

Assessing Grade Four Mathematics in the Learner's Mother Tongue: A South African Experiment

Introduction

“If you can't read English you don't understand and you can't do the sums, you can't do nothing.” (Grade 4 learner)

Since 1994, South African teachers have had to confront a series of radical education reforms that have been launched by the post-apartheid government (Fleisch 2002; Kraak & Young 2001). The most demanding and complex of these reforms have been a South African variant of “outcomes based education” which required, among other things, a marked shift in assessment practices (Vandeyar & Killen, 2007; Vandeyar, 2005; Vandeyar & Killen, 2003). Whereas traditional assessment practices were dominated by summative high stakes testing, the new system requires a greater emphasis on continuous assessment, explicit assessment criteria and a focus on demonstrable performance (Department of Education 2002: 95-97; Department of Education, 2004; 2006).

For most South African teachers, the new outcomes-based assessment policy described in the National Curriculum Statement (Department of Education, 2006) represents a significant departure from their previous philosophy of assessment and this calls for a rethinking of its role and relationship to learning. The shift from a predominantly summative, norm-referenced form of assessment in a content-based education system to more formative, criterion-referenced assessment in the outcomes-based education system challenges many teachers' beliefs about teaching and assessment (Vandeyar & Killen, 2007, 2003). In particular, the strong emphasis that is now placed on the application of knowledge in real-life contexts, and the learner-centred approach that demands a greater degree of interaction

between the teacher and the learner so that cumulative judgements of each learner's abilities can be made causing concern for many teachers.

The pressure placed on teachers in terms of a shift in assessment paradigms is further exacerbated by the fact that they now have to cope with a changing teaching context as well. The desegregation of schools in South Africa has made possible the shift from schools that formerly catered to one race group to "multicultural" schools. Many schools in which teachers and learners were formerly Afrikaans or English speaking now have a student population with a significant proportion of learners whose first language is one of the indigenous languages of South Africa. These learners are now choosing (or their parents are choosing) to obtain an education through the medium of English. This change in student population has, in general, not been accompanied by a change in teacher demographics. Most teachers who are currently teaching in these desegregated schools completed their initial teacher training in the previously segregated education system, with the understanding that they would be teaching in their first language to learners from a particular race group. These teachers now have to come to terms with teaching in English to learners who are not proficient in the language of instruction, sometimes when English is not the teacher's first language. This has placed tremendous stress on teachers who face the multiple challenges of a new education framework (outcomes-based education), a new curriculum, new assessment policies and a culturally and linguistically diverse learner population (Vandeyar, 2008; Vandeyar, 2006; Vandeyar, 2005; Jansen, 1999; Potenza & Monyokolo, 1999).

South Africa enjoys significant language diversity and a high degree of multilingualism.

There are 11 official languages specified in the 1994 Constitution and numerous other languages (such as Portuguese and Tamil) that are spoken by significant numbers of people.

However, in the education context specifically and in South African society generally, language issues have been and continue to be intimately linked to questions of power and the pursuit of human rights (Nkomo & Vandeyar, 2008; Vally & Dalamba 1999). The language-in-education policies of the apartheid government were founded on racial and linguistic discrimination that affected both the access of the learners to the education system and their success within it. (Department of Education, 1997; Nkomo, McKinney & Chisholm, 2004). One consequence of this is that although approximately 80% of South Africa's 12 million school students have a home language other than English (Heugh, 1999) there are ever-increasing demands for English to be the language of instruction in schools. South Africa's rich linguistic diversity could be used as a classroom resource, and as a way of enhancing the human potential of all learners, but this requires very specific teacher expertise and attitudes that cannot simply be mandated through government policy.

The post-apartheid South African government, and thus the Department of Education, actively promotes multilingualism, the development of South Africa's eleven official languages, and respect for all languages used in the country (including South African Sign Language). The *Language in Education Policy* based on Section 3(4) of the National Education Policy Act, 1996, and the *Norms and Standards Regarding Language Policy* published in terms of Section 6(1) of the South African Schools Act, 1996, are designed "to facilitate communication across the barriers of colour, language and region, while at the same time creating an environment in which respect for languages other than one's own would be encouraged" (Department of Education, 1997). The preamble to the policy suggests, "that the learning of more than one language should be the general practice and principle in our society. That is to say, "being multilingual should be a defining characteristic of being South African" (Department of Education, 1997). Multilingualism is not something new in South

Africa. During the apartheid era, many whites were bilingual (Afrikaans and English) and some were multilingual, although the speaking of African languages by whites was not encouraged through the education system. On the other hand, a large proportion of blacks were multilingual, with Afrikaans or English as one of their spoken languages, because English and Afrikaans were compulsory subjects in school and were generally required for employment. The life chances of these learners were inextricably linked to the power of language. This is one of the principal reasons that official recognition and promotion of languages other than English and Afrikaans is part of the post-1994 South African government's broader attempts to redress the inequities that characterised the apartheid era.

The South African government does not favour any particular approach to bilingualism in schools (for example, two-way immersion), but their overall aim is to “maintain home language(s) while providing access to and the effective acquisition of additional language(s)” (Department of Education, 1997). As a result, the Department of Education's position is that schools should adopt an “additive” approach to bilingualism, which Lambert (1974) describes as two linguistic and cultural entities combining in a complementary and enriching fashion. Where feasible, learners are given the right to choose the language of instruction. The major impediment to this approach is that few teachers are able to teach in more than one language. This is a particular problem in the schools in which desegregation is proceeding most rapidly—these are generally schools in which the language of instruction was historically Afrikaans or English and in which the “new” learners come primarily from homes in which neither English nor Afrikaans is regularly spoken. The teachers in these schools are predominantly English or Afrikaans speakers and “many native English or Afrikaans-speaking teachers cannot speak an African language and therefore cannot communicate and

clarify concepts in the pupils' main language when this is an African language" (Howie, 2002:39).

A further complicating factor when considering the appropriateness of any policies regarding language of instruction in South African schools is that many students are not "truly fluent in even one language" (Howie, 2002:25). This situation occurs frequently in urban areas (particularly in poor township areas) where, due to the mingling of many different ethnic groups, children "develop a dialect made up of words from a variety of African languages, English and Afrikaans" and consequently "do not have an obvious primary language".

I had observed the complex multicultural classroom environments described above and the difficulty of dealing with these situations had been raised numerous times when I was conducting workshops on outcomes-based education. Teachers frequently lamented that learners had limited English proficiency, and that they "*were not the old learners that we were used to*" (Grade 4 teacher 1). I was concerned because many teachers seemed to be blaming learners rather than having empathy with the challenges these learners faced.

Comments such as "*With word problems unfortunately the basis there is language...I don't know how to take the language out of the word problems*" (Grade 4 teacher 2) and "*If you are talking, they don't know the language as such, if they have no knowledge of English, they don't know what you are talking about*" (Grade 4 teacher 3), prompted the author to consider several innovative ways of helping teachers to address this challenge.

It seemed that in order to cope and survive, some teachers were adopting approaches to teaching and assessment that denied reality. Comments such as the following suggested that some teachers were ignoring the limited language ability of the students (in the language of

instruction) and simply hoping that the students would somehow learn the language and subject matter: *“If I think of my tests now, the Indian child can read instructions, but the African child has difficulty there...with most of them it is a problem. When we assess them in English then they must be able to cope...this is an English school and they know about it”* (Grade 4 teacher 2). One consequence of this approach was that some teachers were using assessment practices that were unfair and unreliable (thus casting doubt on the validity of the inferences teachers were drawing about students’ learning). Similar problems were identified by Vandeyar and Killen (2003). The research reported here focuses on an attempt to develop fairer and more reliable ways of assessing student learning. It sought answers to the following question: *When the language of instruction is English, are Grade 4 learners whose first language is not English able to express their mathematical understanding better when tested in English or in their mother tongue?*

Language as an issue for addressing abstract concepts in the curriculum

Globalisation is impacting on education, even in the much localised site of the classroom. One aspect of this process is what and the way language is used in teaching. In most classrooms throughout the world, students who are monolingual are not the total population of a classroom. Although there will be classrooms that have most children from a dominant culture, most classrooms will have students from a mix of cultures, and linguistic backgrounds. Multiculturalism in a microcosm, the classroom, clearly brings challenges for pedagogical traditions of teaching. It is no longer acceptable to assume that the answer is simple; that is, the students will have to change. Multiculturalism also has interesting ramifications for the broader school contexts within which individual classrooms sit, such as the adoption of a second-language-medium education system.

Numerous reasons abound for societies to promote a second-language-medium education system. These include the fact that societies may be relics of colonial rule or economic dominance, multilingual or ethnically-diverse countries where national language planning has opted for a neutral language of international currency. Furthermore, some monolingual countries are of the opinion that they cannot train an academic community or sustain academic programmes of any international currency using their own language as the learning medium. In addition, because of the status of English as the international currency of western education, many societies are increasingly moving towards a second-language-medium education (Bruce, 1990).

Teaching inevitably relies on deep communication, in various multilingual contexts. The question is raised as to what is the ability of multilingual learners to handle abstract concepts in the curriculum? The whole issue raises pedagogical questions around whether effective teaching invokes the need for bi- (multi)-lingual teachers who are able explore the depth of understanding achieved through the home language, where this is not the language of instruction. Teaching and learning is a process where cognitive, affective, emotional, social, cultural and linguistic factors are deeply intertwined (Bishop, 1988; Ellerton & Clarkson, 1996; Lave, 1988). Further, the multiple links among these factors makes teaching a complex task, which becomes even more complex in multilingual or multicultural situations.

This complexity of the research context requires the use of a multi layered theoretical perspective, and a great sensitivity towards the different cultures that may be present. But more centrally, the critical question becomes, what does this heterogeneity do to the free flow of ideas that requires multilingual learners to handle abstract concepts in the curriculum that are normally dependent on language?

Numerous models of second-language-medium education have emerged and evolved in differing social contexts to address this complexity. These models range between code-switching (swapping), bilingual education, induction and immersion.

During *code-switching or code swapping*, the teacher switches between English as the medium of instruction to one of the indigenous languages of the country. In contrast the *bilingual approach* to education happens when the teacher uses two languages of instruction. The process of *induction* involves pupils learning the language of the curriculum through talking and working collaboratively with English speakers who act as *role* models. The hallmark of the *immersion* approach is the integration of language instruction with content instruction. Second language teaching is embedded in a rich and meaningful communicative context. The goal of learning language in such a context is not grammatical perfection, but meaningful communication among learners and teachers. Errors in language use are not seen as bad but rather as indications of learners' active efforts to try to use the linguistic system.

In South Africa students normally talk their lingua franca out of class and this is often a non English language. However the official teaching language is English. A common practice in many South African classrooms is that of *code-switching behaviour* (Setati and Adler, 2000). For example, teachers would switch between English and any one of the 9 indigenous languages i.e. Sotho, isZulu, Xhosa, Venda etc. Setati and Adler (2000) claim that a critical path to use in such complex lingual communicative situations is to begin with informal talk in the students' first language, leading through to more formal mathematical talk finally in English.

The favoured option in the USA is that of bilingualism. Teachers utilise English and Spanish to teach. In the United Kingdom, unlike the USA, there has been an inexplicable reluctance to

use *bilingual teachers* or to use teacher assistants who are competent in the principal home languages of the children. Inexplicable because in Wales - one of the celtic countries making up the UK - there has been a successful pedagogical model operating for decades. First language Welsh children become *inducted* to a process of preparation for instruction in English through carefully orchestrated phases lasting several years from initial admission.

In Papua New Guinea, typically students in a classroom will share a lingua franca, although this may not be their first language and indeed they may well speak a number of other languages too. The teacher may speak the common student language if s/he comes from the same region, but will also be multilingual. Up to year 3, schools can choose which teaching language, but from year 3 the official teaching language is English, although teachers are encouraged to use a mixture of languages if possible through years 3, 4 and even 5 (Clarkson, Owens, Toomey, Kaleva, & Hamadi, 2001).

In Australia in the 1980's and early 1990's there was political support for the use of the people's first language to be used as the teaching language, at least in the early years of schooling, with a gradual move to English in later primary years. However, this later changed to situation where monolingual teachers teach a stable mixture of monolingual and multilingual migrant students, with the multilingual students speaking a number of different languages (Clarkson, 2004).

In Pakistan, teachers and students share Urdu as their first language. The official teaching language in these schools however is English. Teachers encourage students to *code swap* and to use informal English before moving into formal mathematical application (Clarkson, 2004).

Many classrooms in which mathematics is taught are indeed micro sites of multiculturalism. Mathematics itself, and more clearly what and how mathematics is taught, is influenced by culture, language, the social milieu of the classroom, the school and wider society. Gorgorio and Planas (2001) argue that it is very hard to separate the social, cultural and linguistic aspects of mathematics teaching and learning and propose that it is much better to think of broader communication within the classroom than a narrow linguistic one.

Research Strategy

I have chosen to locate this study within a quantitative paradigm that involved pre and post testing of Grade 4 students. This research also utilised the case study approach. The grade 4 classes at each of the three respective schools were the cases under study.

To test the hypothesis that students with limited English proficiency would be able to express their understanding of mathematics better in their mother tongue than in English (the language of instruction) the Grade 4 learners at each school were given two assessment tasks. The primary task (referred to here as the “final test”) was designed by the regular Grade 4 teachers at each school. These tests were part of the normal assessment program at the schools and, although the tests were not identical, they all tested mathematical concepts and skills typically taught in Grade 4 (computation, solving word problems and interpreting simple graphs). The other task (referred to here as the “pre-test”) used at each school was designed by the researchers to test the same mathematical concepts and skills that were included in the respective final tests. Each pre-test was designed in consultation with the respective teachers at each school. Two versions of each pre-test were prepared, one in English and one in the African language spoken by the majority of students whose first language was not English (Sotho for the tests at Broadwater and Riverwood, Tswana at Silverstream). The pre-tests

were administered one week prior to the final tests. Students had a choice of attempting the pre-test in English or the African language. All students attempted the final test in English. The indigenous African languages are divided into two broad categories: The Nguni languages and the Sotho Languages. Xhosa, Zulu, Seswati, Tsonga and Venda are categorised as Nguni languages; Northern Sotho (Sepedi), Southern Sotho and Tswana are categorised as Sotho Languages. Young African learners can often speak several languages. This is particularly true of learners who grow up in close proximity of other African language speakers in township areas. Because of their daily exposure to several African languages, these learners frequently grow up speaking competently in two/three/four or even five of the other African languages. However, this does not necessarily mean that they can read or write well in any of these languages.

At Broadwater, the alternative version of the pre-test was offered in Sotho because this was the home language of the majority of students whose home language was not English. Seventeen of the 84 Grade 4 learners at this school attempted the pre-test through the medium of Sotho, 13 of these learners were Sotho speaking, 2 were Zulu speaking and 1 was Tswana speaking. The 60 students who took the English version of the pre-test came from 11 different home language backgrounds: 38 English, 6 Afrikaans, 3 Xhosa, 3 Tswana, 2 Sotho, 2 Zulu, 2 Portuguese, 1 Spanish, 1 German, 1 Russian and 1 Chitchewa (Malawi). Seven students were absent for either the pre-test or final test.

At Silverstream, the alternative version of the pre-test was offered in Tswana and 25 learners attempted the test in that language (21 Tswana speakers, 2 Sotho speakers, 1 Tsonga speaker and 1 Venda speaker). The English version of the pre-test was attempted by 31 learners (22

English speakers, 4 Afrikaans speakers, 2 Sotho speakers, 2 Zulu speakers and 1 Venda speaker).

At Riverwood, the alternative version of the pre-test was offered in Sotho and 42 learners attempted the pre-test in that language (26 Sotho speakers, 13 Tswana speakers, 1 Zulu speaker, 1 Xhosa speaker and 1 Ndebele speaker). The English version of the pre-test was attempted by 32 learners (11 English speakers, 10 Sotho speakers, 5 Zulu speakers, 2 Tswana speakers, 1 Tsonga speaker, 1 Ndebele speaker, 1 Xhosa speaker and 1 Swati speaker).

Sampling frame

Schools and their learners

The research was conducted in Grade 4 classes in three primary schools in a large South African city. For convenience the schools will be referred to as Broadwater, Silverstream and Riverwood. Broadwater had three Grade 4 classes, Silverstream had two Grade 4 classes and Riverwood had two Grade 4 classes. The teacher-learner ratio in Broadwater and Silverstream was 1:28. In Riverwood the teacher-learner ratio was 1:40. For the purposes of this study the Grade 4 classes in each school were combined to form a unit of analysis at each of the research sites. The schools were each examples of schools in which there had been rapid desegregation during the eight years prior to this study. They were also similar in that the teacher population had remained relatively static at each school. This created a situation in which there were considerable mismatches between the linguistic and cultural backgrounds of the teachers and a significant proportion of the students in each school.

The three schools had quite different histories and the process of desegregation had unfolded quite differently at each of them. Broadwater is a well-resourced school situated in a middle-

to upper-class, predominantly white suburb and is one of the few English medium schools in that area. It was established in the early 1900s and formerly served white learners. The early 1990s witnessed the “trickling in” of a few black learners and the school was reclassification from a white public school to a Model C school (a government attempt to cut state costs by shifting some of the financing and control of white schools to parents). As a result of the repeal of the Group Areas Act in 1991 and the desegregation of schools in 1995, there has been a strong influx of black students into these schools over the past decade.

When this research was conducted in 2006, Broadwater had a student population of approximately 800 of whom 60% were white, 33% African, 4% Indian and 3% coloured. The racial mix of the student population at this school has remained relatively static in recent years because the school strictly enforces the government policy of admission of learners to schools (forcing schools to take learners from their immediate area) and because of the high school fees (more than R5000 per year, not including learner support materials). There were 33 teachers at this school all of whom were white. There were a total of 84 Grade 4 learners of who 44 were white, 36 African and 4 Indian. The home languages of these learners were as follows: 49 English, 13 Sotho, 6 Afrikaans, 6 Tswana, 4 Xhosa, 3 Zulu and 3 Sepedi.

The second school, Silverstream, was established in the same year as Broadwater, but was situated in a previously low- to middle-class white suburb and formerly served white Afrikaans-speaking learners. The abolishment of the Group Areas Act witnessed the “migration” of most of the white families to other “white” suburbs, and the increased movement of Indians into this suburb. As a result, the learner profile of this school has changed and in response it became a dual medium school (English and Afrikaans). After the desegregation of schools in 1994, an increasing number of Indian and African learners have

enrolled at this school and most white learners have left. In the two years prior to this research, the language of instruction has become predominantly English, however the majority of teachers are white and Afrikaans-speaking with English as a second language.

At the time this research was conducted, Silverstream had a student population of approximately 535 of whom 52% were African, 43% Indian, 3% white and 2% coloured. Silverstream had 19 teachers. Thirteen of these teachers were white, 4 Indian, 1 coloured and 1 African. The white teachers at this school were all Afrikaans-speaking with English as their second language. The school charges fees of R2000 per learner per annum for instruction and learner support materials. The language policy of this school requires instruction to be in English or Afrikaans and learners are not allowed to speak any other language even if it is their mother tongue. The reason given for this practice is “*we want them to learn English and Afrikaans so that they can understand what we are teaching them*” (Grade 4 teacher). There were 56 Grade 4 learners of whom 8 were white, 18 Indian and 30 African. The home languages of the learners were: 22 English, 21 Tswana, 4 Afrikaans, 3 Sotho, 2 Zulu, 2 Venda, 1 Tsonga, and 1 Sepedi.

The third school, Riverwood, is an English-medium school situated in a middle-class Indian suburb. This school has been in existence since 1987 and previously served Indian learners, the majority of whom spoke English. The early 1990s witnessed the “trickling in” of a few African learners. As a result of the desegregation of schools in 1994, there has been a substantial intake of African learners. The “bussing-in” of learners has become the norm in this area. The school also caters to black learners from nearby informal settlements. At the time this research was conducted, this school had approximately 840 students of whom 85% were African, 14% Indian and 1% coloured. Learners are allowed, but not encouraged, to

converse and discuss in groups through the use of their mother tongue. Riverwood has 24 teachers. Twenty-three of the teachers are Indian and one is white. None of the teachers at this school speak any African languages. The school charges fees of R700 per learner per annum, including learner support materials. There were 84 Grade 4 learners of whom 10 were Indian (all with English as their home language) and 74 African (with the following home languages: 5 English, 36 Sotho, 15 Tswana, 7 Zulu, 4 Sepedi, 3 Xhosa, 2 Ndebele, 1 Tsonga and 1 Swati.

Collectively, these three schools represent a typical picture of how South African schools are desegregating and indicate why it is important not to overstate the post-Apartheid growth of racial integration in South African education. The general picture in South Africa is that some formerly white schools and many formerly black schools have remained largely segregated; the desegregation has occurred mainly in the formerly Indian schools and in middle-class white schools. This research was focused in schools that were typical of those experiencing substantial desegregation.

Consistent with Department of Education policy, none of the schools in this study had any special English language programs for the learners whose first language was not English. Regardless of their language skills when they first arrived at the school, they were simply expected to fit into regular classes and somehow develop their English language skills with no more help than that given to learners whose first language was English. Anecdotal evidence from the teachers at the schools, and observations of the Grade 4 classes suggested that the English language proficiency of a significant proportion of the black students in this study was at the level that Cummins (1981, 1989, 2000) refers to as Basic Interpersonal Skills (BICS). Cummins defines BICS as the type of surface fluency that the second language learner achieves through informal interaction with peers and teachers; it is basically social

language. Cummins suggests that even this level of fluency may take two to three years to develop when there is no formal attempt to teach the second language. The language proficiency needed for reasoning, problem solving, and general academic achievement in subject matter is what Cummins (2000:129) refers to as Cognitive Academic Language Proficiency (CALP). CALP requires an extended vocabulary, concept knowledge, metalinguistic insights, and knowing how to process decontextualised academic language. Cummins suggests that children need between five and seven years, on average, to approach the level of CALP in a second language that will support grade-level performance on academic tasks. The teachers in this study seemed to be expecting newly arrived students to reach CALP within just a few months with no specific language instruction.

The teachers

In total there were seven teachers involved in this study. At Broadwater there were three Afrikaans-speaking white females, two of whom were middle aged and one who was in her mid thirties. At Silverstream there were two Afrikaans-speaking white females, one in her mid twenties and the other in her mid forties. At Riverwood there were two English-speaking Indian females, one in her early thirties and the other in her early twenties.

The assessment tasks

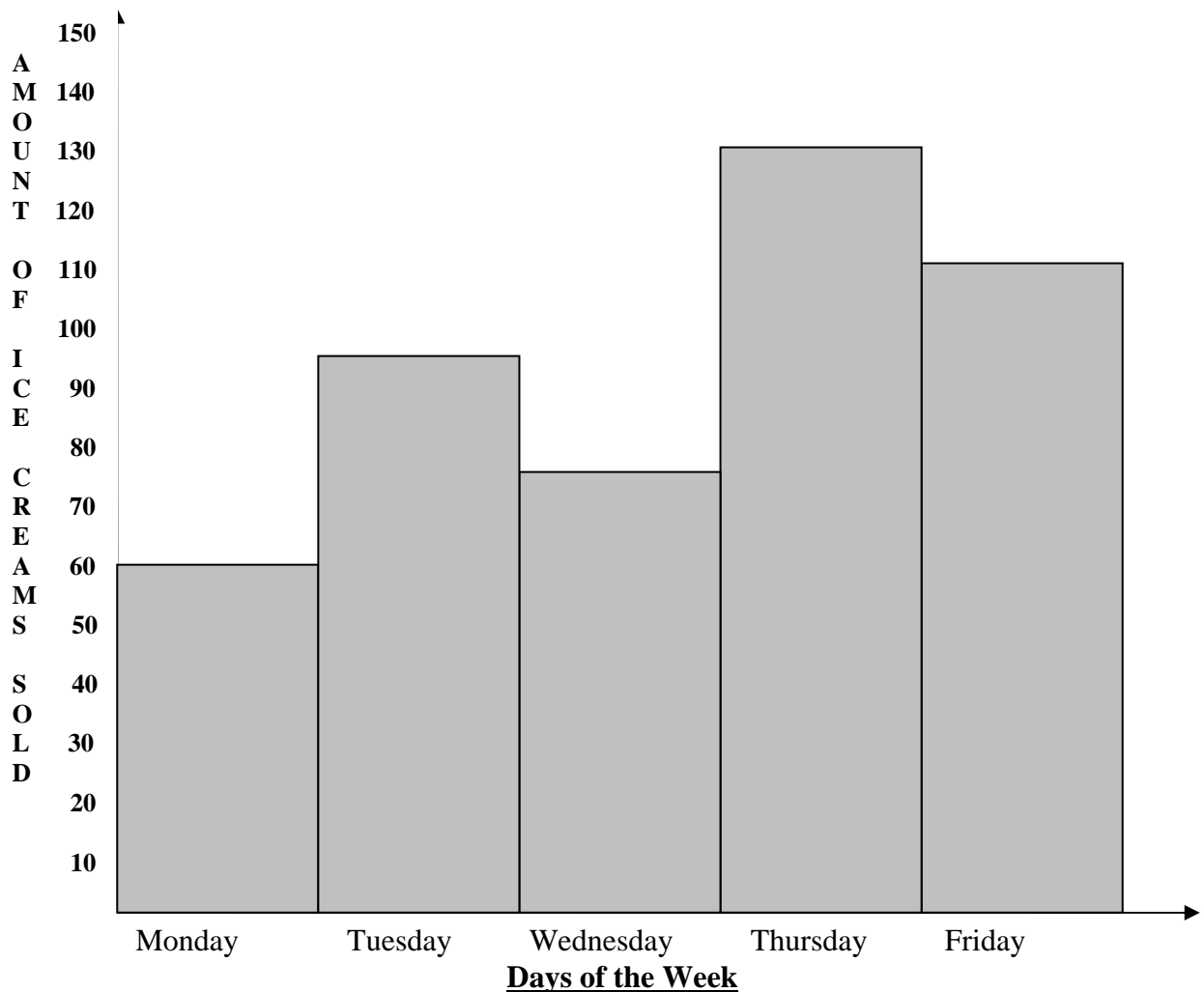
The following are samples of the questions that were used in the pre-test at Broadwater:

1. *Sam weighed 37kg and John weighed 52 Kg. How much more did John weigh?*
(Sotho version) Boima ba Sam ke 37 kg, ha boima ba John bona ele 52 kg. John o feta Sam ka boima bo bo kae?
2. *Peter has R30. He buys a chocolate for R 4,30 and he gives R3, 69 to his friend. How much would he have left?*
(Sotho version) Peter o na le R30. O reka chocolate ka R4. 30, ebe o fa motsoalle oa hae R3, 69. O tla be a saletsoe ke bo kae?
3. *Themba has 186 seedlings (small plants) to plant. He plans to plant 10 seeds in each row. How many rows of seeds can he plant and how many seeds will he have left over?*

(Sotho version) Themba o na le lijalo tse 186 tseo a ratang ho li jala. O rerile ho jala lijalo tse 10 moleng ka mong. A ka khona ho jala mela e mekae, eaba ho sala lijalo tse kae?

The following are examples of questions used on the pre-test at Silverstream:

1. *Peter wants to buy a Gameboy (Computer game). The computer game costs R765. He saved R500. How much does he still need?*
(Tswana version) Pitere o batla go reka game-boy. Game-boy ke R765. O bolokile R500. O tlhela bokaе?
2. *Komotso spends R25,40 for a doll, and Mogadi spends R 32-75 for the same doll. How much more has Mogadi spent than Komotso?*
(Tswana version) Kgomotso o reka mpopi ka R25.40, Mokgadi o e reka ka R32.75. Mokgadi o dirisitse bokaе fa godimo ga madi a a dirisitsweng ke Kgomotso?
3. *Graphic work*



Use the graph above that shows you the amount of ice creams that were sold at a tuck shop, to answer the following questions:

1. In groups of how many must we count when we count the ice-creams?
2. How many ice creams were sold on Friday?

3. What is the total amount of ice creams that were sold altogether on Monday and Wednesday?
4. How many ice creams were sold altogether for the whole week?
5. On which day was the most ice creams sold?
6. On which day was the least ice creams sold?
7. Why do you think that day sold the least ice creams?

(Tswana version)

Dirisa graph e ka godimo go laetsa gore go rekisitswe di-ice cream tse kae tuckshop, go araba dipotso tse di latelago:

1. Ke mefuta e mekae ya ice cream e ka balalwago?
2. Go rekisitswe di-ice cream tse kae ka Labotlhano?
3. Ke palo bokae ya di-ice cream tseo di rekisitswego ka Mosupologo le Laboraro?
4. Go rekisitswe di-ice cream tse kae beke yotlhe?

5. Ke letsatsi lefe fa go rekisitsweng di ice-cream tse ntsi?
6. Ke letsatsi lefe fa go rekisitsweng di-ice cream tse mmalwa?
7. Go reng o akanya gore go rekisitswe di-ice cream tse mmalwa letsatsi leo?

The tests at Riverwood used questions similar to those used at Silverstream, but with the alternative version of the questions written in Sotho rather than Tswana.

Results

The students' results on the pre-test and final test at the three schools are summarised in Table

1.

| School | Language of Pre-test | Number of Students | Mean Test Scores | |
|--------------|----------------------|--------------------|------------------|------------|
| | | | Pre-Test | Final Test |
| Broadwater | English | 60 | 37.8 | 45.8 |
| | Sotho | 17 | 29.7 | 41.1 |
| Silverstream | English | 31 | 46.1 | 57.4 |
| | Tswana | 25 | 33.7 | 56.3 |
| Riverwood | English | 32 | 57.3 | 64.9 |
| | Sotho | 42 | 39.1 | 59.5 |

Table 1: Comparison of pre-test and final-test scores for all students who attempted the pre-test in the nominated languages.

The data in Table 1 appear to show some clear trends. However, this is potentially misleading for the following reasons. At each school, some of the students who attempted the pre-test in English did not have English as their first language, and some of the students who attempted the pre-test in Sotho (or Tswana) did not have Sotho (or Tswana) as their first language. At

Broadwater and Silverstream there were some Afrikaans students who attempted the pre-test in English; at all schools there were some African students who attempted the pre-test in English; and, at Broadwater there were some students whose first language was not English, Afrikaans or any African language who took the pre-test in English. At each school there were a small number of African students who opted to take the pre-test in Sotho (or Tswana) when that was not their first language. To eliminate the confounding influences of data from these students, the data set was reduced to just those students who attempted the pre-test in their first language. This gave the results shown in Table 2.

| School | Language of Pre-test | Number of Students | Mean Test Scores | |
|--------------|----------------------|--------------------|------------------|------------|
| | | | Pre-Test | Final Test |
| Broadwater | English | 38 | 40.4 | 47.7 |
| | Sotho | 13 | 30.6 | 41.7 |
| Silverstream | English | 22 | 49.7 | 61.3 |
| | Tswana | 21 | 32.7 | 54.5 |
| Riverwood | English | 11 | 57.1 | 60.9 |
| | Sotho | 26 | 34.7 | 57.3 |

Table 2: Comparison of pre-test and final-test scores for all students who attempted the pre-test in the nominated language when that language was their first language.

A series of t-tests were conducted to identify significant differences between scores on the pre-tests and final tests and between the groups of students who took the tests in English or the alternative language.

At each of the three schools, each group of students who took the pre-test in their first language (English, Sotho or Tswana) scored higher on the post-test (in English) than on the pre-test. With the exception of the small group of students who took the tests in English at Riverwood, the differences between the pre-test and post-test scores were all significant ($p > 0.05$). This suggests that the pre-test was sensitising students to the post-test and thus influencing their post-test scores. Such an effect is not unusual when the pre-test and post-test contain similar questions (as they did in this research) and are separated by only a short period

of time (as they were in this research). However, our main interest was in the differences in the pre-test scores.

At each school, the group of students who took both tests in English (when English was their first language) scored significantly higher ($p > .05$) on the pre-test than the students who took the pre-test in their first language of Sotho or Tswana. There are two possible interpretations of this result. The first is that the English first-language students had greater knowledge of the test content than did the other students. The second is that the students taking the test in Sotho or Tswana were unable to adequately demonstrate their mathematical understanding because of their limited ability to read and/or write in their first language. That is, taking the test in their first language disadvantaged them. This latter explanation seems most likely, given that there were no significant differences in the post-tests scores of the two groups at each school.

At each school, the group of students whose first language was English scored higher on the post-test than the group of students whose first language was Sotho or Tswana. These small, but not significant, differences may have been due to one of the following reasons. First, it is possible that limited reading ability in their first language may have reduced the pre-test sensitisation effect for the students who did not take the pre-test in English. Second, it is possible that at least some of these students had not achieved Cognitive Academic Language Proficiency in English (Cummins, 1981, 1989, 2000) and, consequently, they had not been able to develop the same levels of understanding of mathematics as their English-first-language peers.

The results discussed above indicate quite clearly that there was no general advantage in allowing students to attempt the assessment tasks in their first language when that language was Sotho or Tswana. The most likely reason for this was that the students did not have high

levels of literacy in their first language. This possibility was reflected in Grade 4 student comments such as “*But Maam, we can’t read or write Sotho*” and “*I speak Tswana and I read a little, but this is difficult, I don’t understand what it says, I can read English better*”.

However, there were a small number of students who did appear to benefit from attempting the pre-test in their first language when that language was Sotho. At Broadwater, 3 of the 13 students who attempted the pre-test in Sotho gained higher scores on the pre-test than on the post-test and at Riverwood, 3 of the 26 students who attempted the pre-test in Sotho scored higher on the pre-test than on the post-test. One student commented, “*Ma’am, I speak Sotho at home and I understand it so I know I will do good*”. This suggests that it might be advantageous for some students to give them a choice of being tested in English or in their first language.

Conclusion

There are several possible explanations for the consistent significant difference between the pre-test scores of the students who attempted the pre-test in English and those who attempted the pre-test in Sotho or Tswana, and for the consistent significant difference between the pre-test and final scores of the students who attempted the pre-test in Sotho or Tswana. The most obvious explanation is that the learners found the questions written in Sotho or Tswana more difficult than similar questions written in English. This suggests that the students’ ability to read Sotho and Tswana, or their academic literacy in those languages, was much lower than their academic literacy in English. Perhaps this is because the learners had limited exposure to the written form of their home language, even though they had daily experience speaking the language. This difference between their ability to speak their home language and their ability to read/write it was probably a result of the emphasis that their parents and their teachers

placed on the importance of English literacy. From Grade 1, the learners who had attended the schools in this study had been taught in English. The learners who enrolled at the schools for the first time in Grades 2 or 3 had previously been taught at township schools through the medium of their mother tongue. Because none of the schools in this study attempted to teach through the medium of the learners' home languages, or even taught those African languages as separate subjects, there was little incentive for learners to develop their literacy in these languages.

The results of this study suggest that the government's Language in Education policies are being ignored at these schools—there was no evidence that the teachers were attempting to implement additive bilingualism. There is little evidence that the language policies of the schools in which this research was conducted were informed by an in-depth consideration of any major models on second-language-medium education. Rather, they seemed to have been determined by parental pressure. “Parents see English as a means to social and economic advancement and as a language of power” (Howie, 2002:35), hence there is strong pressure on many schools to commence instruction in English as early as possible. This creates problems for those young students whose first language skills are not well developed.

It is well known that students experience considerable difficulty learning a subject (such as mathematics) through a language in which their skills are insufficient to enable them to verbalise their developing understanding (see, for example, Dawe, 1983; Setati, 1999). The results of this study suggest that this problem may exist for students whose first language is English as well as for those whose first language is not English. The relatively low average post-test scores of all groups suggest that there may be problems in these classrooms. In discussions with the researchers, the teachers had tended to view the students whose first

language was English as generally more capable than the other students (a matter being investigated in depth in another paper). The fact that there were no significant differences in the post-test scores of the groups of students whose first language was English and those whose first language was Sotho or Tswana suggests that these perceptions may have been ill founded.

Although it is clear that students' language skills influence their ability to learn mathematics (particularly when the language of instruction is not their first language), there are also many other factors that need to be considered when analysing students' achievements. A full exploration of those student-, classroom- and school-level factors is beyond the scope of this article. However, the results of the research supported here are a salient reminder of the dangers in categorising students and their abilities on the basis of race or culture.

Word count: 6843

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