

Six adult mathematical workers on literacy, matheracy, and technoracy for life

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This is an opportunity for some members of a government sponsored community which recognizes and validates life experiences as a basis for earning the secondary certificate to share their ideas about mathematics and the world. This presentation includes six essays developed in the context of this community that explore the process of adults learning mathematics. These essays reveal the product of a Freirean educational approach and some thoughts socially constructed in interaction with volunteer educators from different parts of the world and with different experiences and backgrounds. The main objective of this paper is to open a way for the voices of the adults learning mathematics to be heard through our mutual efforts.

Prelude

Mônica Mesquita and Sal Restivo

‘To be’ and ‘to be with’ – this work contains essays which are thoughts from these two positions (that of ‘being’ and ‘belonging’). The reality of the work experience by volunteer adults and educators has allowed a certain level of freedom between the two positions, where every social actor involved in this process sought a number of exchanges. These exchanges were not rooted directly in material capital but in the realization of how each one was related to everyone else.

Volunteer work is a main feature of the D.A.R. à Costa - Tr@nsFormArte Project, where we, as adults, are situated. One part of this project is focused on the CRVCC¹ – the governmental process to recognize and validate various competencies of the adults to grant them access to a primary, basic or secondary degree. This volunteer work has been encouraged as a practice to bridge the gap between ‘to be’ and ‘to be with’. It allows us as individual, human beings to satisfy the need to work while at the same time increasing the educational ‘capital’ of our group, where formal education tends to maintain the gap.

In this symbiotic exercise between ‘to be’ and ‘to be with’, as a part of a movement of coherence of our actions, we found, as others did, the emerging need to discuss education

¹ CRVCC – Certificado de Reconhecimento e Validação de Competências Chave (Certificate of Recognition and Validation of Key-Competences)

from a critical point of view and not as an essentialist position. Our central focus was to learn rather than to obtain whatever degrees we could get. The exercise, from a critical education point of view, was to remember, analyse and discuss our experiences of life, listening and interacting with other experiences of life. This allowed us to construct our *situcionalidade*² - ‘where we are’ and ‘who we are’ - as a group and, intrinsically, as social actors. In a detailed, case study, perspective – a ‘zoom-in movement’ - volunteer educators such as Adelaide Paredes, Sal Restivo, Maria do Carmo Domite, Alexandre Pais, Margarida Belchior, Lia Laporta, Orlando Cêpa, and Filipa de Carvalho worked with us, bringing to our group a diversity of thoughts and allowing us the possibility to learn more and more.

Now, as a part of this exercise in what might be considered ‘a zoom-out movement’, we present ‘moments of life’ from six of us. We leave these, our diversity of thoughts, to others and encourage others to produce their own to allow us to learn more and more. Fernanda, a volunteer English teacher, and Paulo, a volunteer ICT teacher, are part of the group – and assisted in the preparation of this paper and, indeed, all aspects of the development of the presentation. We took a big step as we wanted to “shout” our experience to the world through this International Congress, demonstrating our practices and all the new methods and tools that we developed – the dramas-classes, the English classes, and the ICT classes. In particular, through preparing the international text, undertaking a historical search on the internet and producing the presentation slides. It has been our normal practice to share our methods through being researchers of our own practices.

We are a study group with a volunteer character from a range of perspectives that decided to come together to understand more of our *situcionalidade* concerning mathematical concepts. Our group consists of seven social actors - one mathematics educator, Mônica, and six adults, Jorge, Trindade, Margarida, Isaura, Conceição e M^a São José - who finished the RVCC for basic school together about two years ago. We meet two times per week. Each one of us agreed to come together in this informal way, where even Mônica (although she participated in the process of development of CRVCC in the Portuguese Educational Ministry, as a researcher at Lisbon University) has no formal certificate to prepare adults for this process. What was more important to us was to be together in this family of knowledge created by us.

We are one with the collective voice of those learning mathematics as adults, different because we are professional educators and researchers, the same because we are adults learning mathematics. We are pleased now to introduce the six essays by our adult learners, organized around three theoretical and three practical themes in the context of a reflexive critical practice.

Maths, Love and Society

Jorge

“What, then, should be our approach to social change in mathematics and society? The constructivist perspective suggests that we should focus on transforming ways of living, social relationships, and values in society at large. As I have noted elsewhere: A radical change in the nature of our social relationships will be reflected in radical changes in how we organize to do mathematics – and these changes will in turn affect how we think about and the content of our mathematics (1).” (Restivo, 1991, p.171)

² In the sense of Paulo Freire which can be loosely described as the roles and relationships within a specific context. The *situcionalidade* of a human being can be thought of as a way for them to think about their own existence: to have knowledge about and engage with their own space, their own situation.

Talking about Mathematics is just like talking about love – you either love it or hate it!

I like them both and now I'm going to try to explain my comparison. In Maths we basically learn that one and one is two, or one and one is eleven, which makes it easier in extremely complex accounts, but we also learn that it makes us feel the dimension of what surrounds us, that it is an exact science that keeps on revolutionizing our system and, whether we want it or not, will take us wherever we want. As a matter of fact, the evolution of this science is so great that our world will be too tiny to contain us.

In love we also know that one and one is two, but can be multiplied by many more if those two are willing to do so.

From my life-experience I know that mathematics is part of our everyday life – working and earning money is a plus sign and spending it, is a minus sign.

At the end of the month when we start paying the bills (water, electricity, house, etc.) it is a division sign. And last comes the multiplication sign. This one is there to complicate our life with worries, distress, disillusion and everything else the future has in store for us.

As an adult, I have the privilege of having the type of teachers who, in spite of being aware of our shortcomings, teach us and patiently give us their knowledge, making us believe that in the minus/plus table we are on the positive side. They also receive something from us, among other things, the most important may be the experience we have accumulated along our lives. Accordingly, we try to find the incentive for will and to prove that we can still be very useful to society. It is with the love they teach mathematics and with that they also multiply those interested people, whom they regard as their own children making their first steps.

Being born out of a critical relationship with this informal movement I've been living in the RVCC, love appears as a social construction which unites us with a social language of mathematics and turns us into social mathematicians.

Discussing the will of mathematics: searching a dialogue

Trindade

“Por “O Arbítrio da Matemática” nós nos referimos ao posicionamento que vê e sente a matemática como algo puro, transcendente e certo, com resultados que se aproximam de um nível de veracidade tão alto quanto os seres humanos podem esperar alcançar. Nessa hipótese é que a realidade da Matemática se encontra no discurso, de tal forma que a Matemática é tão real quanto – e apenas tão real quanto – a vida social ordinária.” (Bauchspies and Restivo, 2001, p.103)

You can find mathematics in the universe as a tool, throughout time. From time immemorial until now, mathematics has been a link among different cultural groups, as a language.

Numbers, groups, weights, measures, volumes, dimensions, space, time, etc. can be express in the mathematical language. Mathematics is a universal tool that also demonstrates the differences that occur according to the cultural groups in which it is developed.

As a survival tool mathematics is suitable for the development of techniques that can guarantee the continuity of the different cultural groups. With regards to history I can say that mathematics has served to assess archaeological finds, namely those of the Incas in South America, to measure pyramids and lands, count the sheep, locate the stars and explain survival techniques.

Still, as survival tool, Mathematics in the hegemonic society in which I'm included serves to produce calculations for the development of nuclear bombs such as those used in World War II, so perfected that where they hit the ground they destroy all life around. Mathematics is also responsible for the production of many other artefacts lethal to the earth.

In my view, this is an infinite tool for unlimited solutions to everyday life problems, keeping in mind the notion that Mathematics is Platonically shaped to the patterns of the dominant classes, which is in itself a social problem.

Mathematical Complexity

Margarida

I've always liked Maths! At the present time I'm an adult and I keep on learning. First at school Maths was considered to be an exact science. What a simple definition! We start learning the numbers, the letters and the geometric figures never realizing where those numbers, letters and figures can take us, the resulting development being infinite...

Thinking about our life Maths has been present from the day we were born, the day, the hour and the place of birth this taking already in consideration the concept of space, e.g. where we saw for the first time the light of the sun. Thinking about the sun, we can figure out an infinite dimension of mathematical applications e.g. the distance between the earth and the sun, the values of the sun's rays, their dimension and existence among others.

During my path, I keep on finding Maths everywhere, e.g. in a hospital with its surgical equipment where you can find extremely precise instruments, unthinkable until recently. The application of Maths has been, since the early times of humankind, developed by several cultural groups and each one, in its own way, finds techniques and solves their problems in order to survive.

However, we can also find in Maths a 'not so good' side, culturally considered a negative one. Its development leads to loss, disease and unhappiness. And in these times most of the world lives with this nightmare – little, less, nothing. The lack of so many things, from economic aspects to love and affection, that can be seen in so many homes, is reaching a 'maximum exponent'.

“We are living in a moment where no conflict has a regional character and no responsibility has a limited character. The human being is in the centre of the universe, and at the same time is the main author of a history, responsibility for which they cannot exempt themselves... In this indubitable commitment, pure mathematics appears as an excluding factor, as a boundary, not permitting the engagement of all human beings. But mathematics is a language of the world; it is a tool to communicate that must belong to all. I understand that for mathematics to be a common tool, it is first necessary to recognize the mathematics that exists inside the different cultures around the world. It goes beyond recognition alone though. It is necessary to think of mathematics as more than accidental imposition, more than an Euclidian and non-Euclidian way, more than the mathematician's way. “(Mesquita, 2008, p 89, 90)

Praxis of Matheracy

Isaura

“Materacia é a capacidade de interpretar e manejar sinais e códigos e de propor e utilizar modelos na vida quotidiana”. (D'Ambrósio, 2002, p. 67)

What we understand as mathematics starts to be important at the hour of our birth – it is the weight, the centimetres, the strength of our cry, which should be immediate and spontaneous to enable our better adaptation to the new world. Then we start learning to share toys, games, affection, etc. and next comes school time.

The day I sat on the benches of my first school was magical to me. I was seven years old and it was there I started to understand mathematics through the 4 little signs, which added, subtracted, divided and multiplied. I thought they were interesting and not too complicated except for the sign of division. Even today we are not the best of friends and I still quarrel with it, but only as far as school mathematics is concerned, because in my everyday life sharing with others helps me to multiply my happiness. Would it not be possible to apply mathematics with a little poetry, in such a way that it would develop and become more concerned with the well-being of humankind?

Later, in my professional life, what we understand as mathematics learnt at school was very important, when I worked out ideas emphasising the aesthetics of dressing well and I had to draw the geometric, symmetric and asymmetric figures (several sizes) where the millimetre is of the utmost importance to the success of any drawn mould I had to approve for the model created by me, or the interpretation of a croquis drawing. Without taking notice of it, many busy hours had been spent with mathematics. Summing up, one of my professional activities as ladies' clothing modeller is based on school mathematics. Of course, at the beginning of my activity I didn't use the above mentioned mathematic rules and the work was carried out by calculator, a more accessible method which allowed a better communication with others.

After all not everyone had the opportunity to attend school; however they progressed and overcame a lot of obstacles, side by side with the mathematics of life.

Praxis of Literacy

Conceição

“LITERACIA: a capacidade de processar informação escrita e falada, o que inclui leitura, cálculo, diálogo, ecálogo, mídia, Internet na vida quotidiana (**Instrumentos Comunicativos**).” (D'Ambrosio, 2002, p. 66-67)

In my childhood, not all the children could go to school, for many reasons. There were only a few schools, which were very far from where the children lived. There wasn't any type of transportation, and also no money for the books, the notebooks, or any of the school “apparatus”! Not to mention that clothing and footwear were not plentiful.

The children were needed at home, to help with the daily tasks like housekeeping, taking care of the field, of the cattle, and of the youngest. We, the children, had a very difficult road to follow, with rain and cold, and were barely fed most of the time.

My father Francisco could read and write. My mother, Maria, was illiterate, but a very demanding person, especially in what concerned house and work tasks. Maria was a factory employee and since she was tall enough to reach the knitting machine she was a knitter.

Ever since I was little, I heard my mother talking about numbers 1,2,3, etc, and started to ask my father what the numbers were for; that is when I started to discover Mathematics! When I first went to school, I could already read and write them to twenty, more or less, I don't know exactly.

Mathematics is a complex language, a closed box full of surprises, a language tool, Mathematics has existed ever since the world has been known as it is, and I consider that it is a technique for solving problems that varies in every culture.

Looking at the scientists as a cultural group, with their different areas of investigation, we can say that they have discovered true wonders for mankind through the Mathematics of that culture. This Mathematics, which has done wonders, is a two-sided tool – the atomic bomb was a disaster for Hiroshima, Nagasaki and all mankind, killing thousands of living creatures.

Mathematics as a language tool is present in the act of classifying, measuring, exchanging, evaluating, and so on... In particular, nowadays, it features strongly in the act of buying.

In my case, mathematical literacy decodes symbols, signs and feelings - giving me power for my survival as a social being.

Praxis of Technoracy

M^a São José

“TECNORACIA”: A capacidade de usar e combinar instrumentos, simples ou complexos, inclusive o próprio corpo, avaliando suas possibilidades e suas limitações e a sua adequação a necessidades e situações diversas. (**Instrumentos Materiais**, D’Ambrosio, 2002, p67)

When I was at school I always had some difficulty in mathematics, although I got good marks. However Maths in my everyday life was always easily carried out.

Now that I think about it, I see that almost everything in my life has been connected with Maths. This is what happens to the numbers from the time I get up till the time I go to bed. Just think about the alarm clock that wakes me up when it reaches the the number I set it for, to start a work day or a leisure one.

Then I spend my day producing calculations about everything e.g. my life, the money I spend, all the bills to be paid, in order to reach the precise amounts, no more no less. Doing so I use the maths I’ve learnt in my first years at school namely, addition, subtraction, multiplication and division. But I also use other weights and measures e.g. kilos, litres, metres, spans, feet, pinches, threads, etc.

I work every day with some of these weights and measures especially in my kitchen baking a cake, making bread, mixing dough, cooking rice and I also use a thread of olive oil and a pinch of salt. This way, I use them all the time to cook properly and feed my family in a correct way, with the exact quantities.

Therefore, I consider that in my kitchen I use mathematical techniques.

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