Exploring Mathematics Education in Various Countries

Interview with Marcos Cherinda, Founder Member of *Associação Moçambicana para a Investigação em Ensino de Matemática e das Ciências Naturais* (AMIEMAC)

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General

Dear Marcos, thank you for being willing to give us an interview. The current situation in Mozambique is not easy, and yet you were able to make this interview possible. Can you briefly tell us what makes Mozambique unique as a country?

Before answering the questions posed by GDM, I think it is important to briefly situate Mozambique in the post-colonial historical panorama. Mozambique is a southern African country, a former Portuguese colony, which gained its independence on 25 June 1975. This was a political independence in which the country, like other formerly colonised countries, was freed from an oppressive colonial administration and began to determine its own social and economic development destinies. In this struggle for socio-economic development, Mozambique has realised since its political independence that "the struggle continues!" against underdevelopment, including in the cultural sphere, in which education occupied a fundamental space in the then newly born *People's Republic of Mozambique* (today Republic of Mozambique).

It is worth noting that already during the armed struggle for Mozambique liberation, mathematics education played an important role for the freedom fighters. A curious fact is that the first mathematics textbook for Mozambique (which also served the liberation movements of Angola and Guinea Bissau) was designed by the German mathematics teacher Achin Kindler between 1968 and 1969. One effect of the book's association with the liberation movements was the presence of weapons and guerrillas in the mathematical exercises in Kindler's books, which included questions such as "How many guerrillas are there in the maneuver camp?".

Once the land and man was liberated – with the overthrow of colonial power – it was necessary to build a free and prosperous Mozambique for all. With the revolutionary impetus came the creation of a 'new man' free of colonialist values in all their negative dimensions, continuing the political line already defined during the 10-year armed struggle for independence. In this process, the school became a place of privilege: '*Make the School a Base for the People to Take Power*' (Machel, 1979).

One of the first landmark moments in the history of mathematics education in independent Mozambique was undoubtedly the 1st National Seminar on the Teaching of Mathematics, held in May 1980, in which the opening lecture was entitled "Mathematical Science: A Weapon in the Construction of Socialism".

It is in this context, which ranges from the revolutionary enthusiasm of the masses in the early post-independence years to the socio-economic crises of the present days, that my account of (mathematical) education in Mozambique is set.

Quelle: Gerdes, 1981, S. 44

1st National Seminar on the Teaching of Mathematics, 5 May 1980

How is the mathematics education research community organised in your country?

The mathematics research community in Mozambique is still very dispersed, i.e., we do not have a specific consolidated forum of researchers in mathematics education with a functional organic structure. There were some initiatives by some mathematics teachers back in the 1980s, which I can summarise as follows:

In the mid-1980s, there was the beginnings of an organisation called "Associação dos Amigos da Matemática" [Association of Friends of Mathematics] in Maputo, promoting talks on mathematics (education) issues among lecturers at Eduardo Mondlane University. João Carlos Beirão and Paulus Gerdes stand out as the promoters of this initiative. It worked in practical terms, holding some lectures and debates, but was never formalised and so disappeared.

In 1989, Gerdes created the Centre for Ethnomathematical Research at the Instituto Superior Pedagógico (today the Pedagogical University of Maputo), where he led a group of young teachers in ethnomathematical research, of which I was a member. It is this small research group that I will be able to talk about the most, in terms of research in mathematics education.

In 2009, a group of teachers of mathematics and natural sciences (*biology, physics and chemistry*), of which I was also a member, founded the "Associação Moçambicana para a Investigação em Ensino de Matemática e das Ciências Naturais" (AMIEMAC) [Mozambican Association for Research into the Teaching of Mathematics and Natural Sciences].

In this forum, although mathematics teachers were relatively more active, mathematics education was never debated outside the scope of the natural sciences debates. AMIEMAC was stimulated by the Southern African Association for Research in Mathematics, Science, and Technology Education (SAARMSTE). In fact, AMIEMAC still functions today as a Chapter of SAARMSTE, with a kind of annual accountability for its achievements.

All this is to say that to this day, outside of routine research linked to obtaining academic degrees at universities, Mozambique does not have a community organised into a functional structure for research in mathematics education.

Research Focus and Methods

Are there any specific themes or questions that are particularly in focus in mathematics education research in your country?

With National Independence in 1975 and the establishment of a socialist regime in Mozambique, mathematics education, like other fields of scientific knowledge, had to contribute to the construction of the "new mankind" – a personality with an ideology and knowledge based on science, where mathematical knowledge is obviously fundamental.

The colonial mantle placed mathematics as a "difficult" subject, reserved only for special people. As a result, fear of mathematics led to widespread underachievement in this subject in our schools. It was necessary to start by demystifying mathematics, showing from primary school onwards that the Mozambican people, like people in other parts of the world, not only

had the capacity to learn mathematical science, but had always used mathematical knowledge, albeit in an empirical way. This conviction was the great starting point for a peculiar research project in Mozambique, deeply rooted in mathematical aspects "hidden" in the day-to-day work and the various cultural manifestations of the people.

Without a doubt, Professor Paulus Gerdes (1952–2014) was the great driving force behind this line of research – which later came to be called *ethnomathematics*. Gerdes stimulated generations of mathematics teachers and educators, both inside and outside Mozambique, towards a didactic approach based on the results of ethnomathematical research.

Outside this ethnomathematics group, what predominates in mathematics education research in Mozambique are case studies of didactic practices on mathematics subjects in the school programme.

What challenges does the mathematics education research community face in your country?

The persistent problem of teachers' working conditions is at the root of the challenges facing research in mathematics education. Many teachers, not just mathematics teachers, face basic subsistence difficulties and seek to increase their income by working in different schools, a factor that significantly reduces research activity.

In 1981 appeared the first Mozambican mathematics education magazine, called *TLANU – Revista de Educação Matemática*. TLANU aimed at encouraging mainly primary and secondary school mathematics teachers to share their didactic practices that create a solid foundation for their pupils to learn mathematics and, above all, practices that consolidate pupils' self-confidence that they themselves can and should develop mathematical knowledge. The magazine ceased to exist at the end of the 1980s for reasons of economic sustainability.

Basically, due to the overall socio-economic problems that affects the country and the education sector in particular, the research in mathematics education is reduced to studies for monographs, dissertations and theses for academic degrees.

How is collaboration between mathematics educators and teachers organised in your country to implement research results in practice?

In the day-to-day running of the school curriculum, teachers have the so called "Zones of Pedagogical Influence", forums in which groups of teachers from schools of the same geographical region discuss their teaching problems and find joint solutions for implementing them in the classroom. In terms of in-depth research, it has always been the aim of the Ethnomathematics Research Centre to take its research results into the

Foto: Marcos Cherinda

classroom. However, despite the efforts made, from the 1990s to the present day, little of the results of ethnomathematical research have been reflected in mathematics textbooks.

Future perspectives

To what extent do international research trends and debates influence mathematics education in your country?

News and good practices in mathematics education around the world have been reaching us through participation in regional forums such as the SAARMSTE conferences, and international ones such as ICME, when some teachers manage to attend. In universities, recent graduates from abroad bring with them valuable experiences and try to maintain links with mathematics education forums in the countries where they were trained.

What trends or developments do you consider particularly promising or important for the future of mathematics education in your country?

In the region, the Southern African Consortium for Monitoring Education Quality (SACMEQ) has served as a barometer for innovation in mathematics education in the country. SACMEQ studies have provided relevant and highly reliable data on student performance, the academic profile of teachers, school management and other aspects relevant to policymaking. Among the countries participating in the SACMEQ studies, Mozambique shows, unfortunately, a substantial decline in mathematics performance.

Based on the SACMEQ studies and other studies developed in the country, there is an urgent need to reverse the scenario. Mozambique needs innovative mathematics education, which implies investment in the basic conditions for teaching and learning throughout the education system. The creation of infrastructure such as decent classrooms, teaching materials including textbooks for all pupils, teacher training and better working conditions are the major challenges facing the country in terms of developing the education sector in general and mathematics education in particular.

According to the Education Policy Review on the education sector in Mozambique, the country's current fiscal capacity is below what is required for the education sector to achieve Sustainable Development Goal 4 on Quality Education. There is a need to programme education at the top of national priorities in terms of resource allocation. Mozambique needs to regain the enthusiasm of the first years of independence and with the great energy of the young generations of teachers transform the mathematics education for the economic growth of and wellbeing for all.

Literature

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