THREE NARRATIVES ABOUT MATHEMATICS EDUCATION

OLE SKOVSMOSE

In *The Postmodern Condition: A Report on Knowledge,* Jean-Francois Lyotard coins the term 'grand narrative', also referred to as 'metanarrative'. By such a narrative, he has in mind comprehensive conceptions and visions about society and humanity. It could be about science serving as a motor of progress, or about democracy as evolving through an ongoing enlightenment.

Lyotard sees modernity as a period where such metanarratives are circulating and considered valid. Contrasting modernity, Lyotard characterises post-modernity in terms of an 'incredulity' towards metanarratives. Instead of celebrating modern metanarratives, one should rather pay attention to local narratives.

If we concentrate on mathematics education, we can identify different narratives. They might mirror features of some grand narratives, but also represent local narratives. I am going to present three such narratives: The first describes mathematics education as a sublime subject, being one of the pillars of our civilisation. The second narrates mathematics education as a suspicious subject, allied with oppressive forces. The third claims that mathematics education has critical potentials, although it might be difficult to actuate them.

Why point out such narratives? I am concerned about the possible socio-political positionings of mathematics education. Often this education has been claimed to represent objectivity and neutrality. Today, in many countries and contexts, the extreme right appears to be in the ascendance, and in such situations illusions about objectivity and neutrality might turn disastrous. Herbert Mehrtens (1993) has documented the intimate relationships that developed during the 1930s between the social formation of mathematics education and Nazi ideologies. I see the danger of similar tragic repetitions taking place today. They might appear as implicit consequences of disastrous illusions; they might also appear as consequences of explicit right-wing policies. I will return to such speculations, but first the three narratives.

First narrative

Mathematics education is a sublime subject. This is the essence of the first narrative, which includes two chapters: the first about mathematics as a beautiful subject, the second about mathematics as a useful subject.

In *A Mathematician's Apology,* G.H. Hardy elaborates on mathematics from an aesthetic point of view. He sees the work of mathematicians as the work of artists, and such work does not need particular justifications, say, in terms of its social relevance. Like Mozart's and Beethoven's symphonies, mathematical results do not need any utilitarian validation. In fact, Hardy finds what he refers to as 'real' mathematics useless. However, it has a unique aesthetic value closely related to its sublime epistemic qualities, and this provides mathematics with an auto-justification.

The epistemic qualities of mathematics have been acknowledged since antiquity, and Euclid's *Elements* has been recognised as a distinctive way of organising knowledge in a deductive system. The logic of deduction ensures that if the premises are true, then the derived consequences will be true as well. If the axioms of a system are so well chosen that their truths be guaranteed, then logical deduction will transfer the truth of the axioms to any theorem of the system. For centuries, this epistemic pattern was paradigmatic, not only with respect to mathematics, but to any domain of knowledge. Furthermore, Euclid's *Elements* was considered the proper start for any learning of mathematics, as students would come to experience a magnificent case of human knowledge.

An important addition to this celebration of mathematics as a sublime subject emerged as an integral part of the so-called scientific revolution. The people contributing to this—Copernicus, Kepler, Galilei, Newton—were all deep believers in God, and they saw the world as being created by God. What they discovered was that God had done so acknowledging strict mathematical principles. This was an overwhelming insight: Imagine, we human beings have become able to grasp the rationality of God! Mathematics acquires a unique status, not only from an epistemic, but also from a religious point of view: By means of mathematics, we come to understand God's creations. The teaching of mathematics turns almost into a religious requirement.

When science separated from theological assumptions, the celebration of the power of mathematics to explain the world did not abate. Mathematics became interpreted as a unique tool for any scientific activity. The language of mathematics would ensure objectivity by describing the world as it really is; it would eliminate any subjective features of a description and this way ensure neutrality. In other words, it was claimed that mathematics does not assume any political priorities.

By ensuring understanding of the natural world, mathematics obtains unique utilitarian potentials, and this idea brings us into the second chapter of the first narrative about mathematics education as a sublime subject. It is not possible to imagine any modern technology without mathematics being part of its construction and functioning. This utilitarian value is clearly underlined in the report *New Thinking in School Mathematics* (OEEC, 1961), in which Marshall H.

Stone highlights that,

> [the] teaching of mathematics is coming to be more and more clearly recognized as the true foundation of the technological society which it is the destiny of our time to create. We are literally compelled by this destiny to reform our mathematical instruction as to adapt and strengthen it for its utilitarian role carrying the ever heavier burden of the scientific and technological superstructure which rests upon it. (p. 18)

Such a statement turns mathematics education into a unique subject essential for our modern civilisation.

The two chapters about mathematics education as a sublime subject, being beautiful and useful, are brought together in the *Mathematics Report: Mathematics is Important* [1], which claims that mathematics education is important due to three factors: (1) Mathematics is a core skill for life, meaning that in order to act as citizens in the modern society one needs to master some mathematical skills. (2) Mathematics is a key to economic prosperity, which is a direct expression of what was stated in *New Thinking in School Mathematics.* (3) Mathematics is beautiful, referring to the claim that mathematics has unique aesthetic and epistemic values. Furthermore, in the report, one finds a range of recent references for these claims.

This first narrative provides a paradigmatic umbrella for mathematics education practices and for mathematics education research. What becomes taught and learnt has a range of attractive qualities. There are no political controversies related to the teaching and learning of mathematics. In fact, mathematics education can abstain from paying attention to any such issues, and concentrate on the so-called content-matter issues. This is, for instance, the position of radical constructivism, as inspired by the work of Ernst von Glasersfeld, who in turn elaborated on Jean Piaget's ideas about the nature of learning mathematics. As a consequence, the teachers as well as the researchers in mathematics education can serve as ambassadors of mathematics.

Second narrative

Mathematics education is a suspicious subject. There is a huge discrepancy between what is stated as aims of mathematics education, and how it functions in a given socio-political context.

Looking at such aims, one may read about creativity and critical thinking. However, in most cases the educational practice is dominated by textbooks, which present sequences of pre-formulated routine exercises. Taking a closer look at such exercises, we can observe a specific pattern. An exercise includes some information expressed in numerical form. This information is *sufficient* for solving the exercise. There is no need for the students to look up additional information, say by going to the library or to a supermarket. The information given in numbers is also *necessary* for solving the exercise. There does not appear any numerical information that is not going to be used. There is *one and only one correct answer* to any question, so issues of being right or wrong are clearly defined.

Working with such exercises does not seem to propagate any form of creativity, nor of critical thinking. Could it be, then, that worldwide mathematics education is malfunctioning? It appears so, if we consider the official formulations. However, we have to acknowledge the brutal reality that the real function of mathematics education has nothing to do with creativity and critique, but is all about ensuring submission and conformity.

Michel Foucault's work offers new ways of looking at social institutions. By applying a critical historical approach, he points out that institutions serve interests and functions in society other than those explicitly assumed. Foucault tries to show that what we take for granted is formed by the extension of historical contingencies. As part of this formation, various interests and preconceptions can be incorporated. Many institutions maintain a double-life by assuming a certain appearance, while in reality operating in a quite different way, school being one of them.

With this observation in mind, Thomas Popkewitz (2004) discusses mathematics education and points out that it, too, maintains a double-life. In making this claim, Popkewitz gives much inspiration for elaborating in greater detail the second narrative about mathematics education, and I want to refer to two doctoral dissertations that do so, both supervised by Paola Valero.

In *(D)effecting the Child: The Scientifization of the Self Through School Mathematics,* Melissa Andrade-Molina (2018) reveals how basic mathematics education serves the formation of what she refers to as the 'desired child'. This is a person who—when becoming an adult—will fit into the production line of a capitalist economy. In one of the articles composing the dissertation, Andrade-Molina and Valero (2017) highlight that the teaching of geometry, as organised in accordance with the Euclidian paradigm, tends to shape precisely such a 'desired child'. They document in great detail the social double role of also this particular part of mathematics education. If we listen to the first narrative, we would hear statements about the importance of children experiencing the power of deductive reasoning, and through elementary geometry coming to grasp an essential feature of mathematics. However, Andrade-Molina and Valero point out that here we are dealing with an extreme case of double talk.

In parallel to Andrade-Molina's discussion of the desired child, Alex Montecino, in *The Fabrication of the Mathematics Teacher as Neoliberal Subject* (2018), points out how the 'desired teacher' becomes formed through a network of assumptions and presumptions. We are dealing with a fabrication that does not reflect articulated educational priorities, but rather neo-liberal presumptions. Not only the 'desired child' but also the 'desired teacher' become conceptualised when we read beyond the explicit wording of official documents, and grasp their hidden meaning. The studies conducted by Andrade-Molina, Montecino and Valero allow us to grasp the profoundness of the second narrative.

Drawing in particular on inspiration from Slavoj Žižek, Alexandre Pais highlights that we cannot forget that mathematics education takes place in a society, where capitalist structures and accompanying ideologies permeate whatever is taking place, also in this school subject. As an illustration, he considers the broadly celebrated slogan 'mathematics for all'.

According to Pais (2012), it covers a cynical irony:

> In the example of "mathematics for all," this official claim conceals the obscenity of a school system that year after year throws thousands of people into the garbage bin of society under the official discourse of an inclusionary and democratic school. […] The antagonistic character of social reality—the crude reality that in order for some to succeed others have to fail—is the necessary real which needs to be concealed so that the illusion of social cohesion can be kept. (p. 58)

In other words, mathematics is a suspicious subject. Its brutal task of first identifying those to be thrown into the garbage bin and secondly performing this very act, is concealed beneath respectable looking aims and metaphors like 'mathematics for all' [2].

In my own publications, one also finds formulations that connects to the second narrative about mathematics education. In *Travelling Through Education* (2005), I highlight that if one reads aloud all the exercises that a student is presented with during school, it would sound like a long sequence of commands. To follow orders is an important 'quality' of an attentive student, as well as of an obedient workforce. I have referred to this obedience as a *prescription readiness* (2008), and mathematics education could demonstrate a successful way of exercising such readiness. A prescription readiness might operate in different ways in different situations; it might have disastrous implications—just think of Nazi Germany as one example.

Third narrative

Mathematics education has critical potentials. It might be that traditional mathematics education functions as a means for fine-tuning students to the dominant economic order, but it need not be so. Mathematics education can be organised in other ways and become part of a struggle for social justice.

With inspiration from Paulo Freire, one can come to see that even in the midst of extreme oppression and against all the odds, one can work for social justice. Freire established an educational project confronting the Brazilian dictatorship at that time. He was forced to leave the country, but still his activism demonstrates that a radical pedagogy can be developed even at times when it seems least viable. In fact, we have to do with an almost contradictory situation: oppression makes a radical pedagogy necessary; simultaneously this very oppression tends to make it impossible.

Freire's pedagogy of the oppressed has been metaphorically formulated as a preoccupation with reading and writing the world. 'Reading' refers to a capacity in identifying and interpreting patterns of oppression and domination, while 'writing' refers to political actions and attempts to make changes. These metaphors can also be applied with reference to mathematics; thus Eric Gutstein (2006) explicitly talks about reading and writing the world with mathematics.

In the article *Critical mathematics education: an application of Paulo Freire's epistemology,* Marilyn Frankenstein (1983) explores ideas developed by Freire, which brings her to conceptualise a critical mathematics education. The importance of addressing mathematics critically is due to the fact that forms of oppression can be masked by layers of numbers that establish an appearance of a 'necessity' of oppressive socio-economic structures. Thus Frankenstein states:

> A significant factor in the acceptance of this society's hegemonic ideologies is that people do not probe the mathematical mystifications that in advanced industrial society function as vital supports of these ideologies. (p. 327)

A pedagogy of the oppressed should examine critically all forms for hegemonic structures, which could be opaque and taken for granted, and Frankenstein highlights:

> Critical mathematics education can challenge students to question these hegemonic ideologies by using statistics to reveal the contradictions (and lies) underneath the surface of these ideologies […]. Further, critical mathematics education can link this questioning with action, both by illustrating how organized groups of peoples are using statistics in their struggles for social change and by providing information on such local groups as students may wish to join. (p. 329)

In *Relearning Mathematics: A Different Third R—Radical Maths,* Frankenstein (1989) presents an abundance of examples illustrating how a critical mathematics education can address oppressive structures. She and others, including Eric Gutstein and Bülent Avci, offer a variety of examples that illustrate what it could mean to read and write the world with mathematics.

Through my own work, I have also given input to the third narrative about mathematics education (see, for instance, Skovsmose 2014). I have tried to show that although mathematics education often embraces routines that cultivate a prescriptive readiness, one can work with topics contributing to the development of a critical citizenship.

What to think of the three narratives?

When one listens to different narratives about the same phenomenon, one comes to ask: which one is true? This is the immediate reaction of a judge sitting in the courtroom listening to contradictory accounts about the same criminal charge.

The very notion of truth has run into philosophic difficulties, and the post-modern wave has made us recognise that truth is not any straightforward notion. This is a main point of Lyotard's 'incredulity' towards metanarratives. While the modern metanarratives have generated truth to a range of ideas about science, technology, and progress, the post-modern condition opens for a range of local narratives. They establish a profound perspectivism and, as a consequence, the notion of truth may escape the classic principle that truth cannot be assigned simultaneously to two contradictory statements. To put it formally, one cannot associate truth to a proposition p as well as to non-p. However, when one operates with a strict perspectivism, all kind of statements might turn out to be true, at least from a certain point of view. Such a radical perspectivism has not reached the courtroom, but it seems to have reached many university lecture rooms, where postmodernity has been advocated, also in its radical epistemic format.

Being aware of this, I will not try to pursue the idea that one needs to find out which of the three narratives about

mathematics education, if any, tells the truth. Naturally, the point of any narrative is to present things *as if* they were true. This applies to the grand narratives of modernity, but also to local postmodern narratives. However, any such truth-claim can have two versions. One can claim that things in fact are as told, but that they easily could have been different. Such a narrative, I will refer to as a *contingent account.* Contrary to this, a narrative can present things as if they were true by necessity due to the very nature of things. Such a narrative, I refer to as an *essentialist account.* Essentialism in general refers to the idea that things are defined through a set of intrinsic qualities that cannot be different. The grand narratives of modernity have been presented as essentialist accounts. This was precisely the point that brought Lyotard to articulate an incredulity towards them.

The first narrative about mathematics education provides an essentialist account. Due to the very nature of mathematics, mathematics education turns sublime.

This narrative has deep roots in the essentialism that accompanies the grand narratives of modernity. In fact, I see the first narrative as a specification of the optimism associated to the modern outlook claiming that society is progressing due to the progress made by science and technology. The conception of mathematics as being crucial for both science and technology makes part of this modern essentialism. This first narrative serves as a paradigmatic frame for much mathematics education. Maybe not at first with respect to what is said, rather with respect to what we are silent about. The first narrative helps to install a *paradigmatic socio-political silence in mathematics education,* not only in educational practice but also in research. When mathematics is considered sublime, one need not argue for the relevance of teaching specific topics. Instead, one can head directly for the question of how to do it. For instance, in *For the Learning of Mathematics* from 2018, one finds articles addressing 'a conversational understating of function', 'intuitive and formal models for whole number multiplication', and 'diagrams as communication'. I consider all such studies to be highly original, but still they are silent with respect to such socio-political issues and uncertainties that give rise to both the second and third narrative about mathematics education.

My own approach of challenging the modern essentialism inscribed in the first narrative is to engage in discussions of mathematics in action. This way I highlight four things: *First*, that mathematics operates in all kind of contexts. Mathematics is used for designing, whatever we have to do with computers, smartphones, aircrafts, cars, bicycles, or shoes. Any technological construction has been outlined through a mathematical blueprint before any real fabrication has begun. Not to put too fine a point on it, mathematics is an integral part of human life in general. *Second*, as any action, so also mathematics-based actions can have any kind of qualities. They can be useful, risky, dangerous, disastrous, reliable, oppressive, insignificant, expensive, cynical, well-intended, *etc. Third,* any kind of mathematics can be put in action: engineering mathematics, pure mathematics, advanced mathematics, elementary mathematics, any version of ethnomathematics. *Fourth*, any instance of mathematics in action is in need of being addressed critically. These four points about mathematics in action highlight the contingent nature of how mathematics might be brought in operation. When this contingency becomes recognised, any essentialism, referring to the beauty or the utility of mathematics becomes challenged.

The second narrative challenges the essentialism incorporated in the first narrative. It tells that what is stipulated as aims and functions of mathematics education are only discursive decorations. Thus, the second narrative provides a profound critique of the first narrative. It states that within a capitalist society, the first narrative might bring about disastrous illusions.

The second narrative has found much inspiration in Foucault's analytical approach. Here, we do not find any trace of essentialism. Quite the contrary, Foucault tries to display that taken-for-granted social structures and general ideas are contingent affairs; they could be different. What takes place in school is a contingent affair. To this observation the second narrative adds that what takes place in school is *determined* by the dominant social order. By cultivating a prescription readiness, mathematics education will prepare the coming workforce for the capitalist organisation of production.

The second narrative also brings a warning with respect to the third narrative: aspirations of a mathematics education for social justice, within the capitalism order of things, could be an illusion. This warning was articulated in the article *Recovering the meaning of 'critique' in critical mathematics education* (Pais, Fernandes, Matos & Alves, 2012). Here it is pointed out that even though one engages in socio-political relevant topics and acknowledges recommendations from critical mathematics education, one can experience that nothing really comes out of such efforts. No social-political reality is changed, not even at a micro-level. The activities recommended by critical mathematics education might be futile. Why? By carefully considering this question, we might come to acknowledge that mathematics education for social justice within the capitalism order of things *will be* an illusion. Or should we say *might be*?

If the second narrative applies the *will-be* interpretation, it turns into an essentialist account, although in a conditioned version. By *conditioned essentialism,* I refer to the idea that given a certain social order, education in general and mathematics education in particular, will serve predefined functions. In a capitalist society it is unavoidable that mathematics education, critical or not, will adapt to this social order. It is not clear to me to what extent the versions of the second narrative provided by Andrade-Molina, Montecino, Pais, and Valero have the *will-be* or the *might-be* format. I find problematic, however, any sliding from contingent *might-be* formulations towards essentialist *will-be* formulations.

The idea of conditioned essentialism emerges from assumptions included in orthodox Marxism (which according to Lyotard also constitutes one of the grand narratives of modernity that could be questioned). A basic assumption is that economic structures determine other social structures that only can be changed in case the principle format of economic exploitations are changed. This claim defines the conditioned essentialism that emerges from orthodox Marxism.

The third narrative almost always takes the form of a contingent account. It points out that activisms will meet many obstacles. It tells about educational initiatives that take place

against all odds. A mathematics education for social justice is a struggle. Some might work, but many times educational initiatives might turn out to be misconstrued or even counterproductive.

According to critical mathematics education that I associate with the third narrative, it is important, also against all odds, to work for social justice. One has to face the contradiction: oppression makes critical mathematics education necessary; simultaneously this very oppression tends to make it impossible. No recipe can capture how to deal with this contradiction. There does not exist any pattern for being critical.

What can take place or not take place within the capitalist order cannot a priori be identified analytically. One cannot assume that a mathematics education for social justice within the capitalism order of things *will-be* an illusion. I acknowledge that it *might-be*, but one need not be paralysed by this *might-be*. Certainly overall social, political, and economic structures have an impact on what takes place in schools and in mathematics education. However, I cannot follow the second narrative by embarking on any version of conditioned essentialism. I do not see capitalist structures as eliminating all kind of contingencies within the domain of education. Something could be different.

One reason for making this claim is emerging, although from the very wrong direction. As referred to in the introduction, the extreme right is in the ascendance in many countries around the world; also in Brazil where I now live much of my time. The extreme right demonstrates a profound preoccupation with education. It wants to ensure that no discussion takes place in school that could challenge its own general outlook, whatever we have to do with political, cultural, or religious issues. History has to be reorganised that the military dictatorship appears a 'social movement'; any form of gender discussion has to be abandoned; Darwinism has to be substituted by some version of creationism; environmental issues should not be addressed; and Paulo Freire has to be eliminated from education (whatever such a claim might mean). Any unwanted topic has to be abolished, as it is claimed to represent Marxist propaganda.

The preoccupation with education by the extreme right were irrelevant if what takes place in education is conditioned by the dominant capitalist order of things. However, this very right-wing preoccupation indicates to me that the 'logic of capitalism' might not be so profound that it determines everything that takes place in school. Conditioned essentialism could work as a political pacifier. However, the extreme right is not any pacified with respect to educational issues, and we should not be either.

I see the school as located in the middle of a political struggle. This also applies to mathematics education that—like whatever else is taking place in school—is a contingent affair. Hiding behind a decorative discourse from the first narrative about mathematics education being sublime, the very education could serve the formation of a prescription readiness that might turn disastrous within a right-wing dominance. Assuming a conditioned essentialism from the second narrative might establish a discourse of passivity: neither education nor mathematics education could establish social changes. The third narrative, however, makes it meaningful for mathematics education to work for social justice, although it remains uncertain what this could mean. The outcome of such educational struggle is undetermined. Nothing is given in advance, but the struggle is possible!

Like so many other statements, also this last statement makes part of a narrative. It makes part of the third narrative about mathematics education. And we cannot forget that this is not any grand narrative, but a local one.

Acknowledgements

I want to thank Denner Barros, Manuella Carrijo, Ana Carolina Faustino, Peter Gates, Amanda Queiroz Moura, João Luiz Muzinatti, Miriam Godoy Penteado, Célia Roncato, Daniela Alves Soares, and Débora Vieira de Souza for their helpful comments and suggestions.

Notes

[1] Online at https://mathsreports.wordpress.com/overall-narrative/mathematics-is-important/

[2] Previously, Gates and Vistro-Yu (2003) in their pointedly titled '*Is* mathematics for all?' have argued that the real questions are, mathematics for *who*, and mathematics for *what*?

References

Andrade-Molina, M. (2018) *(D)effecting the Child: The Scientifization of the Self Through School Mathematics.* Doctoral dissertation. Aalborg, Denmark: Aalborg University, Department of Planning.

Andrade-Molina, M. & Valero, P. (2017) The effects of school geometry in the shaping of a desired child. In Straehler-Pohl, H., Bohlmann, N. & Pais, A. (Eds.) *The Disorder of Mathematics Education: Challenging the Socio-Political Dimensions of Research,* pp. 251–270. Cham, Switzerland: Springer.

Frankenstein, M. (1983) Critical mathematics education: an application of Paulo Freire's epistemology. *Journal of Education* **165**(4), 315–339.

Frankenstein, M. (1989) *Relearning Mathematics: A Different Third R—Radical Maths.* London: Free Association Books.

Gates, P. & Vistro-Yu, C. (2003) Is mathematics for all? In Bishop, A., Clements, M.A., Keitel, C., Kilpatrick, J., Leung, F.K.S.. (Eds.) *Second International Handbook in Mathematics Education,* pp. 31–73. Dordrecht: Kluwer.

Gutstein, E. (2006) *Reading and Writing the World with Mathematics: Toward a Pedagogy for Social Justice.* New York: Routledge.

Mehrtens, H. (1993) The social system of mathematics and National Socialism: a survey. In Restivo, S., van Bendegem, J.P. & Fisher, R. (Eds.) *Math Worlds: Philosophical and Social Studies of Mathematics and Mathematics Education,* pp. 219–246. New York: State University of New York Press.

Montecino, A. (2018) *The Fabrication of the Mathematics Teacher as Neoliberal Subject.* Doctoral dissertation. Aalborg, Denmark: Aalborg University, Department of Planning.

OEEC (1961) *New Thinking in School Mathematics.* Paris: Organisation for European Economic Co-operation.

Pais, A. (2012) A critical approach to equity in mathematics education. In Skovsmose, O. & Greer, B. (Eds.) *Opening the Cage: Critique and Politics of Mathematics Education,* pp. 49–91. Rotterdam: Sense.

Pais, A., Fernandes, E., Matos, J. & Alves, A. (2012) Recovering the meaning of "critique" in critical mathematics education. *For the Learning of Mathematics* **32**(1), 28–33

Popkewitz, T. (2004) The alchemy of mathematics curriculum: inscriptions and the fascination of the child. *American Educational Research Journal* **41**(1), 3–34.

Skovsmose, O. (2005) *Travelling Through Education: Uncertainty, Mathematics, Responsibility.* Rotterdam: Sense.

Skovsmose, O. (2008) Mathematics education in a knowledge market: developing functional and critical competencies. In de Freitas, E. & Nolan, K. (Eds.), *Opening the Research Text: Critical Insights and In(ter)ventions into Mathematics Education,* pp. 159–188. New York: Springer.

Skovsmose, O. (2014) *Critique as Uncertainty.* Charlotte, NC: Information Age Publishing.