for measurement were considered as contexts, and meanwhile others considered word problems as context.

All teachers indicated that context selections were driven by the content to be taught as described in the work schedule. Textbooks provided the appropriate context for the content to be taught. At the same time, tasks selected focused on the content in the work schedule and the textbooks. There was also evidence that context is in service of Maths, as the contexts used were determined by the content. Most teachers indicated that, to select the context they first looked at the content that they had to cover from the work schedule, and then decided what context will be suitable for it.

Moreover, teachers seemed to struggle with context selection due to the contradictions and challenges they encountered when teaching Maths Lit. The contradiction between what is stated in the policy and what appears in the exams – exams are content oriented, policy emphasizes context oriented problems. The challenge of providing tasks which are localized, whilst the exams and the work schedule do not comply. Thus they did not know how to identify a context as an appropriate localized context. This led them to use the contexts they perceived to be localized to introduce the tasks to be solved, but without engaging with the context. The other challenge they encountered related to learners who lacked basic mathematical knowledge. This made teachers focus on content teaching rather than on context. Teachers have the notion that context cannot support the content or assist in bridging the mathematical gap that learners have.

When looking into the learners' books, there were significant numbers of content based tasks, and few contextualized tasks. Most of the tasks were taken from textbooks as they were not modified to suit the learner's immediate environment. Some of the tasks were word problems and not scenario/context based. Even the activities with context tended to have a content emphasis. Most of these tasks come from the text book. Thus the tasks lack authenticity. Furthermore, the contexts teachers described and the contexts in the learners' books were not the same. Therefore, it seemed that the teachers use the context they describe as an introduction to the topic to be taught and do not let learners build on it or provide problems around the context. Instead they provide problems from the textbook that address the same content that was brought into the context discussed. For example, the introductory talk about 'Mashonisa' was followed by problems given to the learners about bank loans. Teachers therefore seemed to separate context from Maths learning.

Furthermore the teachers believed that sometimes you have to teach mathematical content, and then later apply it to everyday life situations. This explains why there were more content focused tasks than context focused tasks in the learners' books.

The teachers used contexts selected for their tasks as an introduction to the content to be learned. The context selected for the tasks was guided by the work schedule, and the text book used. Most of the contexts selected were not realistic or authentic, as they were not easily transferred to the learners' everyday situations and they did not reflect what is actually taking place in the work place. Most of the contexts selected did not relate to the social and life goals provided in the policy document. Teachers seemed to have been selecting their tasks and context based on the Mathematical goals. Even when the teachers tried to use the context in the learners' social life, it did not appear in the learners workbooks, they only talked about it in the interview. Thus this context did not have an impact on learners' experiences - only the textbook and the work schedule contributed.

In my study, the selection and use of context within Maths Lit classes was not influenced by the types of school in which I explored teaching, the location and the resources available. This was evident from the data gathered, where all four teachers in the sample from different schools, in spite of differences in their order of working with content/ contexts, approached Maths Lit with similar understandings, used similar tools and promoted the same Maths Lit goals, namely mathematical goals.

6.2. Recommendation

My findings suggest that teachers have to be provided with information that distinguishes between scenarios and word problems, and between teaching aids and context. Teachers need to be trained on how to select realistic and/ authentic contexts and the same information and knowledge teachers could be used to identify appropriate tasks from the textbook.

The designers of the work schedule should include more contexts that teachers could use in order to achieve the set goals, and teachers could be allowed to design their own work schedule or have some flexibility within the work schedule given.

The district facilitators have to be well informed on the goals of Maths Lit so that when they go to school to monitor they look for tasks and contexts that promote life-related goals. There should be information sharing forums, which focus on helping teachers improve their teaching approaches, and enable them to teach Maths Lit effectively.

6.3. Limitations of the study

The study was small scale, focused on four teachers. It would be interesting to see if these findings are true more broadly for teachers from different districts, and the data could have consisted of variety of responses based on how each district operates. Focusing on term 1 and 2 work also provided limitations, as there was a possibility that teachers would use more contexts that promoted all the Maths Lit goals on the other terms. That is, the context used in term 3 and 4 could have addressed the issue of contextualization as envisaged in the policy document i.e. data handling would focus on real data, real life situations, thus the tasks would be moved towards contextualization within our continuum. Focusing on the informal classroom tasks created another limitation, as there was a possibility that the formal portfolio tasks were contextualized and focused on the Maths Lit purposes and goals. The strength of the study was the combination of interview data with a focus on workbooks, as this provided space to see where teacher reports seemed misaligned with learner workbooks. However, the use of observations to see the extent to which the teacher introduced and used the context in their classroom would have also been useful.

6.4. Implications of the study

In terms of my teaching, the teaching approach of Maths Lit within my classes has changed and improved. I am now attempting to engage my learners on more context oriented tasks. I first evaluate the context that I give to the learners, in terms of its authenticity. When learners engage with the problem I encourage learners to reflect on their solutions and interpret them in terms of the context and their own experience. I also started encouraging my learners to bring newspapers and to look at their parents' work and what they do at home, community, and relate it to what we have learned. I am now reading the policy document with a different eye, looking at the areas that are focusing on promoting the Maths Lit goals, and have discussions with my learners on the same issues.

When monitoring other teachers' work, I am now starting to channel them in the same direction, of encouraging authentic tasks and the shift from taking tasks as given from the textbooks.

I still have to effectively design my own tasks, and to improve on my skills of identifying an authentic context. I need to enhance my skill of designing tasks with contexts that are local in nature able to cater for the different learners that I have in my class.

6.5. Questions for further research

a. To what extent do the exams and the portfolio tasks use authentic context that promotes all Maths Lit goals?

b. How well informed are the teachers with the Maths Lit goals?

c. What qualifies a context to be authentic within a South African curriculum (Maths Lit)?

REFERENCES

1. AMESA, (2003). *AMESA Submission to the department of Education on the National Curriculum Statement Grades 10-12(School) and in particular on the Mathematics and Mathematical Literacy subjects statements*. Diepriver: AMESA
2. Adler, J., Pournara & Graven, M. (2000). Integration within and across mathematics. *Pythagoras,* 53, pp 2-13
3. Bowie, L. & Frith, V. (2006). Concerns about the South African Mathematical Literacy curriculum arising from experience of materials development, *Pythagoras,* volume,64,December, pp. 29-36
4. Brombacher, A. (2007). Mathematical Literacy, A Reader. Cape Town. Bateleur
5. Brown, B. & Schofer, M. (2006). Teacher education for Mathematical Literacy: Amodelling approach, *Pythagoras,* volume,64,December, pp. 45-51
6. Burton, N.,Brundrett,M.,& Jones M. (2008). Doing your education research project. Los Angeles. SAGE
7. Christiansen, I.M. (2006).Mathematical Literacy as a school subject: Failing the progressive vision? *Pythagoras,* volume,64,December, pp.6-13
8. Christiansen, I.M. Mathematical literacy as a school subject:Mathematical gaze or livelihood gaze?. *African Journal of Research in SMT Education,* volume 11(1) pp. 91-105
9. Daniels, H, (1993). Charting the agendas: Educationional activity after Vygotsky. New York: Routledge, Chapman and Hall.
10. Daniels,H, (1993). Charting the agenda: educational activity after Vygotsky. New York: Routledge, Chapman and Hall.
11. Daniels, H. (2001). Vygotsky and Pedagogy. New York: Routledge
12. DoE (2003) National Curriculum Statement Grade 10-12 (General): Mathematical Literacy

13. DoE (2008) Subject Assessment Guideline Grade 10-12 (General): Mathematical Literacy

14. Engestrom, Y. (2001). *Expansive Learning at work*: Towards an activity – theoretical reconceptualisation. London: Institution of Education.

15. Fraenkel, J & Wallen, N. (1990). *How to design and evaluate research in education*. New York: McGraw-Hill.

16. Graven, M. & Venkat, H. (2006). Mathematical Literacy In South Africa and Functional Mathematics in England: A consideration of overlap and contrast *Pythagoras,* volume,64,December, p 14-26

17. Graven, M. and Venkat, H. (2007) Emerging pedagogic agendas in the teaching of Mathematical Literacy, *African Journal of Research in SMT Education*, 11 (2), 67-86

18. Hatch, J. A (2002) Doing qualitative research in educational settings. SUNY. New York. Chapter 1. Pp. 1– 34

19. Hatch, J. A (2002) Doing qualitative research in educational settings. SUNY. New York. Chapter 4. Pp. 147 – 210

20. Jablonka, E. (2003). Mathematical Literacy. In A. J. Bishop, M. A. Clements, C. Keitel, J. Kilpatrick & F. K. S. Leung (Eds.), *Second International Handbook of Mathematics Education* (pp. 75-102). Dordrecht : Kluwer Academic Publishers.

21. Jablonka, E., Gellert, U., & Keitel, C. (2001). Mathematical literacy and common sense in mathematics education. In B. Atweh, H. Forgasz & B. Nebres (Eds.), *Sociocultural research on mathematics education: An international perspective*. Mahwah , New Jersey : Lawrence Erlbaum Associates

22. Jablonka, E. (2003**)**. Mathematical Literacy. In A.J. Bishop, M.A.Clements, C. Keitel, J. Kilpatrick, F.K.S. Leung (Eds.). *Second International Handbook of Mathematics Education* (pp. 75-102). The Netherlands, Dordrecht: Kluwer Academic Publishers,

23. Julie , C. 2006. Teachers' preferred contexts for Mathematical Literacy as possible initiators. African Journal of Research in SMT Education,Vol.10(2) 2006, pp. 49-58

24. Julie, C. and Mbekwa, M, (2005): What would Grade 8 to 10 learners prefer as context for mathematical literacy? The case of Masilakele Secondary School*, Perspectives in Education* : *Speaking the Curriculum : Learner Voices and Silences* - Challenges for Mathematics and Science Education in the Twenty First Century : Special Issue, Vol 23(3), Sep, pp.31-43

25. Lee, B. (1985). Intellectual origins of Vygotsky's semiotic analysis. In J.V. Wertsch (ed) *culture, communication and cognition*, Cambridge: Cambridge University Press.

26. Opie, C. (Ed). (2004) *Doing Educational Research*. Sage. London.

27. Saywer A, (2006). Education for Early Mathematical Literacy: More Than maths Know –How. http://www.merga.net.au/publications/counter.php?pub=pub_conf&id

28. Skalicky, J. (2005) Qualitative Literacy in a Reform-based Curriculum and Implications for Assessment. *The association for active educational researchers, Conference paper,* 1-14, Melbourne: AARE – University of Tasmania

29. Steen. L.A (2001). A case for Quantitative Literacy. In Steen L.A. (Ed) 2001. Mathematics and Democracy: The case for Quantitative Literacy.pp 1-22.

30. Venkatakrishnan, H., Adler, J. (2008). Expanding the foci of activity theory: accessing the broader contexts and experiences of mathematics education reform. Vol. 60, No. 2, May 2008, 127 – 140, Wits – Johannesburg: Routledge, Taylor and Group.

31. Venkat, H. (2007). Mathematical Literacy – mathematics and/or literacy: what is being sought? *Pythagoras,* volume,64,December, pp. 76-84.

32. Vygotsky, L.S. (1978). *Mind in society: the development of higher psychological* process. Cambridge, MA : Harvard University Press

33. Vithal, R. (2006). Developing Mathematical Literacy through project work: A teacher/teaching perspective. *Pythagoras,* volume,64,December, pp. 37-44

34. Wiggins, G. (2001). "Get Real" Assessing for Quantitative Literacy. *Proceedings of the National Forum on Quantitative Literacy need at the*

National Academy of the Sciences in Washington D.C. December 2001, 121-143

35. Wiggins, G., & McTighe, J. (1998). *Understanding by design.* Alexandria, VA: Association for Supervision and Curriculum Development.

Appendix 1

Informed consent letter

Dear Parent or Guardian

Masters Research Project – University of the Witwatersrand, Johannesburg

I am currently doing some research in Mathematics Education at the University of Witwatersrand. The study's focus is on teachers' selection and use of context-oriented tasks for grade 10 Mathematical Literacy. I am interested in what informs teachers' selection and use of context-oriented tasks for their grade 10 Mathematical Literacy classes. I would like to use data gathered from the learners' class activities and/or portfolio tasks for my research. I believe that through my research, I can make a meaningful contribution to Mathematics education, and gain an understanding of the ways in which context-oriented tasks impacts on mathematical Literacy teaching and learners' experiences of learning Mathematical Literacy in school.

The focus of my research will be on the activities that learners' were given in class and on the contexts used within these activities, and on the kinds of questions that the teacher asked. Only my supervisor, Prof Hamsa Venkat, and I will have access to the data. The school and the names of the learners will remain anonymous. When reporting my findings, it is my intention to illuminate critical features in relation to the tasks set. In this regard I undertake to ensure that no untoward references are made about the learners or the teachers. There will be no interruption to normal classes as a result of this research.

I must stress that the participation is voluntary. Your child is under no obligation to participate and there are no consequences should you or your child choose not to. All participants also have a right to withdraw from the study at any future point. I would be very grateful for this opportunity however, and if you are agreeable to this process please read and complete the attached consent form and return it to school.

If you have any questions or concerns or would like to discuss the aim of the research in more details, please do not hesitate to contact me (011) 900 4437. Should you wish to, you can also contact my supervisor, Prof Hamsa Venkat on (011) 717 3742.

Yours sincerely

Consent form for participation in a research project.

(Please cancel clearly where not applicable)

I have read the above and **give consent / do not give consent** for my child to participate in the research project of Thandeka Tilana subject to the conditions laid out in the accompanying letter. These include the use of the data from the learner's class activities and/or portfolio tasks for research/ teachers development purposes and in articles for publication in academic journals on conditions that the school remains anonymous and all participants are referred to by pseudonyms.

Name of learner:……

Signature of learner:…….

Name of parent or guardian:……..

Signature of parent or guardian:……..

Date:……

Appendix 2

Informed consent letter (Teachers)

Informed Consent Form for teachers of Grade 10 Mathematical Literacy

The selection and the use of context-oriented tasks within grade 10 Mathematical Literacy classes.

I, _____ consent to participate in this study conducted by Miss Thandeka Tilana on what informs teachers' selection and use of context-oriented task in the grade 10 Mathematical Literacy classes. I realise that no negative consequences will result from my participation in this study, and that the study is being conducted for purposes of improving the teaching of Mathematical Literacy in our schools. I give permission for the material to be used for research or teaching only.

I participate voluntarily and understand that I may withdraw from the study at any time.

Interviews:

I further consent to being interviewed as part of the study. I also understand that I have the right to review the notes made of our conversations before these are used for analysis if I so choose. I can delete or amend any material or retract or revise any of my remarks. Everything I say will be kept confidential by the interviewer. I will only be identified by a pseudonym in the research report. In addition, any persons I refer to in the interview and the name of the school will be kept confidential.

Name:

_____

Signature: _____

Date: _____

Appendix 3

Information sheet for teachers

Research study on what informs teachers' selection of context-oriented task for grade 10 Mathematical Literacy classes.

I Thandeka Tilana am conducting research for my MEd degree at the University of the Witwatersrand. I am carrying out a study that investigates what informs teachers' selection of context-oriented task for grade 10 Mathematical Literacy classes. I would like to conduct this research among grade 10 Mathematical Literacy teachers at Ekurhuleni South District schools.

I would like to find out about the contexts teachers select and use for their grade 10 Mathematical Literacy classes, and about the teachers' understanding of contextualisation as advocated in the NCS policy documents, the extent to which this approach is used in Mathematical Literacy and the factors that promote the use of contextualization teaching in the Mathematical Literacy classes.

I would like to interview you about your grade 10 Mathematical literacy activities and tasks and take notes on aspects that relate to contextualised activities or tasks. I would also like to interview you in relation to the contexts that you have used with your classes and to analyse a sample the learners' books to explore how you have selected and used contexts in your classes. I would like to tape-record the proceedings of the interviews if you accept.

My research will benefit your school in that your responses will contribute to an understanding of context driven activities as suggested in the NCS policy documents. This will hopefully assist you and other teachers, head teachers and education facilitators to address the issues or difficulties associated with contextualisation within the Mathematical Literacy curriculum.

If you take part in my study, I would like to make it clear that your participation is entirely voluntary, no negative consequences will result from your participation, and all information will be treated with confidentiality. If you do accept to participate, please remember that you may decline to answer any questions, and you may withdraw from the study at any time. In order to protect confidentiality, all names I use will be fictitious.

I will provide you with a summary of my research results on completion if you would like me to.

Thank you.

Name: Thandeka Tilana (researcher)

Appendix 4

Work schedule

PROVINCE
MATHEMATICAL LITERACY – WORK SCHEDULE – GRADE 10

DATE	TOPIC	CONTENT/CONTEXT	LO/AS	ASSESSMENT	DATE COMPLED
TERM 1					
14/1 - 16/1	Rounding and estimation		10.1.2		
19/1 - 23/1	Scientific calculator, fractions and decimals	• Working with formulae by hand and with a calculator • Associative, commutative and distributive laws • Decimals: Addition, subtraction, multiplication, division	10.1.1/ 10.1.3		
26/1 - 30/1	Percentage		10.1.3		
02/2 - 06/2	Ratio and proportion	Direct and indirect	10.1.2/ 10.1.3		
09/2 - 13/2	Simple interest	Annually, half-yearly, quarterly, monthly	10.2.1		
16/2 - 20/2	Compound growth	Annually, half-yearly, quarterly, monthly	10.2.1		
23/2 - 27/2	Loans	E.g. BUYING PROPERTY • Bonds and Transfer Fees • Monthly Repayments • Actual Costs • Reducing Cost of Loan • Which bank, which bond? • Interest Rate Changes	10.1.1	Investigation	
02/3 - 06/3	Entrepreneurship		10.2.1		
09/3 - 13/3	Conversions	Units of measurement and convert measurements within the metric system (km to m; mm^3 to $litre$; km^2 to m^2; cm^3 to m^3)	10.3.2		
16/3 - 20/3	Currencies	E.g. CELL PHONES • Cell phone billing • Contract vs. Prepaid • Calculating VAT/tax • Credit Cards	10.2.1		
23/3 - 27/3	Test				
TERM 2					
15/4 - 17/4	Straight line (tables)	• Cartesian co-ordinate system. • Draw graphs ➢ Point-by-point plotting of data ➢ Straight lines through the origin ➢ Straight lines not through the origin ➢ From equation to the graph and back again	10.2.1		
20/4 - 24/4	Direct and inverse proportion	• Dependant/independent variable in the context of linear and inverse proportion • Determine output values for given input values • Determine input t values for given output values	10.2.3		
28/4 - 30/4	Complete tables, plot graphs and compare graphs	• Draw graphs ➢ Working with formulae to establish points to plot ➢ Graphs that are not straight: Inverse proportion, compound growth, graphs depicting the relationship between variables • Critically interpret tables and graphs that relate to a variety of real-life situations by: ➢ Finding values of variables at certain points ➢ Describing overall trends ➢ Identifying maximum and minimum points ➢ Describing trends(including in terms of rates of change(gradient) E.g. GRAPHS IN NEWSPAPERS	10.2.3		
04/5 - 08/5	Simultaneous equations (graphically)		10.2.1		
11/5 - 15/5	Perimeter and area in 2D problems	Perimeter and area of polygons and circles	10.3.1		

Appendix 5

First interview schedule

1. What do you understand by ML (Maths Lit)
2. How long have you been teaching ML?
3. Which grades have you taught ML before?
4. What subject were you teaching before teaching ML?
5. What do you find interesting about ML? and are there things about ML that you dislike?
6. What kinds of context have you used within your teaching of grade 10 Mathematical Literacy this year?
   ***Possible prompts**:*
   - *And can you explain how you used a particular context?*
   - *Can you tell me about the kinds of activities you designed and the questions you asked the class?*
   - *Those contexts seem to relate to LO4 maybe more than the other LO s? Would that be more broadly true of the contexts you have brought into your ML teaching, or have you used contexts across all the LO?*
7. 'How do you design or select tasks for use in your ML lesson*?*
   ***Possible prompts**:*
   - *do you use textbook, newspaper articles, district provided activities, etc).*
   - *Can you give me an/ some examples*
   - *Do you usually work in this way from the context to maths / from the maths to the context*
   - *How did you merge the two?]*

8. How do you select the context that you have used?
9. Where do you get ideas from on what contexts to select?
   [***Possible prompt**:*
   - *Which textbook are you using/ which textbooks are you using?]*

10. How did you introduce this particular context?

[***Possible prompts**:*
- *And how did you engage your learners in this particular context?*
- *How do you think the tasks went in class?*
- *What do you think learners gained from it and what issues arose?*

And if they say that they are using contexts in all / most of their ML teaching how they feel about this more generally.]

Appendix 6

Second interview schedule

Possible questions in follow up to analysis of workbooks

1 I have looked through the sample of workbooks you gave me and found them very interesting. Can you tell me a little about how you select the tasks you have used in Maths Literacy, and about why you chose to use the specific tasks you have selected here?

2 How do you understand the idea of Maths Literacy?

3 What has helped you to understand the idea of Maths Literacy – (e.g. curr docs, training, colleagues, textbooks, assessment tasks, etc)

4 Can you tell me how the ways in which you think about ML figure within some of the tasks you have used during the year.

5 I can see some of the tasks you have given your learners have context. How have you selected the context in the workbooks?

6 I see there are some examples of more 'pure content' focused tasks here as well. What made you decide to use those even though you have said that you think Maths Lit is based on the idea of context?

7 In the learners' workbooks there is a mixture of context tasks and pure content tasks, when do you merge the two?

8 In your activities do you use content to support context or context to support content? Why?

9 To what extend do you use the context in your work schedule?

10 Have you seen successes/ issues arise within your use of context in Maths Lit. Can you share any of these with me?

Appendix 7

(Examples of the transcript for teacher 1)

Interview 1

TEACHER 1 (from the Location school)

INTERVIEW BETWEEN T1 AND TT (INTERVIEWER)

TT: What do you understand by ML (Maths Lit)
T1: mainly has to do with giving somebody an ability to understand basic Maths that is used in every day life , like literacy has to do with the ability to read and write, maths lit give somebody the ability to understand basic maths that has to do with day to day living
TT: How long have you been teaching ML?
T1: one and a half year, I started last year from august to December grade 10 maths lit
TT: Which grades have you taught ML before?
T1: I have been teaching grade 10 maths lit from last year
TT: What subject were you teaching before teaching ML?
T1: Mathematics
TT: How long have you been teaching Mathematics?
T1: here in South Africa, it has been a year
TT: What do you find interesting about ML?
T1: mainly it involves application problems to real life to things that we understand like things that learners and people encounter in every day life, some thing that's in touch with reality it is not too abstract like Mathematics, 'sin', as with maths lit, I am doing fraction, percentages, financial maths that affects ones life which is what I find interesting
TT: Are there things about ML that you dislike?
T1: not as in, there are instances like content is ok. But my concern normally is when a learner finish grade 12 wants to advance and do tertiary studies, like one wants to do accounts as a learner, will that person be able to relate to accounts , sometimes methods that are done in Mathematics as a tool or a subject. Just for assessing maths lit makes somebody to understand maths
TT: What kinds of context have you used within your teaching of grade 10 Mathematical Literacy this year?
T1: could you be specific, may be to elaborate, I don't understand. I do not want to get out of line

TT: you know in your first question you said that you understand ML as every day life situations, what kind of context have you used to introduce learners to every day life situation
T1: For example most learners struggle with fractions, and some times it appears that most of the things involve fractions, dividing fractions. So one time when I was introducing fractions I had to buy some apples, take an apple as a whole then develop my lesson from there, cut the apple and explain when we say half is like this, when we say one third is cutting like this and equivalent fraction and the like, then later on some times use every day example lets say you are teaching, simple interest, get a cutting from the bank to show what do we mean when we talking about simple interest. This will be a way of building upon thing that we have done before

TT: how did you build the questions around this context, lest start with the apple, how did you build the question for the activity?
T1: with an apple what I did initially was I introduce the concept of the whole like 1, then the concept of half like the addition of fractions. Then I cut two pieces and put them together they give me one. So when I am saying one half I am saying this is one out of the two pieces that I have that's what I mean by half. Then if I want to say two quarters then I cut them again into four parts, like those two pieces into two is to two I will make four parts and in order to introduce the concept of equivalents, this is equivalent to half, this is equivalent to two quarters or to this or its still the same half apple I have but I have cut it into two and how many pieces do I have, four how many are this, it is two out of four and like can you see that they are the same and This is how I was build on, it was more like using teaching aids and the likes so they can really understand.

TT: How do you design or select tasks for use in your ML lesson*?*

T1: could you elaborate?
TT: you said they had problems with fractions, so how did you know that you need to teach fractions?

T1: it was part of the normal we get work schedules that we get, so I was following the work schedule but I realized that with the work schedule some of the work is hinting on certain aspects then I have to go to that aspect and teach it, for development of the lesson. For the work schedule say you do this but then at the end of the day you then realize that what they are doing they are assuming, is the assumed knowledge. They assume that the learner knows that and that, but in real life situation, in the practicality of the classroom situation you

realize that there are some gaps with the learners and of course you can just move swift across the work schedule but the learners will still not understand any thing or find it hard to understand .

TT: from the work schedule can you give me some of the examples of the activities you have design on your own, as you said that in the work schedule they give you content of what learners have to know. So how did you design the activity around that particular topic that is indicated in the work schedule? You can give me one or two from what you have already taught?

T1: I introduced the different from simple interest and compound interest .Initially I introduced what simple interest is and compound interest and the symbols. We had to involve the class were we create a table and put the symbols the principal the rate and the number of years and will calculate for example 10% interest and the learners will now be familiar with percentages from when we did fractions. Then we will do more tables for other problems. After I introduced compound interest where again as a class we will draw two tables to revist the simple interest and remind them that as long as its simple interest we are focusing on principal amount, it does not change.but now with compound interest after working out the first year, lets say our principal amount was R1000.00 at 10% interest for 6 years. At the end of first year I will have R1100. Now the second year unlike simple interest where you will have , 1000,1000,1000, … for your principal amount and the interest is charged on that. On the second year the principal amount become the new amount, R1100. Then you develop your work like that, then once in a while like also use another tables from other textbooks.

TT: From your explanation you said you introduced simple interest first, how did you introduce it?

T1: initially we were talking about ‘Mashonisas’ [money landers] , talking about what they know, I said to them supposing you went to Mashonisa and borrowed R500, and that you are going to return it as R500 after two months, they said no maybe as R750, or what. Then in business that money that is added on is called an interest, so I tried to use what they know then I went to banks, and look at what do they do if you are borrowing or investing
TT: What I am gathering so far is that you talked about content, fractions, simple interest, compound interest, then you also brought in the ‘mashonisa’ and banks. So, do you usually work in this way from the context to content / from the content to the context?

T1: Sometimes it's mixed, well my philosophy is that it depends, some times start from the known to the unknown, or sometimes from unknown to the known, it depends on the type of lesson, like the context as I am saying if I can come up with every day examples
The better, they are readily available, I just start on this, maybe on what they use in every day life then apply maths. Then some times its coming with this depending on the topic

TT: How do you select the context that you have used? (For examples you used 'mashonisa' and the banks)

T1: personally I start with the content that the learners have to know then what in every day life can apply to this thing so that it makes sense to them. As at the end of the day Maths lit is more about application to real life. Other wise they may end up being abstract and divorced from every day life. Normally I start from the content that guide me to select issues in real life, that's how I approach it

TT: Where do you get ideas from on what contexts to select for that content? (i.e. apple for fractions)

T1: well I guess, normally, the way we have been trained back at home, is to be creative and resources. When ever I come with the lesson I have to considered the type of learners maybe average, then I have to make it more meaningful for them to make them understand. Also in maths lit there are guidelines that learners should know about this from the work schedule, where they will have the content on the other side have the application items, the use of apples was an alternative on how best can I teach fractions.
I also get ideas from the policy documents, and from how best I can deliver this lesson
TT: which textbook/s are you using?
T1: Lately I use successful maths lit oxford , then spot on is used as its more simplified for my learners

TT:How did you introduce this particular context?
Initially, I used every day examples to introduce interest, what interest is , like I used mashonisa, before I could even go to the banks, then explain it from there, then link it to the term interest. The I indicated that what the 'mashonisas' are charging is interest, as they say you took my money now you have to pay for the money you have used
TT:And how did you engage your learners in this particular context?

T1: They related it to it everyday life and they joke around about it. When I introduced the bank they could relate it but I also brought the idea that the bank will also pay you for using your money when you have invested.
TT: How do you think the tasks went in class?
T1: they got the concept, some times the learners got things for a short period of time and then forget, especially when we do calculation they will keep on asking what the interest is, or mix up the formula. Even though they understand the interest as a concept
TT: What do you think learners gained from it and what issues arose?
T1: Firstly, they get things that are related to their everyday life and realize that this Maths is not divorced from what's happening on their community, secondly they grasp and understand but this maths is not important if its not link to every day life. But when it comes to calculations they still find it very complex too them they fail to appreciate it it they find it detached it from them.

But having a chance to apply this stuff in maths lit is one of the good things about it, having a chance to apply to real life make it exciting for them and relate it to what's happening. Despite the challenge the learners may have, the application aspects of it to real life is central

TT: How do you feel about the whole idea of using context when teaching?

T1: Despite the limitation of selecting the actual context, it is a brilliant idea, normally in teaching , education is divorced to real life experiences or things that you can pick out from life, hence its just being theory to people, they cannot relate to it. It is very applicable and important that we use this context it is good. Despite the limitation that you may not come up with the actual context you want. Some times you might be limited on the choice of context you want to use, like this is the best context is a very noble idea

TT: What create these limitations?

T1: what will for moment be a best context, like I am using 'mashonisa', that they can relate to it in their communities, of course it should be in the way it will be best for some. Let say you are teaching in the uptown school it might not be the best context. I am saying is the best in terms of the locality situation around where learners are suppose to relate to that. Some times the limitation might be as a result not of content but to find the best example or context that would suit the learners we have.

TT: What makes you to be unable to find suitable context for the learners you have?

T1: I cannot explain that it is just the feeling I have

T1: well the maths lit policy, normally what guides me like I said before is just how best will I deliver for the kids to understand , so that they can apply. I know about the policy statement for ML

Interview 2

TEACHER 1(from the Location school)

TT: I have looked through the sample of workbooks you gave me and found them very interesting. Can you tell me a little about how you select the tasks you have used in Maths Literacy, and about why you chose to use the specific tasks you have selected here?

T1: for example I introduced fraction, as I know we are going to deal with addition of fractions, where we will need LCM, common factors and the like. So before I could introduce fraction I have to do a recap of what factors are I used common numbers, look at also LCM that will lead straight to the addition of fractions, now when it comes to addition of fraction they will know now that if I am adding fractions manually you say one quarter plus one third then you will look for the LCM here and they are going to do this. So basically I just try to find out in terms of assumed knowledge like I have noted, if you just like go straight to the topic in the work schedule, you might go straight to the topic on the work schedule, but there is this assumed knowledge, they are assuming that the learner Is suppose to know this but when you go to the class room situation then you realize is not like that some times. Some times before you even teach that topic, you might have to go a little bit backwards so that it will flow because you do not want the situation where in the mist of the lesson I am assuming that the learners know about common lowest multiples, then you realized they do not which means I have to go back again. So I always make sure whatever things that I might pick up some of the assumed knowledge. Looking at other tasks, with Maths lit normally, its some times more fun, there are some word problems, where they are given in a sentence form. You have to apply what they have learned, like we have done with fractions, so normally what I have done with them, is like in the grade 10, 11, 12 question papers they bring in content

questions, like word problems where you have to pick out now, so in this instance there were more word problems for the topic I have plan for.

TT: How do you understand the idea of Maths Literacy?

T1: well I take Maths literacy as everyday maths, maths to do with life, maths to do with things we meet everyday, in our personal transaction; business transactions, so you go to the bank, personal transaction, you are buying selling, we use money. It has to do with every day maths, every day life, things that one can relate to. Unlike if we talk about Mathematics which is abstract, some times some of the stuff is abstract in Mathematics, but in Maths literacy, its everyday Maths, Maths that helps you to get by to go along with life, understand what's going around you, interpret some of the things that are happening around you, like being able to interpret the electricity bill, they say they are increasing it by 200%, you can interpret what's that in Maths lit, if they say prices are going up, or people are striking, Eskom is striking and they want 5% they will have an idea of what it means when they say 5% of salary increase, because some people may never get to know. You go to the bank, they are given option to invest or borrow some money. I think they can even be able to advise their parents some times, because with Maths literacy we are teaching them many things they need to know about everyday transactions.

TT: What has helped you to understand the idea of Maths Literacy – (e.g. curr docs, training, colleagues, textbooks, assessment tasks, etc)

T1: well, I guess the work schedules that we have, and once in a while the school, like we will be sent to the workshops where you are told how Maths is different from Maths lit, and this and that, and from the informal talks we have with others here at school

TT: what will they be referring to when they are talking, where there any document they were using beside the work schedule

T1: yes, there is a policy document that they talked about, I just cannot remember the side of it

TT: And can you tell me how the ways in which you think about ML features within some of the tasks you have used during the year.

T1: this issue of paint, when we were doing ratio, paint is normally mixed, and in the class room we did some example of mixing drink where you have a

concentration and water, where we see Maths lit being applied. What did you really mean by your question

TT: In the previous question you talked about the idea of Maths lit, now I want you to tell me how the ways you think about Maths lit feature within the tasks you have done in your class room

T1: like I have said its about everyday life examples, by knowing about shops and mixing of paint. When talking about ratio now that in painting there is this part that they can mix blue paint with red paint, may be 2 part of this with 3 parts of that, and they will know that's ratio, they now understand that. Then of course the other things we have done such as fractions, like if they say now in the given question they are required to make 30 liters and you are given 3 parts red and 2 part blue. How do you now after combining these two, you go back to your aspects of fractions that you could have covered. As for maths lit we also talk about people understanding simple interest and compound interest, is things that relate to them. Whether they like it or not its always out there maths lit you choose to ignore it or you are ignorant about it. So whether you are doing Maths lit or not, Simple and compound interest is still there, you still have to mix paint, or concentrated juice.So one can be ignorant about it but its still there, so its better if you are taught about it and now it will begin to make sense and now able to relate to it, so I see it featuring trough Maths lit.

TT:I can see some of the tasks you have given your learners have context. How have you selected the contexts in workbooks?

T1: What I will just, is there was no guidance at such, but I will look at the topic I have to cover, if there was any ways I can relate it to the environment, from the question or the task that I have, there was a context question or a problem they could apply in real life so that they don't see Maths lit as out side them, it is inside, its something they can relate to now and again and also as some thing they can apply it as they have learnt it. I can say we are trying to marry theory and practice, these are the things they need to real life. Apart from that I cannot say there was any properly guiding rationale.

TT:I see there are some examples of more 'pure content' focused tasks here as well. What made you decide to use those even though you have said that you think ML is based on the idea of contexts?

T1: in as much as Maths lit is based on the idea of context, there are also instances where learners have to learn just calculate the stuff then apply it , so I try to make a balance some times in the focused tasks and also marry them now,

the concepts in the content task can now be applied in the context so they can relate to that.

TT: so from what I am getting is that you have to teach content first then context.

T1: not really, sometimes you must start with context that these are the thing they have and then teach concepts. Some times it depends, this can be inductive, starting from specific, something from known to unknown, or deductive, starting from unknown to known, depending on the topic at hand and on what I as a teacher understand better this way, some times could be from context to content or the other way. But its always easier from the context, what they already understand

TT: In your activities do you use content to support context or context to support content? Why?

T1: Normally, it is mixed, like I don't usually believe in one school of thoughts, like say this inductive or deductive, some times I use what I call eclectic the best where the content is used to support the context or the context use to support the content depending with the learners we have and the level of understanding they have

TT: Can you give me an example where either of one supports the other

T1: I will go back to the example of fractions, the use of everyday things they use, talking about fruits. So I notice that prior we had problems about fractions, things that learners should know from primary they do not know, you will find them mixing them up. That's why I had to use the context of every day things like apples this and that cutting them showing them that this is what we call a quarter, then two quarters and the likes. Now where we use content,

TT: To what extend do you use the context in your work schedule?

T1: normal the context given is alright, I use it but some times as we are press with time I just mention it in passing so that they can understand this, but now also depending on the topic at hand, normally I use the work schedule as a guideline, in terms of the context that this are the things the learners should know,

TT: Have you seen successes/ issues arise within your use of contexts in ML? Can you share any of these with me?

T1: well I see, they are quiet a lot, you get satisfaction when you give learners some context questions where they have to apply what they have learnt and you see that they can now relate , when you are talking about increase or decrease in prices, from that to that and if it happens to their everyday environment. Context could go a long way in understanding Maths lit.