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Mathematical Literacy teachers: Can anyone be one?

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In this case study, Mathematical Literacy teachers were interviewed and observed in the classroom in order to provide insight into the way this subject, relatively new in South African schools, is handled. The focus of this research was the instructional practice of these teachers specifically in terms of their mathematical knowledge regarding the subject and its learners. The idea that this subject is inferior to other subjects in general, but to mathematics in particular, was alluded to by some participants, alongside of the notion that it was infra dig to teach it. The study revealed that a working knowledge of mathematics as well as teaching-and-learning skills are necessary for this subject to achieve what it was meant to do when it was introduced into South African high schools in 2006.

Keywords: Mathematical literacy; teachers; instructional practice; mathematical content knowledge; pedagogical content knowledge; teaching

Introduction

In 2006, South Africa was the first country in the world to introduce Mathematical Literacy (ML) as a school subject in the Further Education and Training (FET) band (Grades 10 to 12). This new subject was presented as the only alternative to Mathematics in the FET band, ensuring that all learners are required to study some form of mathematics in Grade 12. The purpose of this subject is to increase learner awareness and understanding of the importance of mathematics in the modern world, by providing opportunities to engage in real-life problems in different contexts. Limited in-depth research has been done concerning the ML teachers' instructional practices and what knowledge is required to teach this subject effectively and proficiently. Since the subject was introduced as new in 2006 and was immediately taken by a large number of learners, many teachers were co-opted into teaching it, whether they had a mathematical background or not. As a result of this, and because of the fact that learners who struggle with mathematics are obliged to take ML, some view the subject as a watered-down, inferior form of mathematics (Bowie & Frith, 2006:32) which can be taught by nearly anyone.

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Research aim

Is it true that anyone can, in fact, teach ML effectively? Or does the teacher need to have an understanding of mathematics? This research aims to answer these questions by investigating ML teachers' instructional practices as well as the knowledge they bring with them into the classroom. This study does not aim to generalise its findings, but rather to provide insight into the classroom practices of four ML teachers. Specifically, two foci are considered: To what extent are these teachers equipped to teach the subject effectively, thus their pedagogical content knowledge (PCK) and mathematical content knowledge (MCK), and how their instructional practices may be described.

Literature study

Internationally, ML refers to "the competence of individuals" (Christiansen, 2006: 6), which ranges from a competence demonstrated in word problems to a critical or democratic competence. In South Africa, ML was introduced in 2006 as a high school subject presenting an alternative to Mathematics in the last three years of high schooling (Grades 10 to 12). In this respect, different views exist, but the most common descriptions of ML are: mathematics in action (Skovsmose, 2007); mathematics in context (McCrone & Dossey, 2007); realistic mathematics education (Hope, 2007), and mathematising (Hope, 2007). The variation in these descriptions reveals how an understanding of the depth of the required mathematical knowledge and skills ranges from functional to being advanced.

While some researchers associate the application of mathematics to real-world contexts with a high level of mathematical knowledge and competence in using it (Hope, 2007; Jablonka, 2003; Skovsmose, 2007), others believe that everyone should have sufficient mathematical know-how to make well-informed decisions in their daily lives, to care for their families and to contribute in their workplace or society (McCrone & Dossey, 2007; Skovsmose, 2007). The value of being mathematically literate is evident, but it remains uncertain to what extent ML should address educational practices and to what extent it can contribute to an individual's quality of life or even the development of the country (Jablonka, 2003; Skovsmose, 2007). To provide only one international definition of ML is not viable, as it depends primarily on a particular social practice and the context involved.

In South Africa, ML as a subject was intended to bring mathematics to all people and to ensure that "citizens of the future are highly numerate consumers of mathematics" (DoE, 2003a: 9). The emphasis is on the knowledge needed to be a self-managing person, a contributing worker and a participating citizen. The DoE's (2003a: 9) national definition of ML reads as follows:

> *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 analyse everyday situations and to solve problems.*

Thus, the focus of ML is on the applicability of mathematics in everyday life situations and on improving the low level of learners' mathematical knowledge and mathematical literacy skills. The subject would provide the opportunity for each learner to become mathematically literate, in order to effectively deal with "mathematically related requirements in disciplines such as the social and life sciences" (DoE, 2003a: 11). However, concerns in this regard are expressed by Julie (2006), who regarded the ML curriculum as fraught with myths, omissions and unwarranted ambitions. He mentioned, among other constructs, the complexity of teaching ML compared to Mathematics; the lack of a recreational component in ML, and the dilemma of what context should be taught.

From a pedagogical point of view, the teaching and learning of ML was to provide opportunities to engage with mathematics in diverse contexts at a level that learners can access logically (DoE, 2003b). However, teaching mathematics in a contextualised and de-compartmentalised manner where the content topics are integrated complicates the teaching of such a subject as ML, since teachers may or may not have the knowledge and skills to do so. Research has indicated that Mathematics learners and, in many instances, teachers find word or application problems requiring conceptual understanding more difficult than routine problems which require factual recall or the use of routine procedures (Grobler, Grobler & Esterhuyse, 2001; Johari, 2003). The depth of mathematical knowledge required to teach ML is not defined in the literature or by the DoE. Nor has the DoE provided guidelines regarding pedagogical approaches in the teaching of the subject: instead, "the absence of precedents of what pedagogy and assessment should be like" (Graven & Venkat, 2007: 67) caused multifarious interpretations of the curriculum aims.

Conceptual framework

The instructional practice of the teacher occurs in the classroom where teachers' goals, knowledge and beliefs serve as driving forces behind their instructional efforts to guide and mentor learners in their search of knowledge (Artzt, Armour-Thomas & Curcio, 2008); simply put: teachers' classroom behaviour. Artzt et al. (2008) describe teachers' practices in terms of three observable aspects of their lessons, namely tasks, discourse and the learning environment, as well as the driving forces behind their lessons, namely teachers' knowledge. The purpose of tasks is to "provide opportunities for learners to connect their knowledge to new information and to build on their knowledge and interest through active engagement in meaningful problem solving" (Artzt et al., 2008: 10). To contribute to learner understanding, the discourse in class should provide opportunities for learners to express themselves, to listen, to question, to respond and to reflect on their thinking. A learning environment consists of a particular social and intellectual climate, the use of effective modes of instruction and pacing of the content, and attending to certain administrative routines (Artzt et al., 2008).

For the purpose of this study, ML teachers' MCK is based on Ball's description of common content knowledge that can be defined as a basic understanding of mathematical skills, procedures, and concepts acquired by any well-educated adult, enabling a teacher to solve mathematical problems in the prescribed curriculum (Ball, Thames & Phelps, 2005). Hill, Ball and Schilling (2008) define PCK in terms of three categories: content and learners, which includes teachers' ability to understand and predict learner understanding; content and teaching, which refers to teachers' ability to know what facilitates learner understanding, and curriculum knowledge, which includes knowledge of the purpose, aim, learning outcomes and assessment criteria of the subject, as well as appropriate teaching strategies. The level of productivity of the teachers' instructional practices is described based on Franke, Kazemi and Battey's (2007) view of a productive practice: a practice where the teacher listens to learners' mathematical thinking and aims to use it to encourage conversation that revolves around the mathematical ideas in the sequenced problems. Figure 1 encapsulates the conceptual framework used in this study.

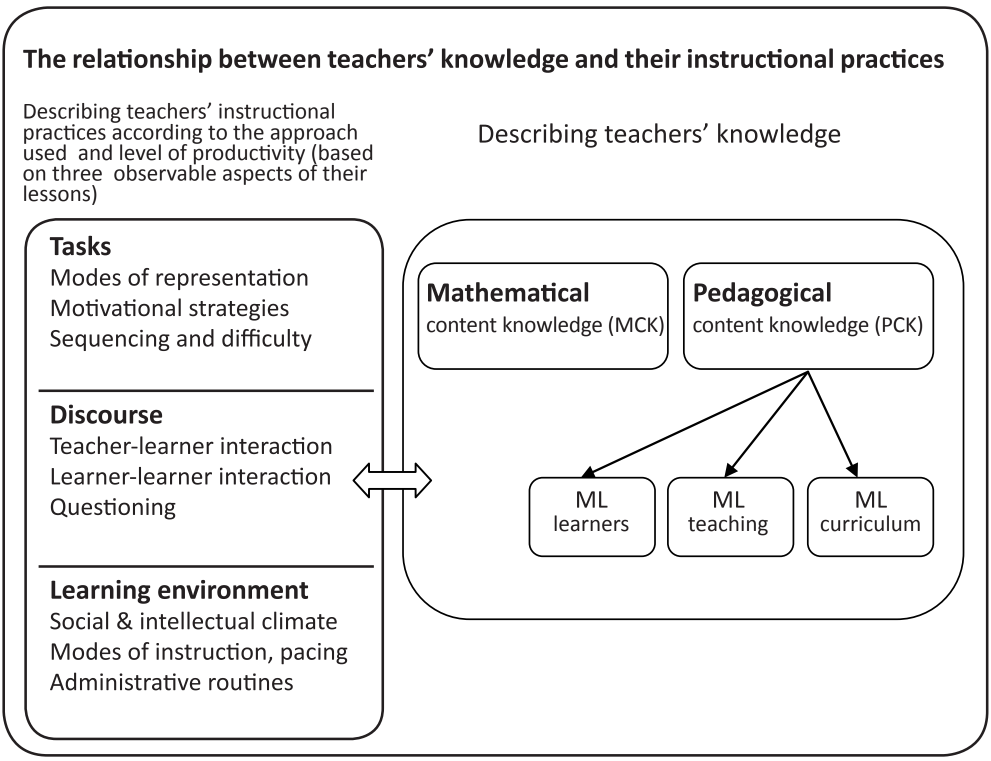

Figure 1: ***Adapted framework of analysis (adapted from Artzt et al., 2008; Franke et al., 2007; Hill et al., 2008***

Methodology

This research is qualitative. White (2005) emphasises the fact that qualitative research is concerned with conditions or relationships that exist, beliefs and attitudes that are held, effects that are being felt and trends that are developed. This exploratory case study focuses on describing ML teachers' instructional practices and the knowledge they bring with them to the classroom.

Sampling

The population consists of the ML teachers in South Africa, including Mathematics and non-Mathematics teachers from urban and rural government and private schools. Due to this wide variety of teachers, it is not possible to choose a representative sample. Convenience and purposive sampling were implemented to select four different secondary schools in Tshwane. The sampling is partly convenient, as the schools were chosen from easily accessible schools in Tshwane. Two traditional Black, one predominantly White and one predominantly Black school were chosen by way of purposive sampling. Only the Grade 11 teacher from each school participated, with the prerequisite that the teacher had taught ML for at least one year.

Data collection

Three lessons taught by each of the teachers were observed. These observations were done with different classes to obtain a general impression of the teacher's instructional practice. The first observation was done before any interviews were conducted, so that the teacher would not be influenced by the questions from the interviews. The lessons were videotaped and transcribed afterwards. Interviews were conducted to determine why teachers did what they did in class and to gain insight into the planning of their lessons and providing evidence of their knowledge regarding the learners, teaching of ML and curriculum. All interviews were audio-taped and the tape recordings were transcribed *verbatim*.

Ethical clearance

Ethical clearance was requested from both the Ethics Department at the University of Pretoria and the Gauteng Department of Education. Both the teachers and principals signed letters of consent which explained the purpose, their participative roles, possible advantages and disadvantages of taking part in the study as well as information regarding confidentiality, anonymity and potential risks involved in taking part in the study.

Data-analysis strategies

In this study, DEDUCTIVE-inductive (uppercase denotes the preference given to the style of analysis) qualitative data analysis was used, since the analysis was initially deductive and then inductive. The raw data were analysed according to the categories in this study's conceptual framework: tasks, discourse, and learning environment. This deductive phase of analysis was followed by the inductive analysis where the organised data were studied, in order to explore undiscovered patterns and emergent understandings (Patton, 2002). ATLAS.ti 6 was used to analyse the video and audio data, in order to establish a relationship between teachers' knowledge and their instructional practices. The coding used in the programme was, to a large extent, done deductively. An external coder was requested to view the videos, read the transcripts and confirm the justifiability of the coding and interpretations.

Validity

The Hawthorne effect (Cohen *et al*., 2001) was taken into consideration: the credibility of the data may have been influenced as the presence of the researcher in the classroom may have an impact on teachers' behaviour during observations. To reduce this effect, the first observation was done without a prior interview or discussion, as the interview questions prior to the second and third observations could influence teachers' behaviour in the classroom. Emphasis was placed on the uniqueness of each teacher and that the purpose was not to report their performances in class to their superiors. To further enhance the trustworthiness of the observations, the lessons were videotaped, field notes were taken, and the teacher had to verify these after each observation.

The data from the two interviews prior to the lessons were compared with the classroom observations. The same interview schedules, including the same questions and their sequence were used for all interviewees. The questions were short and concise, in order to avoid confusion or misunderstanding. The interviewees were asked exactly the same questions and, after each interview, the interpretation of the data gathered during the interview and observation were discussed with the participants: thus the interpretations were member-checked.

Results

The four participants, Monty, Alice, Denise and Elaine, were observed and interviewed over a period of four weeks. Pseudonyms are used to protect the participants' identities.

Monty

Monty is a novice teacher in his second year of teaching Grades 10, 11 and 12 ML. He taught Grade 10 Mathematics for one year. He is 24 years old and completed his BEd degree with Mathematics as major in 2010. Apart from attending the six ML courses organised and presented by the DoE and the District Office during 2010, he had no formal training for teaching ML. He teaches at an inner-city school of 500 learners.

Monty's instructional practice

Tasks

Monty did not consider the use of tasks to connect learners' prior knowledge to the new mathematical situation to be a tool that he could use successfully. Instead, he attempted to use a topical context to make the lesson he was about to teach relevant to the learners. For example, in introducing a lesson on simultaneous equations, he introduced local elections:

> *OK, remember we are approaching the Election Day and we need to support the campaign. Don't you think the results can be solved simultaneous, how? Remember he has to sit on the parliament and the province and we have 9 provinces né? Remember for the vote of the 18th they are going to take the result because remember people voted for this particular party or this party or organisation. They are going to add all those results and what information do you think we can get out of that? We can convert it into equations and solve simultaneous. That will tell us how many positions that party is going to get in …? Parliament, né? So you see we solve it simultaneous.*

However, he was not able to link the context to the mathematical content in such a way that it actually contributed to building learners' understanding, as was evidenced by their continued misunderstanding. He did not use the context to design a task which might have facilitated assimilation of the idea of simultaneous equations.

Discourse

He communicated in a non-judgemental manner and appeared keen to maintain a positive rapport with the learners. Nevertheless, the discourse was somewhat one-sided: learner participation was limited to the answering of simple questions in the style of sentence completions as in the quote above, or one-word-answer type questions: "OK, we call this one a co? efficient (completed the word himself). This one we call it? (Learner answered variable). The variable". When learners did express misunderstanding, Monty explained the work again. Intercommunication between the learners was not encouraged and general discussion did not happen.

Learning environment

It was obvious to the observer that Monty was confident and enthusiastic about teaching ML and kept the class quiet and working continuously. His management of the classroom was generally traditional and formal: "So, if I see you talking, I am going to chase you out and then you will come back next term". He used direct instruction as instructional strategy. The learners' time during the entire lesson was spent on listening to the teacher and copying work from the board.

Monty's knowledge

He made no calculation mistakes, taught the mathematical content with confidence, and it appeared that his MCK regarding the specific content covered was sufficient.

However, in the interview after the first lesson, he predicted what the learners would and would not understand of the content in the next lesson. This did not materialise. It seemed, in fact, that at times he could not understand what the learners could not understand, and this made him irritable. In a subsequent discussion regarding his PCK, he explained his thought on examples: “The more you have examples, the more they can see how to do it”, which entailed giving the learners “more sums because the more they practice maths the more they understand it, especially if they do it individually, that is when they learn best”. Although Monty discussed the importance of accessing learners’ prior knowledge to promote understanding, he chose similar, basic examples without using multiple representations. For the most part, he used direct instruction “because our learners are different from other school learners so we need to use the direct instruction”, although he did not elaborate as to what made the learners in his school different from others. Monty had no knowledge of other subjects’ curricula that integrate with ML. He knew about ML’s definition, purpose and learning outcomes, but was not aware of all departmental documents.

Alice

Alice grew up in the Congo; she is 30 years old and, in 1995, she obtained a BTech Management Accounting degree at a University of Technology with Financial Mathematics as major, but did not do any Mathematics Education or Mathematics Methodology courses. She has no experience of teaching Mathematics and it is her second year of teaching ML. She teaches at an independent inner-city school with 350 learners.

Alice’s instructional practice

Tasks

Alice believed that spending time on the development of contexts in the classroom used up valuable time which could rather be spent on learning mathematics. Except for one task being set in a context, her lessons therefore consisted of mathematical content only. In none of the observed lessons did she point out the value of mathematics in every-day life. In the dialogue below, she was using the table method to teach the class how to draw a quadratic graph:

> *Teacher: You remember when we draw the graph (she cleans the board and draws an x and y coordinate table) Quiet guys! (She writes:* $\mathbf{y - x^2}$*) Guys! Now you are not given any formula. We need to start at a negative (She writes -2 on the board.)*
>
> *Learner: Why do you start with -2?*
>
> *Teacher: Because they don’t give it. I am just assuming this is a problem. (She completes the table.) This is now where you draw your graph. (She draws two Cartesian planes below the table). This is your positive and this is your negative (indicating the first and second Cartesian plane). Quiet!*
>
> *Learner: Shhhh.*

> *Teacher: Let's draw (and she draws a set of axes and labels them. Learners talk and teacher looks at example and erases the set of axes before beginning to draw something on the axes) Shhh shhh. OK.*
>
> *Learner: Mam, where's my textbook?*
>
> *Teacher: OK, we have* $6x^2 + x = 12$ *. Quiet please! If you don't want to learn, you can leave the class (and she continues to solve* $6x^2 + x = 12$ *).*

Discourse

Alice did not encourage the participation of learners, except where she needed help with her own mistakes and misunderstandings. She dominated the discourse with direct instruction and allowed no interaction by the learners other than to answer the questions she posed, mainly of the complete-the-word/sentence type: "Your mean is always the? (Learner answers: middle number). No, mean is the sum of the data divided by the number of data". Despite the single directional flow of the discourse, the class was noisy and undisciplined.

Learning environment

A positive relationship with the leaners and co-operative atmosphere were not prioritised in Alice's classroom. She frequently appeared bored, irritated and un-enthusiastic, as could be observed in both her verbal and non-verbal communication. Once a learner asked how Alice solved the problem, she replied: "Don't ask me how to get this; you have to look at me". The learners did not persist in their enquiries; instead, they spoke to each other and paid scant attention to what Alice was doing.

Alice's knowledge

Alice knew about ML's definition, purpose and learning outcomes but was not aware of other subjects' curricula that integrate with ML. She made several mistakes and it appeared that her MCK is insufficient regarding the specific content covered in the three lessons. After the solution to a quadratic equation was completed on the board, Alice said:

> *Am I right? (She checks her own calculations.) You are supposed to always get a negative and a positive answer. So, what happened here? I am sure there is something wrong because here we have two positive answers. Guys please! (Class became noisy).*

She appeared to believe that all quadratic equations have one positive and one negative answer. The learners seemed to think otherwise, judging by their objections and attempts to assist Alice. Alice had predicted that the learners would find all the content easy and was annoyed by what she perceived as their inability to assist her. In an interview, she spoke of her belief that learners learn from practising in the presence of someone who gives them confidence, but made no mention of her own mistakes and misunderstandings. Instead, she indicated that the pace of instruction and the voluminous content that she presented in class were appropriate for the classes concerned.

Denise

Denise is 42 years old and completed a BEd degree in 2003 with Mathematics and Methodology of Mathematics as two of her major subjects. She completed her BEd Honours in 2009. She obtained both degrees from the University of Witwatersrand, but did a 40-hour course based on ML and the teaching thereof at the University of South Africa. She has seven years' experience of teaching Mathematics and it is her fourth year of teaching ML. She teaches at a school in Pretoria with 908 (predominantly Black) learners.

Denise's instructional practice

Tasks

The various representations used allowed her to link learners' prior knowledge with the new content of the day. Denise taught pure mathematical content and learners seemed motivated by the teacher rather than by the nature of the tasks. The tasks were sequenced over the various lessons, and suited the learners' level of understanding. She moved through the lessons at a brisk pace and did not require explanations from the learners, preferring brief answers:

> *Teacher: Number 1? Length, mass or capacity?*
>
> *Learner: Capacity.*
>
> *Teacher: Can you see it? Right. And number 2? What is it?*
>
> *Learner: Mass.*
>
> *Teacher: Mass … and number 3 that Jenny is doing now?*
>
> *Learner: Capacity.*
>
> *Teacher: OK.*

Discourse

Denise was non-judgemental and verbally encouraged the learners as she praised their efforts and made comments such as: "You did excellent so far, guys". She required learners to give demonstrations of their work in writing, but did not expect them to explain their work. She provided scaffolding to support learners' understanding and also recognised and clarified learners' misunderstandings.

Learning environment

Denise was confident and strict and seemed to have a positive attitude towards both the learners and the subject. She often adopted the role of facilitator in class discussions, and frequently invited learners to show their calculations on the board.

She encouraged the learners, saying: "Keep on practising till we don't see that minor mistakes". All information on the board was correct and ordered.

Denise's knowledge

She made no errors in her examples or corrections on the board and it seemed that she had sufficient MCK regarding the specific content covered in the three lessons. She also proved to be correct in her predictions of what learners would and would not understand. She did not expect learners to explain their thinking so that she could hear their thinking, but as they demonstrated their work on the board, she could rectify learners' misconceptions.

Denise used varied and appropriate representations to make the content comprehensible to the learners, and sequenced her tasks. However, she did not use contexts as a means of showing the learners the relevance of the mathematical content they were learning. She did not know the definition of ML and could not describe its learning outcomes.

Elaine

Elaine is 44 years old and completed her Higher Education Diploma: Senior Primary with Mathematics and Mathematics Didactics as two of her major subjects in 1989 at Normaal College of Education. She did not attend any courses on ML. She has eight years' experience of teaching Mathematics and it is her third year of teaching ML. She teaches at a school in Pretoria with 1.300 (predominantly White) learners.

Elaine's instructional practice

Tasks

Elaine used various representations, and when she selected her tasks, she took learners' diverse abilities into account and frequently reminded them of the value of mathematics in their lives. To elicit a class discussion, she once suggested: "Let us talk a little about why a person would rather wait to buy a house until he increased his deposit". Learners spontaneously took part in the class discussions. She connected learners' prior knowledge to the new mathematical situation and also sequenced the tasks given to enable the learners to progress in their cumulative understanding of the work, set in context.

Discourse

She was non-judgemental and all learners were involved through questioning and discussions. She expected learners to give explanations and justifications of their thinking, both orally and in writing, but also provided scaffolding to support learners' understanding such as:

Teacher: Which interest are we working with?

Learner1: Compound interest.

Teacher: Why did you choose compound interest?

Learner1: It's not simple interest.

Teacher: Right, but what tells you that it's not simple interest, but compound interest?

Learner1: The bracket and the part below.

Learner2: But there is no fraction.

Learner3: 'A' is the final amount.

Teacher: In simple interest 'A' is also the final amount. I told you earlier that you know it's compound interest when you see 'n' written as a power, then we reason this is more complicated than the normal formula, then it's compound interest. So I don't want you to just guess that it's compound, you must be able to give a reason why you say it is compound interest.

She was able to recognise and clarify learners' misunderstandings. Elaine encouraged the learners to listen and respond to other learners' ideas.

Learning environment

There was every indication of a good rapport with and among learners and she made her appreciation clear: "I really appreciate your efforts". Elaine was confident, well-prepared and enthusiastic, applied good discipline and created a calm and relaxed atmosphere. Her style varied between mediator and facilitator, using discussion tools such as: "Let's go a little bit further …") and direct instruction as instructional strategies. She allowed sufficient time for learner involvement and goal attainment.

Elaine's knowledge

No errors or misconceptions were observed and it seemed that she had sufficient MCK regarding the specific content covered. She accurately predicted what learners would and would not understand and how they would understand the new content. She was aware of learners' possible misconceptions and rectified their misunderstandings in class. Elaine looked at learners' work, and gave them opportunities to explain their thinking. She taught the content in context and used powerful examples, illustrations and explanations and various representations to make the work comprehensible to the learners. Elaine knew ML's definition, purpose, learning outcomes, relevant departmental documents, and how ML integrates with the curricula of five other subjects in school. In all her lessons, content was taught in context as ML should be taught.

Discussion

Two highly differing cases were Alice and Elaine. Alice, as a novice teacher with no mathematics teacher training, was the only teacher who communicated judgementally with the learners; did not work at a slower pace as stipulated in the ML curriculum (DoE, 2003a); did not have the ability to transform her own knowledge into forms that were pedagogically powerful, and viewed ML as similar, but inferior to Mathematics. Elaine, an experienced teacher, was the only teacher who used contextual tasks effectively; pointed out the value of mathematics; required the learners to explain their answers; posed a variety of questions on different levels, and had sufficient curriculum knowledge. In this instance, it appears that experience and mathematics teacher training play a crucial role in the instructional practices of ML teachers.

Teachers' knowledge

Teachers' MCK

Except for Alice, the teachers in this study appeared to have sufficient MCK regarding the topics they were teaching at the time of the observations. Alice's MCK was not always coherent, and she made several mistakes in the written examples on the board as well as during her verbal explanations. Alice, in fact, is similar to most of the participants in Hechter's (2011: 149) study, in which she concluded that the knowledge of most of the teachers in her study "was not coherent and some errors were made with respect to the mathematical content dealt with in the classrooms".

Teachers' PCK

The fact that the two experienced teachers seem to have developed PCK confirms the findings of Ball (1988), Ma (1999), Shulman (1986) and Sowder (2007) that PCK can be developed only over time through experience in the classroom and that it cannot be taught. Ball (1990) also believes that solid understanding and knowledge of mathematical subject matter are prerequisites for developing PCK. In this study, the two teachers who had developed a certain level of PCK also had adequate MCK. However, Monty's instructional practice indicates that sufficient MCK (teacher training) does not guarantee PCK.

Alice was the only teacher in this study who demonstrated insufficient MCK, and her instructional practice could well be described as unproductive. This finding supports Kilpatrick's (2001) view that proficient teaching demands, among other things, teachers' conceptual understanding and procedural fluency. In fact, both novice teachers in this study had insufficient PCK and unproductive instructional practices in contrast to the two experienced teachers who had sufficient PCK and productive instructional practices. This finding suggests that PCK influences the productivity of teachers' practices. According to the literature, teachers' knowledge strongly influences their practices (Artzt *et al*., 2008; Ball, 1990).

Elaine was very positive about both the subject ML and the knowledge and skills required to teach it. In her final interview, Elaine mentioned that, when she had been asked two years previously to be the coordinator for ML, she had initially felt that she was being demoted, but she claimed that ML had grown on her since then. She enjoyed being involved in ML and never wanted to return to Mathematics.

Conclusion

It appears that, apart from relevant knowledge having a definite influence on teachers' practices, teaching experience as well as mathematics teacher training may play a significant role in the productivity of the instructional practices of the four teachers: both experienced teachers had productive practices and, comparing the practices of the two novice teachers, the teacher with mathematics teacher training had a more productive instructional practice than the teacher without any teacher training. Thus, the ML teachers in this study with little or no mathematics teacher training are at a distinct disadvantage, as are their learners. They are unable to relate the real world to the mathematics classroom in such a way as to make the learners appreciate the value of mathematics. In this study, the teacher with both mathematical knowledge and experience in establishing a productive instructional practice seemed to be the only one accomplishing the requirements of the ML curriculum.

Data were gathered from a very small number of ML teachers and generalisation of the results is impossible. Quantitative research in this regard may confirm what this small-scale study suggests: not just anyone can teach this subject.

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