

Adler, Jill:

Teaching Mathematics in Multilingual Classrooms

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1. The theme

The book "Teaching Mathematics in Multilingual Classrooms" is about teaching children mathematics in post-apartheid South African schools. It is not about students' experience of learning mathematics in these schools. The focus is on problems of teaching mathematics in a language, which may be the home language of only a few students in the class. However, the fact that the language of teaching is different from the home language of the students sometimes only sharpens problems of mathematics teaching and learning that could occur in any classroom, anywhere in the world. The book is thus of general interest to mathematics educators.

2. The style

In her introduction, the author often uses the word "story" in reference to the contents of the book. But the reader who takes this promise literally is soon disappointed. The book reads more like a research report. The story or stories are, most of the time, behind this scholarly discourse and it is not easy to imagine how one would become or develop into a mathematics teacher in a multilingual classroom. The closest to "telling a story" is Chapter 2, which outlines the historical, political, economical and cultural contexts of mathematics teaching in South Africa. Chapters 5, 6, 7 and 8 contain an account of classroom observations and interviews with 6 teachers. Part of this account is told in the form of "vignettes" presenting concrete, and chosen as particularly dramatic, classroom situations. But these vignettes, as well as citations from interviews with the teachers, are, in a sense, a-historical. They are snapshots of the teachers' experienced reality; they do not capture the process of development of this experience over time, as a story would normally do.

3. The research

The book has grown from a research project focused on mathematics teachers' understanding of their practices in multilingual secondary classrooms. The data of the research consisted of observation of classes and interviews with six secondary mathematics teachers, conducted during the years 1992 and 1993. The political context of education in South Africa at that time put unwelcome constraints on some aspects of the research, e.g., forcing an opportunistic rather than statistically

representative "sample" of teachers for the study. The author writes,

At that time, South Africa was in the process of negotiating its way out of its apartheid past. There was a great deal of turbulence that regularly spilled over into schools. ... [S]chooling in some areas had all but become dysfunctional. In order to conduct a qualitative study at that time, it was important that I had an already established relationship of some trust, at least with the participating teachers. Access to schools and classrooms otherwise could have been blocked, even dangerous, or so unstable as to not enable significant data gathering. (p. 37)

However, the choice of this historical time was deliberate. This was a time of radical changes in the schools, with the classes becoming multilingual and multiracial "almost overnight", as the author says. Extreme situations always put people's beliefs, habits, knowledge and competencies to the test. For a social sciences researcher, such authentic extreme situations afford a unique occasion to see and understand what might have remained hidden in calmer times.

4. The contexts of the research

Chapter 2, which, as mentioned, is devoted to mapping out the political, economic, ethnic, and linguistic contexts of teaching mathematics in South African schools, is a very important part of the book. Without this background information, it would be hard to see how the didactic problems ("dilemmas" as they are called by the author) discussed later in the book are specific to multilingual classes in South Africa. For readers who teach in multilingual classes anywhere in the world, this chapter gives a lot to think about, whether by contrast or by similarity with the South African situation.

The starkest contrast could lie in the extent of poverty and unemployment. Concerning unemployment in South Africa, the author writes,

Unemployment in 1996 (and there have been significant job losses since then) was 33.9% overall, with 52% of women unemployed. Moreover, 62% of those employed earn less than R1500 per month (roughly US\$200). (p. 19)

Schools are ill equipped to provide any - not just quality - education. On the material plane,

... 17% of all schools in South Africa lack basic physical infrastructure. There is serious overcrowding in some of these schools, with classes of up to 100 students, and in 23% of all schools there is no running water or any toilet facilities in or close by the school.... [L]earning and teaching is not only hampered by shortages of learning materials in such schools, but physical conditions actively detract from possibilities for focused attention on learning and teaching. (p. 20)

On the plane of human resources, the situation is no better: over 50% of mathematics and science teachers in South Africa have less than one year of post-secondary study in these subjects. This means that most teachers don't feel comfortable with the mathematics they teach and some are not comfortable with the language in which they have to teach it. The author says,

"one of the effects here is that as some teachers struggle to communicate mathematics in English, errors are fossilized and

conveyed as such to learners" (p. 21).

Events such as 0% pass rate on an external matriculation examination for a school are not unusual; this was the case for 80 schools across the country in the year 2000.

South Africa is a linguistic maze, with 11 spoken and recognized languages, of which isiZulu is the primary language of the largest proportion (22.9 %, data from 1996) of the population; this language is followed by isiXhosa and Afrikaans – the primary languages of about 18% and 14.5% of the population, respectively. Sesotho is next with 9.2 % and English is the primary language of only 8.6% of the population. In this situation, decisions about the primary language of instruction and the role in instruction of the mother tongues of students had to be difficult and they had to be controversial. In South Africa they had been controversial to the point of extreme violence as in the case of the 1976 Soweto uprising. (p. 23)

But African people were not fighting for the right to education in their home languages, as one might naively think. The policy of mother tongue as the medium of instruction at the primary school level was perceived by many as "the apartheid grand plan to deny Africans access to socio-economic advancement" (p. 24). The efforts of the post-apartheid governments to create conditions for the advancement of the African languages through the implementation of the so-called "additive model of multilingualism" have not met with positive reception. Africans have wanted their children to learn in English (p. 25):

[A]lthough new language policy in South Africa is intended to address the overvaluing of English and Afrikaans in relation to African languages, in practice, English continues to dominate. Despite being the main language of the minority, English has become both the language of power and the language of educational and socio-economic advancement. English has both symbolic and material power. In Bourdieu's... terms, English is the dominant symbolic resource in the linguistic market in South Africa. Particular linguistic skills, like competence in English, are required of social actors for access to social, educational and eventually material resources. (p. 26)

5. A comment on the domination of English

In her discussion of this situation, the author pretty much gives up hope for the possibility of reversing this trend. She gives arguments to support the claim that English is a truly international language and that it would be too costly to develop any one of the African languages into a language of science and mathematics.

One wonders, at this point, if the world is not giving up to the domination of English in science and mathematics altogether. Already there is the well-known academic adage, "publish in English or perish". In some countries there are even no undergraduate mathematics textbooks in the local language. This is the case, for example, in Sweden where mathematical lectures at the university are given in Swedish but the textbooks are in English. They are often the same textbooks as those used at American universities. In mathematics education, originality of a research work is often measured relative to the existent

literature in English, not *all* literature. Reviewers are indulgent if the author is ignorant of a result published in French or, perhaps in German or Spanish, and they excuse the author completely if the research had been published in some other language. Rather, the author of the ignored result is blamed for not having published in English.

Personally, I think it would be a grave error to give up developing scientific¹ registers in languages other than English. More generally, it would be a big risk for the depth and advancement of science if scientists became monolingual, even if only in their domains of research. Monolingualism blunts the edge of one's sensitivity to ambiguities and abuses of language. Translation into different ethnic languages offers scientific languages some protection against degenerating into scientific jargons.

6. The analytical tools of the research

Chapters 3 and 4 present analytical tools used by the author in designing her research and interpreting the data. Concerning the goals of research, the author's preoccupation was not "whether and how teachers were adopting multilingual perspectives and practices" and not "whether or not [they] were attempting to change the mathematical and pedagogical practices in their classrooms". Her main question was, "how and why [teachers] do what they do... in multilingual settings" (p. 35). The goal was thus to describe teachers' specific professional "knowledgeability" in the domain of teaching mathematics in multilingual and multiracial classes in post-apartheid South Africa. There was no attempt to judge or evaluate, if their practices were effective in achieving certain educational objectives and ideals.

"Knowledgeability" was a central term of the author's chosen theoretical framework. The author defined it as "practice-based knowledge", a kind of knowledge that draws on past situated experience and adapts to new situations, not by planning ahead, but as they evolve. The main reference here was Lave and Wenger's social practice theory and the notion of situated learning. Knowledgeability is mostly tacit knowledge. Therefore it was not easy to access it. By inviting teachers to talk about their practices, reflect on them, the author could obtain only analytical reconstructions of this tacit knowledge, not access this knowledge as such. This was one of the main methodological problems of the research.

The author decided to frame her interpretations of teachers' knowledgeability in the language of "dilemmas in teaching". This term refers to the necessity of making a choice between two possible courses of action in the classroom, such that each leads to an important didactic or pedagogical objective, but the choice of one makes the class lose the objective that could have been obtained through the other course of action. In this situation, the teacher is always unhappy, whatever the choice he or she makes.

¹ I am using the word "science" here in the general sense of the German word "Wissenschaft", not in the sense of natural science, as is common in English.

Chapter 4 reviews some educational literature where the language of dilemmas has received attention at a theoretical level. The review is restricted to a few positions (Lampert, Berlak and Berlak, Edwards and Mercer, Jaworski). Regrettably, the important theorization of teaching/learning paradoxes in the theory of didactic situations (Brousseau, 1997, pp. 40-47) has not been discussed. Yet, the word "paradox" in this theory is used in much the same sense as the word "dilemma" in these other works. But - forgive the irony - the author may be excused for this omission; after all, theory of didactic situations has been developed mainly in French.

7. Teachers' voices: interactive teaching in multilingual classes

In Chapter 5 the reader finally gets to hear the voices of the teachers. This chapter gives an overview of the themes raised by the teachers in their reflections on their practice and introduces the dilemmas that emerged in the study: the dilemma of code-switching, dilemmas of mediation, and the dilemma of transparency. These dilemmas are further discussed and illustrated by classroom vignettes in chapters 6, 7 and 8.

It was interesting to note that, on the average, teachers spoke almost as much (but a bit less) about issues of teaching mathematics in English (linguistic issues) as about issues related to the specificity of mathematical discourse. They spoke about twice as much about pedagogical issues (such as approaches to teaching and learning and classroom interaction). It is important to know that the style of teaching mathematics adopted by the teachers was based on small group work, communication of not only results but also of ways of thinking about a problem by the students, and whole class discussions. The chosen approach is pedagogically challenging even in monolingual classes; this could explain the attention that the teachers awarded pedagogical issues. In this setting, the demand on the student's mathematical communication skills was far greater than in a class where students would only watch the teacher showing a model solution on the board and then work individually in silence on similar problems in their exercise books. Since this communication had to be done in a foreign or "additional" language, the challenge was greater still.

8. Comment: A student's voice from the past

Reading the book was, for me, a deeply personal experience. I have been myself, in my life, a student in a multilingual school, a student in an international school, and, for twelve years now, a teacher in multilingual classes at the Concordia University in Montreal. The book brought back memories from the time when, at the age of 12, I was sent to a French school in Damascus, Syria, where my father had started a job as a commercial attaché in the Polish embassy. At 15 I was already fluent in French, but I did not have to speak this language in mathematics classes. Mathematics was not expected to be discussed. It was an object of silent study and solving problems, of apprenticeship with very little talk even on the part of the teacher. Exploration was individual, only

its results were to be made accessible to the teacher. Only once during my four years in the French school was there a discussion during a mathematics class. It happened during my last year in that school, in 10th grade (troisième). There was this particularly challenging geometric problem requiring a proof and I volunteered to show my solution on the board in front of the whole class. I started off with confidence, but then I suddenly realized that I didn't know whether the symbol "E", which I used to name a point, should be pronounced as a wide "é" (arranging my mouth rather like in saying "cheese") or as the narrow "e" (turning my mouth into a spout, like in ø). I struggled with this problem, now "cheesing", now "spouting" this annoying vowel, regretting all the while I hadn't used some other letter to name that point. The teacher looked down upon me from the height of her chair, completely disgusted, whether with my French pronunciation, or my awkward presentation of the solution, or both, I never knew. It wasn't long before she interrupted my presentation and sent me back to my seat. I still remember this incident, after so many years. But I don't recall feeling humiliated. I remember this as an experience of sudden realization that writing mathematics was not the same as talking mathematics and that an oral presentation might need some special preparation. A valuable realization, perhaps, but one I was given the opportunity to put into practice only several years later, in my last year of mathematics studies at the Warsaw University, when I was asked to present my master's thesis work in a seminar.

9. The dilemmas

In South African classes, multilingualism need not be extreme to the point of no two students sharing the same home language (this kind of situation is quite likely to occur, for example, in a Montreal school). Thus students working in a small group may turn to communicating in their common home language. In this situation, the teacher faces a dilemma: should I command the students to switch to English for the sake of complying with the school language policy or should I let them continue discussing in their home language for the sake of developing the mathematical meaning? This is a difficult decision, because, if the teacher happens to speak the students' home language, the students may expect him or her to engage in the discussion in this language. If the teacher yields to this request once, the students may want her or him to do it all the time. It may be hard to switch back to the official language of teaching. This is the dilemma of code-switching.

When students are awkward and unclear in orally reporting about their solutions, the teacher may have trouble deciding whether the problem is with their language or with their mathematical understanding. Should the teacher correct their English while they are reporting, or ignore the mistakes and try to make sense of their mathematical ideas? In the former case the teacher may be interfering not only with the language but also with the mathematical thinking, indeed, "putting words in their mouths instead of hearing what they have construed" (as one of the teachers said in the interview, p.

64). In the latter case, the students may miss the chance of improving both their mathematical thinking and communication skills. This is one of the dilemmas of mediation.

The teacher may try to improve the students' mathematical expression by simply using the language correctly him or herself; but she may also try to make it an explicit object of teaching. Should the language be used as a transparent (invisible) medium of communication, or should it be made visible through direct instruction? The latter choice may interfere with the present "learner-centered approaches" and the tendency to reduce teacher's "telling" the students how to do things to an indispensable minimum. It may also interfere with the objective of teaching students the deep meanings of mathematical concepts by shifting their attention to the form and syntax of mathematical expressions. These are the dilemmas of transparency.

10. The conclusions

The book concludes with a chapter titled, "Central dilemmas as curriculum and research agenda". The author contends, "a learning curriculum in mathematics teacher education [in South Africa] would benefit from being organized around the dilemmas identified in this book as constitutive of, and constituted by, the multilingual setting" (p. 139). The language of dilemmas allows capturing the complex teachers' professional knowledgeability in a descriptive way for a researcher in mathematics education. For a practicing teacher, this language can support reflection and serve as a source of professional development.

Among aspects that have not been addressed in the book but the author mentions as worthy of more intense and focused research is the learning experience of students in multilingual mathematics classrooms. Indeed, very little is known about this experience, although in some publications about multilingual mathematics classes, the learners figure more prominently than in the present book, even though their experience may not be the main goal of the research (see, e.g. Gorgorió & Planas, 2001).

I think it is important to talk to students directly, ask them to tell their part of the story. In one of the vignettes in the book, there were two students, Rose and Joe, who were presenting two quite different solutions or ways of thinking about the question of the possibility of constructing a triangle with two obtuse triangles. It was obvious that Rose could not understand Joe's way of thinking, perhaps because he decided to use some concrete angles in his oral explanation, although his idea seemed to be quite general (it was worded by his partner in the group as "if you stretch [angle] A, then [angles] B and C will get smaller"). Rose's explanation was that, with two obtuse angles, one gets a quadrilateral, not a triangle. The teacher was unable to make the two communicate in a more efficient way. She did not understand Joe's idea well, either. So she "deflected" by changing the subject of conversation. In analyzing this situation, the author discussed the options that the teacher had and what could have been their consequences for the

learning in Rose and Joe. She speculated about the possible feelings of Joe in case the teacher decided to publicly compare his and Rose's solutions and point to Rose's solution as more general: "Joe might have felt that his thinking was not good enough because it was not like Rose or Sue's [Sue was the teacher]. This could inhibit his willingness to participate in [the] future or negatively shape his goals" (p. 111). At that point, as a reader of the book, I regretted that the researcher only interviewed the teacher and not the students, as well. It would be interesting to know how Joe really felt, both about his way of thinking, and the teacher's reaction to his solution.

11. Some general comments

The title of the publication, "Teaching mathematics in multilingual classrooms" evokes a broad range of phenomena, of which only a very special case had been tackled in the book. There are probably many ways in which one might chart this domain. One way could be to ask certain questions about multilingual classes and look at the possible answers.

11.1 Questions about multilingual classes

Below I identify six axes that could organize the domain of multilingual classes: language of teaching, teacher's relation to the language of teaching, students' relation to the language of teaching, level of multilingualism, style of classroom communication, attitude towards the language of teaching. I formulate these axes in form of questions and I code them for ease of future reference.

[LoT] *Whose language is the language of teaching?*

[LoT=C] Is it the language of the colonizers or the invaders of the country?

[LoT=D] Is it the dominant language of the political and economical world, and of the world of culture and science?

[LoT=H] Is it the language of the host country for an immigrant?

[T] *Who is the teacher?*

Does the teacher belong

[T=S] to the culture of the students or

[T≠S] to the culture of the language of teaching?

[S] *Who is the student?*

Is the student

[S=N] a native of the country or [S≠N] a newcomer?

Is the language of teaching

[LoT=homeL] the same as the student's home language or [LoT≠homeL] different?

[M] *How multilingual is the class?*

Is it the case that

[n(homeL)=1] all students speak the same home language which is different from the language of instruction? Or is it the case that

[n(homeL)>>1] the number of home languages in the class is not much smaller than the number of students?

[Style] *What is the style of teaching?*

To what extent the ability to communicate in the language of teaching matters in the classroom?

[Com=hi] Vs [Com=lo]

[AttLoT] *Whose decision is it to study in a language different from the home language?*

Is the student's attitude to the language of teaching [AttLoT=pos] positive or [AttLoT=neg] negative, or [AttLoT=amb] ambivalent.

These questions point to a large number of variants of multilingual classes, each worthy of mathematics educators' attention. A warning is, however, in order. As Jill Adler has shown in her book, in research on multilingual classrooms it may be very difficult to avoid discussing political issues. Mathematics educators may not be prepared or willing to undertake such themes. It may be difficult to publish such research, under the pretext that it is "too controversial", and perhaps even difficult to have it recognized as scientific research, because of the common view that science must stay away from political discourses.

11.2 The political character of the issue of multilingual classes

***Cujus regnum, ejus educatio*²**

It is quite clear that teaching dilemmas experienced by a particular teacher are dependent on the hierarchy of objectives of the teacher, which may, in turn, depend on particular curricular recommendations and on value systems held by the society at large. Thus, the sources of dilemmas are political in character, as rightly acknowledged by the author (p. 23). This is true of any dilemmas, not only those related to language-in-education practices and policies. But dilemmas related to language-in-education seem to be more sharply political.

Cujus regnum, ejus lingua

Language-in-education policies have long been used as a political tool. All invaders wanted to have power not only over a country's administration and economy but also over people's thinking. Naively identifying thought with language, they would force the local population to assimilate into their language (LoT=C). This is what was happening in the nineteenth century Poland, which was annihilated as a state and remained under the occupation of three neighboring powers till the end of the first world war. My grandparents, born in the Russian district, were more or less fluent in Russian. My maternal grandfather may not have liked having to study in Russian but he was a great believer in the educational power of the famous Russian complicated arithmetic problems (AttLoT=amb). He used them as a whetstone to sharpen my mother's wits, much to her distress.

Canada, and especially Québec, is a very interesting site for research on multilingual classrooms. But language issues here are extremely political and emotional: for the francophone Quebecers "de vieille souche", English is the language of former oppressors. Presently, obtaining education in French is *guaranteed* (or *enforced*, depending on whether AttLoT=pos or AttLoT=neg) by law, namely the famous Bill 101.

Cujus lingua, ejus regnum

Bill 101 obliges immigrants' children to attend French schools, unless they can afford very expensive private

education in English. Some immigrants regard this law as impinging on their freedom of deciding, which education is best for their children and diminishing these children's chances of pursuing higher education in English Canadian and American universities. For these people English is the language of career opportunities (LoT=LoD), just as for parents of South African children.

English is perceived as an international language and a language of power in many countries. This might explain the spreading of the so-called international schools in Europe. In the Middle East, there exists a network of the so-called American Schools. In Egypt, there is a possibility of getting primary and secondary education also in French schools. If you have not attended English or French schools and universities in Egypt, your chances of obtaining a government job, or, more generally, succeed in any professional career, decrease dramatically, says Atef, one of my students at Concordia University in Montreal, born in Egypt.

12. Concluding remarks

Teaching and learning mathematics in multilingual classes are phenomena in a dire need of being described and understood. Jill Adler's book is an important contribution in this direction. Her understanding of the constraints and contexts of teachers' work was supported by her 25 years of experience as a teacher and mathematics educator. I contend that, in general, research into teaching and learning of mathematics in multilingual classes must be a long-term research. In relation to learning, one needs to capture the processes of learning mathematics in their interplay with development of fluency in the language of teaching. The latter takes a long time, sometimes years. Also in relation to teaching, one needs to look at how teachers learn from their experience and develop techniques of working in multilingual settings over years of practice.

When reading about research on multilingual mathematics classrooms, one may easily get the impression that multilingualism is a burden, an added difficulty to an already complex task of teaching mathematics. But multilingualism, per se, does not have to be perceived as an additional complication. Rather, it can be experienced as an additional opportunity for learning. Such has certainly been my own experience, first, as a student and then as a teacher in multilingual classes. Learning mathematics in a foreign language, made me view the language in which I learned mathematics as one of possible languages; I could say the same thing in another language. This made my thinking more analytic and helped me in understanding mathematics. Now, as a teacher, I have students who come from all parts of the world; they give me a chance of looking at mathematics through their mother tongues. This is an experience of opening horizons of meaning. This can be an experience of joy. While Jill Adler's account of her conversations with teachers and of the classes, couched in terms of dilemmas, conveys the teachers' feelings of distress and difficulty rather than joy, the book as a whole is optimistic. Without optimism, without the author's stubborn hope against all odds, this

² Paraphrase of *Cujus regio, ejus religio* - a liberal principle (Augsburg peace treaty, 1555), recognizing the right of Lutheran states to choose their religion.

research would not have been done and this book would not have been written.

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