RETHINKING THE NOTION OF EQUITY TO ADDRESS THE FUNDAMENTAL ASSUMPTIONS AND GOALS OF CURRICULUM 2005[1]

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One of the fundamental assumptions of Curriculum 2005 is that all learners can learn mathematics and succeed. This, together with rhetoric about "equity", "redress", "access" and "personal empowerment", is certainly appealing in a country with a legacy of inequality in education. Working in collaboration with the TAP Project in Israel, MALATI has developed a philosophy of and approach to teaching and learning that we believe reflects these underlying assumptions and goals. This requires a shift in thinking about the notion of "equity" and time, and changes in classroom and assessment practices. This paper describes the MALATI philosophy and reports on the process of implementation of the approach by two teachers in a MALATI project school. Successes achieved as well as obstacles to implementation as perceived by the teachers are discussed.

Introduction

National policy documents for Curriculum 2005 contain technical guidelines on interpreting the outcomes, designing learning programmes, planning assessment etc., and much attention is currently being paid to the implementation of these guidelines in schools. While acknowledging the necessity for and merit of these initiatives, we feel there is a great need to focus on the underlying assumptions and goals of Curriculum 2005 and the possibilities for the realisation of these ideals in the mathematics classroom. For example, one of the basic assumptions of this curriculum is that all learners can learn mathematics and succeed. "Equity", "access", "redress" and "personal empowerment" are highlighted as important goals of the curriculum (Department of Education, 1996, 1997b).

In view of the history and legacy of inequality education in South Africa and recent reports of poor performance by South African learners in the Third International Mathematics and Science Study (TIMMS), it is imperative for the sake of the individual, society and the country that the goals of Curriculum 2005 be achieved and that more learners have the opportunity to study mathematics for a longer period than has been the case in the past.

Official documentation for Curriculum 2005 and literature on OBE provide suggestions on how the broader ideals can be achieved. This demands shifts in thinking about the notion of time, the role of the teacher, classroom organisation and the use of assessment.

For example, official documentation for Curriculum 2005 states that "time no longer controls the learning process". Rather, teachers are required to use a variety of teaching methods and assessment tools to assist each learner to develop and succeed at his/her own pace (Department of Education, 1997b, 1998). This is radically different from the traditional approach to time in which the school year is divided up according to the requirements of the prescribed syllabus. The teacher teaches the same content to the whole class and then proceeds to a new topic after the given time in order to ensure that the syllabus is "covered". This view of time is common: Carter and Richards (1999) refer to the "universal issue/dilemma" of time and "the teachers' belief that if they do not spend enough time 'covering' the 'curriculum' they will be damaging their

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students". On the contrary, research shows that learners gain conceptual understanding in a problem solving environment despite the fact that a syllabus has not been "covered" (Newstead, 1999). Furthermore, in our view the traditional approach to time **promotes** inequity because some learners in the class might not have gained the necessary understanding of the topic in the given time and could thus be excluded from the study of other areas of mathematics requiring this concept.

Curriculum 2005 also requires changes in assessment practices. Assessment is no longer used only for summative purposes and for reporting to others, but continuous criterion-referenced assessment is used to diagnose areas of strength and need of individual learners to inform ongoing teaching and learning. Assessment strategies should also provide learners with multiple opportunities in varying contexts to demonstrate what they know and can do (Department of Education, 1997a, 1997c). Furthermore, since one of the goals of Curriculum 2005 is for more children to study mathematics and for longer than has been the case in the past, and since this curriculum recognises a wider range of mathematical skills than was traditionally required, a broadening of the scope of assessment is needed in order to capture a wider range of understandings.

The realisation of these ideals appears daunting to South African teachers practising in the context of an increased workload, large classes and general low morale in the teaching profession. Working within this context, MALATI staff have been supporting teachers in seven project schools in the Western Cape since January 1998 to implement a philosophy of teaching and learning which reflects the fundamental assumptions of Curriculum 2005 and can, we believe, realise the goals of "equity", "redress", "access" and "personal empowerment" by ensuring that more learners learn mathematics for longer than was previously the case. In this paper we describe the MALATI philosophy and then focus on the efforts of two teachers to implement this approach in their classrooms.

MALATI "Equity" and "Diversity

Official documentation for Curriculum 2005 stresses that, "In view of the country's history and its legacy of inequality, it is important that the state's resources be deployed according to the principal of equity, so that they are used to provide essentially the same quality of learning opportunities for all citizens" (Department of Education, 1997c). While acknowledging the importance of the distribution of financial resources and the provision of a curriculum which caters for learners of different genders, cultures, language groups etc. in addressing the issue of "equity" in education, MALATI has, in collaboration with the TAP (Together and APart) project in Israel, developed particular views on the notions of "equity" and "diversity" and an accompanying teaching approach. This philosophy is based on the **high** expectations we have of learners' abilities to do mathematics and is aimed at ensuring that more learners are successful in mathematics for longer than has been the case in the past.

Firstly, it should be stressed that the MALATI philosophy refers specifically to **mathematical** diversity. Our view of "equity" is that all learners can learn **provided they are given appropriate instruction and time**. We believe that an "equity" learning environment can be achieved while retaining excellence and without compromising the mathematical knowledge of any group of learners, whether high- or low- ability learners. The creation of such an environment requires the pursuit of two apparently contradictory goals, for diversity (**mathematical** diversity) is both "acknowledged" and "ignored". By acknowledging diversity we mean that all learners are given the opportunity to fulfil their mathematical potential (and we acknowledge that different learners will learn at different levels), by ignoring diversity we recognise that certain mathematical knowledge (Indispensable Mathematical Knowledge (IMK)) is required by **all** learners if meaningful interaction in heterogeneous groups is to take place and

to allow access into future mathematical activity. In this way a diverse and productive mathematical community can be created – for there is sufficient space for meaningful sharing of mathematical knowledge as well as enough space for learners to express their mathematical diversity. (Linchevski, Kutscher, & Olivier, 1999).

Creating an Equity Environment

Our views on "diversity" and "equity" naturally lead to a particular approach to the selection of study material, methods of instruction, classroom organisation and assessment.

Classroom Organisation: If learners are to be part of a productive mathematical community which provides access into further study of the subject, there needs to be a certain amount of "taken-as-shared" knowledge (Cobb, 1996) between members of the community. For example, when a piece of IMK, say the concept of place value, is "taken-as-shared" in a group, then the group assumes that everybody understands it. If, therefore, one learner actually does not understand, s/he is excluded from the ongoing discussion in the group and is thus deprived of a learning opportunity. We regard this as inequity! We are not claiming that all learners should have the same understanding, but rather that their concepts should be close enough so that they can understand one another. This has important implications for the grouping of learners within grades and classes.

The grouping of learners with the same "ability" into the same classes or groups within a class has traditionally been viewed as one way of promoting "equity", as the teacher will be able to respond to the different needs of the different groups of learners. Recent research, however, suggests that the assumptions on which this form of organisation rest cannot be supported educationally, cognitively or morally (Oakes; Linchevski, & Kutscher, 1998a). On the contrary, it appears that this form of organisation actually provides **barriers** to achievement of learners, because the placement of learners in ability groups appears to increase the gap between learners beyond the initial differences. This widening of the differences usually results in the lowering of performance of the "weak" learners who tend to be exposed to a "watered-down" curriculum. In such settings, therefore, it could be said that there is "too much diversity" in that the gap between the understandings of learners becomes too large for meaningful communication to take place between them.

On the other hand, research by Linchevski and Kutscher (ibid.) points to the benefits of mixed-ability settings: They indicate that the added gap between ability groups is "nearly non-existent" in mixed-ability settings and that the placement of learners in these settings is not detrimental to the achievement of any learners. Furthermore, from a cognitive perspective, the mixed-ability setting provides for collaboration between diverse learners in which there can be sufficient shared knowledge creating a rich learning environment.

Oakes (ibid.) reminds us that one also has to consider the "fairness" of ability grouping. Referring to the placement of poor and minority learners in the United States, she warns of the link between track placements and learner background characteristics. She notes that these placements might be acceptable if it could be proved that they provided access for learners into higher tracks. This does not, however, appear to be the case. Viewing this system of grouping in the light of the legacy of inequities in the South African education system, therefore, it would be morally unacceptable to support such a system.

The MALATI approach is thus aimed at maximising interaction in heterogeneous settings. The homogeneous arrangement is used only if the different needs of learners cannot be satisfactorily addressed in the heterogeneous groups. Teaching is conducted in four different settings: (a) in a

whole class setting (heterogeneous), (b) in small mixed-ability (heterogeneous) groups, (c) in small homogeneous groups, and (d) in large homogeneous groups. The two co-operative heterogeneous settings (a) and (b) are used for the parts of the "shared topics" which are studied by **all** learners (this is known as the "core material"). The shared topics are intended to provide learners with the necessary IMK for meaningful interaction and access to further mathematical activity and are studied approximately 70% of the time.[2]

The homogeneous groups are constructed on the basis of prior achievements on a topic (shared or unshared). When arranged in a homogeneous setting, learners are generally engaged in different activities – these can be for shared or unshared topics. When studying a shared topic, learners study the "complementary material" – this can consist of orientation for learners who do not have the necessary background to study the core material for a shared topic, revisiting of IMK, consolidation of IMK or enrichment. Learners in the homogeneous groups can also be given enrichment on unshared topics (Linchevski & Kutscher, 1998b).

Assessment: The MALATI philosophy of teaching and learning has a constructivist basis in that it acknowledges the difference in learners' prior knowledge and experiences. Instruction for each learner is designed on the basis of the teacher's knowledge of each learner's existing understanding of a particular topic. This information is obtained through assessment at different stages during the learning process and each learner is then provided with an opportunity to build on this knowledge. For assessment to play this role, a shift in thinking about assessment is needed, from assessment as a means of reporting to others and for filtering learners into different levels of mathematics and eventually out of the system, to a view of assessment as a **diagnostic tool** to inform the teaching and learning process.[3] The design of these assessments should be in line with the MALATI view on "equity": This requires assessments that accommodate the different ways different learners think about mathematics as well as assessments that provide information on the necessary IMK. It is not expected that teachers become experts in designing sophisticated diagnostic tests, but they are expected to be able to analyse learner responses for the construction of a "profile" for each learner (Linchevski et al, 1999).

Implementation of the MALATI Philosophy

Since January 1998 MALATI staff have been supporting teachers in seven Project schools to reflect on and implement this philosophy of teaching and learning. This paper reports on the process of implementation in a high school on the Cape Flats. Support at this school has taken the form of workshops, "window sessions"[4], classroom visits and informal discussions with the six mathematics teachers. Data in the form of field notes, teacher beliefs questionnaires, teacher interviews and video recordings of classroom visits has been collected to assess the impact of the intervention.

This paper focuses on the work of two teachers, Teachers A and B, both of whom are well-qualified in mathematics education and have participated enthusiastically in the project. They have been selected for this discussion because their work illustrates the progress that can be made when implementing the change required by Curriculum 2005, as well as the obstacles to this change as perceived by these teachers.

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[2] Linchevski, Kutscher, & Olivier (1999) point to the important role of the teacher in identifying the necessary IMK as well as the learners who have problems with the IMK.

[3] This approach does not distinguish diagnostic assessment from other forms of assessment such as summative and formative assessment. Rather, we believe that a well designed test can be used for diagnostic as well as other purposes, for example, for reporting progress to others.

[4] A "window session" is a scheduled period during the school week during which all mathematics teachers are freed from their teaching duties to meet as a group to discuss and reflect on their work. Discussions focus on issues of content, class culture, assessment etc. Malati staff provide support or facilitate the discussion where necessary.

Positive Developments

Motivation to Implement the MALATI Philosophy: The six teachers were introduced to the MALATI philosophy and approach in a window session in May 1998 where MALATI staff used the analysis of test responses of learners in Teacher A's grade 9 class to illustrate the approach. Within a few months it was noted during classroom visits that both Teachers A and B had begun the process on their own. Although these attempts, as discussed below, were certainly not without their problems, and were regarded by Teacher A as "scary", it was encouraging that the teachers had taken the initiative with respect to the following: deciding on the appropriate time during the teaching process to assess; designing the tests to be used for assessment, undertaking the analysis of the responses; and conducting the process of remediation in the homogeneous groups, formed on the basis of the diagnosis.

Teacher B attempted to diversify for the first time in two of his classes in August 1998 – after using a diagnostic test in one class, he had seven homogeneous groups doing different consolidation activities. This process was observed to be a great strain for the teacher and he admitted as much. However, the fact that he saw it as beneficial was illustrated in his comment that it was necessary if he was going to gain a "deep knowledge" of his learners' understanding.

Classroom Organisation: Teacher A has changed from a situation in January 1998 where all the learners were doing the same work all the time, to at times, organising the class into two, and sometimes three homogeneous groups, each of which is given different work. Teacher B's organisation has undergone a similar change, but he seems to be able to cope with a larger number of homogeneous groups doing different work.

Decision-Making: There has been a change in the way the teachers gather information on which they base their instructional decisions. Initially they based these decisions purely on observations made during interaction with small groups and whole class discussions. These decisions were based on informal interaction with a few learners and the teachers admitted to only spending a few minutes interacting with the small groups. Furthermore, the problems they perceived were then addressed with all learners in a whole class discussion. In February 1998 Teacher A indicated that if fifty percent of the learners working in small groups "know what is happening" then he continues with the lesson and "hopes" that the rest of the learners will catch up during the whole class discussion.

These teachers continued to use this informal assessment in the decision-making process, but as the year progressed they started to design their own written diagnostic tests and to consider the content into consideration when making decisions. The two teachers also began to focus more on the strategies used by individuals. In August 1998 Teacher B analysed his learners' abilities to perform different isometric transformations and then diversified on the basis of this. He continues to use the learner strategies as a means for deciding how to diversify his classes. When asked what he did when he had performed an assessment, Teacher A replied, "I basically…I take it home, have a look at it so I don't address it within that period, I take it home and split it up into who I think knows what's going on and who doesn't". In general MALATI staff have noticed a change in the focus of all six teachers at the school: Discussions during window sessions now involve teachers' descriptions of the mathematical strategies used by their learners rather than discussion of administrative details.

Views on Assessment: There has been a clear change in the views of Teacher A. Initially he claimed that he used class tests (based on old tests and aspects the learners had struggled with in class) to "gage his success", as well as informal assessment as described above. By the end of 1998 Teacher A had begun to feel the pressure of having to "complete" certain content by the

end of the year and had started reflecting on the school policy of assessment. Early in 1999 Teacher A was the motivation behind a proposal for changes to the school assessment policy compiled by the mathematics department and submitted to the principal.

The Concept of Time: During 1998 both teachers referred to perceived pressures to complete the syllabus and mentioned that this limited their opportunities for assessment and remediation. There does, however, appear to have been a change in this regard. Firstly, when discussing the coming examinations in November 1999, Teacher A stressed that he did not want to be constrained by deadlines which he was not sure he could meet before examination time. After making a determined effort to implement the MALATI approach in early 1999, Teacher B was asked for his opinion on the time involved in the process – to our surprise he said he felt he had been working too fast and planned to slow down the pace in the new term. MALATI staff have noted that the six mathematics teachers have, in general, become less concerned about time: During the first months of involvement with MALATI teachers expressed concern that they were not "covering" what had traditionally been taught in one school year. By the end of 1998, however, concerns of this nature were not raised. Teachers also requested that they be able to "follow" their learners through into the next grade in 1999. Perhaps the teachers were more in touch with the understanding of their learners than in previous years and were beginning to see the process they were engaged in as valuable.

Interestingly, the teachers' increased determination to cater for the diversity in the classes is now becoming a cause for concern amongst MALATI staff as teachers are spending so much time on certain topics, that progress through the proposed MALATI curriculum is slow. The challenge is to assist teachers to distinguish between concepts that need to be remediated immediately and those that can be revisited again during the year.

Perceived Obstacles

Different Learners Doing Different Work: Teacher A has had problems managing more than two different groups of learners doing different work. In an interview in October he indicated that he "couldn't cope" with three different groupings. As he struggled to provide appropriate material for the different groups. When he diversified he gave core material to the group identified as having an adequate understanding of the topic. The learners in this group then moved further ahead on the shared topics thus decreasing the likelihood of there being meaningful interaction in the heterogeneous groups. By June 1999 it was clear that Teacher A was trying to avoid this situation by focusing more on the heterogeneous groups and seldom diversifying. We feel that MALATI has to address this problem in its provision of materials and teacher support: MALATI staff are currently providing teachers with enrichment materials for this purpose as well as designing additional materials for inclusion in the MALATI packages of materials.

Teacher B appears to have been more successful in coping with a greater number of homogeneous groups at a time and providing a range of activities for the different groups (he has also requested enrichment material from MALATI staff). This teacher is, however, very aware of his limitations: In an interview in March 1999 Teacher B indicated that he felt that he could only cope with performing a thorough analysis with two of his classes. In the other classes he did attempt some diversification, but this was based on a less thorough analysis than in the two classes. He was also considering varying the classes for which he performed a thorough analysis.

Mixed-Ability Groupings: While MALATI staff and the teachers have been focusing on the mechanics of conducting diagnostic assessments and diversifying the classes into homogeneous classes, it appears that the heterogeneous settings have been neglected. Observations of group interactions by MALATI staff indicate that the required setting for meaningful interaction in

heterogeneous groups has not been created in the majority of mathematics classes in this school. Furthermore, it appears that the difficulties encountered in this regard are not only related to issues of the practical implementation of the required classroom culture, but also to the underlying beliefs of the teachers. Perhaps these teachers have not yet had experiences to convince them of the benefits of mixed-ability groupings. In December 1998, for example, Teacher A's responses to the beliefs questionnaire suggested that he was convinced of the benefits of mixed-ability grouping for weaker learners, but indicated that he did not have "enough personal experience" to comment on the benefits for stronger learners in such a setting. Teacher A has been, in his words, "getting to know group work" and has tried different strategies, for example, constructing mixed-ability groups and ability groups and allowing the learners to choose their own groups. In July 1998 Teacher B indicated that the learners had been placed in ability groups – he suggested that in mixed-ability groups the weaker learners will come to rely on the stronger ones and that learners in ability groups might be more motivated to work. During 1999 this teacher has permitted the learners to select their own groups and has admitted that these do end up as ability groups.

Analysis of the data on these teachers suggests that they are not using the mathematical content in making decisions about the appropriate groupings for their classes. The teachers' descriptions of the different groups reflect their underlying beliefs, for example, the "strong" or the "weak" group suggest that these "abilities" are regarded as fixed, regardless of content.

Additional "Obstacles": Using MALATI materials for the second time in 1999, the teachers have displayed greater confidence in handling the content and in deciding when to conduct assessments. It does appear, however, that they still feel the need for guidance on identifying IMK, as well as which aspects of IMK require immediate remediation and which can be revisited at a later stage. Furthermore. Although, Teacher A has taken the initiative to analyse the work of his learners, he still tends to use marks as a basis for diversifying his classes. In an attempt to encourage teachers to focus more on the strategies of individual learners, MALATI staff are currently using a strategy whereby they encourage teachers to spend an extended period sitting with one group, observing the processes in this group.

Although these teachers are consistently using diagnostic assessment to inform the teaching and learning process, they have not yet seen the way forward to actually setting different assessments for different learners. When assessment is conducted after consolidation this is only given to the so-called "weak" learners who have revisited a shared topic.

A common topic of conversation in "window sessions" is that of coping with unmotivated learners, many of whom have consistently failed mathematics over many years and who are perceived by the teachers as disrupting the normal learning process. At MALATI we are currently debating the issue of how such learners can and should be catered for. For it appears that the Malati approach described in this paper is not appropriate in the case where the "gap" between learners has become so large that the learners cannot communicate meaningfully. Teachers at the school are currently working on other ways of motivating these learners and reducing this "gap".

The frustrations experienced by Teacher A in relation to the whole school policy of assessment have been discussed. Furthermore, debates between the teachers during window sessions reveal the teachers' frustration at trying to build a culture of using group work in the mathematics classroom when this culture is not being enforced in other subjects. Again, if the classroom culture is not appropriate, one is reducing the possibility of there being meaningful discussion in heterogeneous groups.

Addressing Underlying Beliefs

The implementation of the MALATI philosophy has, as discussed, had some positive impact and MALATI staff and teachers are working at overcoming the practical obstacles to this implementation as perceived by the teachers. Analysis of the beliefs of the teachers and observation of their classroom practice, however, suggest that there is still work to be done in addressing the underlying beliefs of the teachers in this regard and that these teachers are not yet fully convinced of the merits of the system. Areas that require attention are that of the benefits of mixed ability rather than ability grouping as discussed above, and beliefs about the potential of different learners to achieve in mathematics.

Conclusion

This paper has attempted to illustrate how, with the intensive support of MALATI staff, two enthusiastic, dedicated and reflective teachers have attempted to implement an approach to teaching and learning which we believe provides a way of achieving the ideals of Curriculum 2005. The implementation of this approach has resulted in some shifts in the thinking of the teachers and changes in their classroom practice, but it is clearly a long and complex process. At MALATI we are conscious of the "luxury" we have had as a project in terms of physical and human resources in providing support to schools. In the light of our experience of the complexity of implementing this approach to teaching and learning under these circumstances, therefore, we are concerned about the viability of effectively addressing the fundamental assumptions and goals of Curriculum 2005 given the scale of implementation and the limited support that is going to be available to the majority of teachers.

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