

Preface

How do you start yet another book? On mathematics education? I can say that the figures are tragic: poor people around the world get little education, let alone a good schooling in mathematics and the sciences, which might help them to escape from poverty. Hence, generations of poor people continue to get born, live and die without the promise of a decent life. Since all democratic states in the world (in theory all member states of the UNO, although the latter is not really a synonym of ‘democratic state’) subscribe to the Universal Declaration of Human Rights, it would follow that the human race officially engages itself to offer a good education to its youth. The facts belie this engagement. Mathematics education is believed to be a pillar of any conceptualization of what could be termed ‘a good education’. Hence, offering suggestions for the improvement of mathematics education is a good thing to do. That could have been one opening for a book like this.

Another one is to state yet another truth: I am an ignorant learned person, who has been teaching at good Western universities throughout his life. Yet, the concepts, theories and problems of science I do not know anything about (more than the layperson, or even that is saying too much) are innumerable. Moreover, I am not an exception in this: it is safe to say that all my colleagues share this condition with me, and the amount of knowledge we are lacking is growing every minute. Academic lore has it that the last person, who ‘knew everything’ about the natural sciences alone, died near the midst of the nineteenth century. One net result of this condition is that the authority of learned knowledge dwindled over the years: today the media are more likely to ask a sportsman or a movie star for their opinion on issues of religion, culture, morality or politics, and even the cost of scientific research today than colleagues of mine. With the corporatization of academia, we witness today that CEOs are hired as chancellors of universities, because they pretend to know how to run a business, and a university is considered more and more to be yet another branch of business (Sahlins 2008). In our ‘learned unknowing’, we researchers still do want to have a say in what the next generation might best learn in schools, because schooling seems to help or at the very least not

hinder lots of people in their career opportunities. And from there, it enhances their chances to live a decent life.

I choose the second entry for this book: I am ignorant, and yet I know something. I am convinced that I am rather able in posing a problem. I have been reading and writing a lot about human creativity, as it unfolds and can be recognized in such human endeavours as thinking, artistic activities, religious and life stance stories and procedures and even in political or community practices. I have been doing fieldwork (as an anthropologist by vocation) while being trained in philosophy, and hence, I have been struggling with problems of meaning, contact, communication and interaction, with identity and with existential issues. That was and is a good schooling, I think: you learn to think, rethink, negotiate and change the problem you consider relevant. It may sound as a truism to most, or maybe even as blasphemy to some, but when I think I can pose problems, then that is largely due to this practice of intercultural negotiation and interaction. Strangely enough, very few people are teaching that at the learned schools, but it comes along in some disciplines (like anthropology or psychotherapy training) when the students are pushed outside and into the field and have to meet with real people in order to ‘do science’ about them. Because of this peculiar extracurricular learning I benefited from in my contacts with other cultural subjects, I now dare to write the book that is in front of you.

Indeed, this book is not written by a mathematician, but rather by an anthropologist/philosopher. Hence, the lack of knowledge in pure or ‘academic’ mathematics is obvious from the start. In the words of the famous and uniquely creative mathematician Hardy (1967), I am not concerned with pure or creative mathematical knowledge, but rather or at the most with what he calls ‘trivial mathematics’ (Hardy 1967, sec. 28). Trivial mathematics deals with elementary geometry, elementary number theory and such, which can be shown to be ‘useful’ in business calculation, in orientation in the real world, or in a more general way allows people to become educated in mathematical skills that have a beneficial impact in jobs, in daily life and in sustainable ways of life in the present-day predicament. The pure mathematician is not busy with that sort of issue (which is perfectly alright and in agreement with Hardy’s well-made point), but mathematics as a subdomain of knowledge has impact and potential here, and that is what I want to highlight. So, even though I am not and cannot be concerned with problems within mathematics as a discipline, I take the particular focus on the constraints, the estrangement, the attraction and the wonder that I can describe when pupils from different cultural groups come into contact with mathematics in schooling and are given to understand that this formal way of thinking is extremely important for their chances in life and for the future of the world in general. The mathematician is, fairly and unavoidably, as stupid or ignorant as me in a million other questions and concepts outside his or her own specialization. Because these colleagues are raised in the same sort of tunnel view on the discipline as a whole, which is supposed to be a building block of science in general, of which nobody has had an overview for the past five generations or so, it is permitted that somebody—even an outsider like me—poses some questions on the primary level of mathematics education. The

perspective I advocate is not entirely new: since the 1960s of the past century, the ‘underachieving’ pupils have been the focus of some attention, and since the 1980s, the sociocultural approach has gained at least some status in mathematics education circles (Atweh et al. 2010). Although studies in this realm have not been systematic, and almost never placed mathematical thinking and learning squarely with all other empirical perspectives on knowledge (see below), it should be granted that the detached view of ‘pure mathematics’ is growing less dominant in mathematics education than it has been in the past.

Moreover, I want to claim an important role for ‘trivial mathematics’, to use the phrase of Hardy once more. It is well known indeed that many mathematicians will side with Hardy in believing that mathematics is in some way ‘above’ reality, or might address another reality than the one laypeople have access to. Platonism in the profession seems to help safeguard that belief: there is supposed to be a layer of reality that is beyond the common empirical one, and that layer is the playground of the pure mathematician. Recent research on mathematical literacy and common sense, however, seems to undermine such convictions. Not only has the importance of ‘much of the mathematics taught in schools to individual pupils rapidly decreased’ through the use of PCs and other devices (Gellert et al. 2010, p. 58), but international researches point to the growing need for mathematical literacy understood as the ability to behave mathematically. The emphasis here is on behaving, rather than on ‘pure thinking’. Again, Gellert et al. (2010, pp. 59–60): ‘This ability is to be developed by experiencing mathematical modes of thinking, such as searching for patterns, classifying, formalizing and symbolizing, seeking implications of premises, testing conjectures, arguing, thinking propositionally, and creating proofs and all this at increasingly higher levels of mathematical abstraction’. The relevance of ‘trivial mathematics’ in education is firmly substantiated through research, it seems, when these authors conclude that ‘Giving the pupils the opportunity of experiencing the process of applying mathematics is certainly an essential contribution to developing methodological insights into the process of mathematical modelling’ (idem: 60). For them, it is not just a bonus, or a curiosity, but ‘essential’ learning.

Today, being knowledgeable in mathematics (or in certain branches of the ‘trivial part’ of it) is a severe selection criterion for higher studies, for better jobs and potentially for more cloud in the globalizing world. How could that work, when we are all so ignorant about the totality of knowledge, or even about a larger picture for which to educate? What sort of amazing trust or blindness do we manifestly show when we leave the task of perfecting and enhancing that strange system of education in the hands of those big players today (Greer 2012), who ‘believe’ that the principles of the free market will solve all long-term problems when we just leave the big choices to the free market and have them manage the road that leads to the right horizon? I am not going to solve that question, but given the turn we are taking today in these matters, I at the very least want to take the opportunity to say what I understand on the ways formal reasoning (and especially mathematics education at the elementary level) takes shape in the obviously culturally diverse universal classroom which emerges. The excuse to dive into this sea as an outsider

to the club is that I have an ‘educated guess’ on the causes of failure in the classrooms, precisely because I am a bit more acquainted than specialists in the discipline of mathematics with contexts of learning, different cultural backgrounds and the contextual constraints of our own scientific learning processes.

One further warning before I start. I take for granted two philosophical postulates in my search. I invite the reader to go along with me in accepting them.

In my view, action is the more generic category in the relationships between human beings and the world. Language, and within that texts as such, is a particular type of action, constrained by specific and particularistic rules and traditions which differ from other types of action (such as physical actions, perception, thinking, maybe rhythm). The forceful and rather imposing Western tradition of education through instruction (in schooling primarily) shows a marked preferential use of linguistic action, and even of verbal instruction, in mathematics education. My plea is to look at this consciously and alter it where possible, because this focus and rather excluding perspective in mathematics education is alienating, rather than emancipating (as schooling officially promises to be) for many groups and traditions.

In the second place, I am convinced that sophistication and abstraction in thinking is a high value and an intrinsic aspect of what is called education worldwide. However, the roads to sophisticated thinking, abstraction and formal thinking are many and diverse. In that perspective, I warn against the implicit and taken-for-granted ideological use of value-laden concepts such as ‘universal’ and ‘universalism’. Yes, abstraction and sophisticated thinking will be found to be a high value in all education of the human species. But the premises, the choices for pathways and for particular ends and goals will most probably be differing across cultural traditions. My plea is to respect these divergences in the curricula and in the learning strategies for mathematics education. This is captured in the notion of multimathemacy.

To make that notion clear from the start, it is useful to work with a visual metaphor:

Mathematical knowledge (like any other knowledge, but that is beyond the scope of the present project) can be represented with the visual metaphor of a city. The city shows many buildings: one impressive skyscraper, a few semi-tall buildings and a huge amount of huts and small dwellings. The skyscraper is the building of academic mathematics (AM) with its own logical structure, its neatly designed separate rooms and a staff looking after the maintenance and the eventual enlargement or rehabs of the building. The staffs are the mathematicians. The other taller buildings are the substantial mathematics corpuses of Chinese, Indian and other traditions. All of them developed one or the other special branch, working on their own particular intuitions and often applying their knowledge in architecture, irrigation systems and so on. And then, one finds a huge amount of small dwellings in the city, harbouring particular local knowledge in mathematics, as exemplified in building, sacred doings, tapestry or pottery making and the like (EM or ethno-mathematics). All of these buildings in the city work with particular linguistic, religious and social settings, and all of them are also local in the sense that their

intuitions, their choices for this or that line of reasoning and learning, their values and their expectations in terms of usefulness, elegance or rightness (truth, inalterability) are not necessarily duplicated in the other buildings. In the eyes and minds of the inhabitants of the AM skyscraper, mathematics education consists for all city dwellers in learning what the skyscraper people decree it to be. On the other hand, mathematics education, according to the view of multimathemacy, has to take the complete range of this diversity into consideration, since it instantiates the many versions of background knowledge and capacities and attitudes the pupils carry with them when being touched by the products and programmes of AM. It is my conviction and expectation that in education it will be wise, enhancing emancipation and generally beneficial for all humans to use educational curricula and learning strategies (in schools or otherwise) when starting from the particular context of each dwelling and try to find a way towards the rooms and structures of one's own and any other building in the city that is supposed to be relevant, interesting and beneficial for one's own world. The latter include, among other buildings, that of AM.



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Pinxten, R.

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