A MATHEMATICS EDUCATION UTOPIA

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Introduction

> *- Well, maybe he looks like a mathematician?!*
> *- I do not know; I cannot know what a mathematician should look like!*
> *- You say something that is very correct. A mathematician doesn't look like anything at all; that is, he looks so generally intelligent that it has no definite content! With the exception of the Roman Catholic clergy, there is no longer anyone today who looks like they should, because we use our heads even more impersonally than we use our hands; but mathematics is the very highlight, it already knows as little about itself as humans, if they were ever to live on energy pills instead of meat and bread, would be able to know about green meadows and calves and hens!* (Musil, 1978a: 57) [My translation]

The school is on a wild path when it comes to teaching mathematics. The pupils are not interested in mathematics, and they do not want to learn mathematics. According to Hustad (2002), we can, at least in Norway, thank the political left for this, and primarily the Labor Party, which has been in government for large parts of the post-war period. The unified school idea has given us a different school than we had before. If we go back 60 years in time (the 1960s), there were not many pupils or students who worked with mathematics at a higher level, that is to say in upper secondary school and at university level (Niss, 2003). Mathematics was for the few, and there was no emphasis on facilitating the learning of the subject, the material was presented for acquisition. There was no need for didactics in the subject of mathematics. The pupils and students themselves had chosen to work with the subject, and had to take responsibility themselves if they did not master what was expected. Now, however, there is political and research-based agreement that the teaching of mathematics is of great importance for pupils' and students' learning, and there are a number of different perceptions and expectations about how mathematics can and should be taught. The introduction of grades earlier in school, teaching outside the classroom, less theoretical and more applied mathematics, and more professional and didactic schooling of the teachers in mathematics, are examples of this. The reasoning is that you as a citizen need a minimum level of mathematical knowledge, and that society is based, among other things, on mathematical knowledge. Education policy measures must then be taken that secure society's interests. So far, it seems that the measures taken have had a limited impact, other than more pupils and students learning some mathematics and very few learning a lot of mathematics.

In any case, it can be established that the so-called myth that: "Mathematics is a vitally important subject which cannot be valued too highly" (Ernest, 1998: 37), is in the process of re-establishing itself as something else than a myth. The importance of school mathematics for society is discussed with such great seriousness, and sometimes with such great pathos, that something revolutionary must happen. It is no use with the tinkering and filing that we have seen in recent decades. Kahane (1998: 76) actually says quite neatly what many people probably are thinking: "...we had utopia in the past; we are now in a period of realism; we need utopia for the future." So something must happen. Kahane (1998: 84) even wishes and suggests that "Mathematics being universal, being used in unexpected situations and being present in the whole course of education, even at an early stage of childhood, should be a common good of the entire mankind", but sees this as utopian to achieve in both research and teaching of

mathematics. "Realism would lead us to say that the universality of mathematics is a mere illusion." (Kahane, 1998: 84). Kahane's wish may to some extent be met by pointing to the fact that *to calculate* has entered the school as a basic skill in all subjects, but we are still talking about adapting an established perception, and fulfilling an expectation that the teaching of mathematics should be beneficial for everyone who either sees the need to learn a little mathematics or needs a grade in this school subject in order to realize one or another professional dream in adulthood. Is there any alternative to this form of willingness to accommodate society members' desire for self-realization and society's need for mathematical knowledge, which is in many ways based on the basic idea of democracy and charity, but also on human naivety and pathological, political altruism?

Science and mathematics – out of reach

> *... - then the research of our time is not only science, but sorcery, a ceremony of the highest heart and brain power, for which God opens one fold after another of his cloak, a religion whose dogmatics are permeated and borne up by the rigors of mathematics, brave, mobile, knife-cold and razor-sharp thinking.* (Musil, 1978a: 35). [My translation]

In his main work *The Man Without Qualities*, the author Robert Musil (Musil, 1978a; Musil, 1978b) makes visible an alternative view regarding school and the teaching of mathematics, and bases much of this on the philosopher Friedrich Nietzsche's thoughts on mathematics and science. Musil's main character in *The Man Without Qualities*, Ulrich, is a man who feels free from all conventions. Adopted or generally recognized guidelines or norms in society do not apply to him. To some extent, this was also the case with Nietzsche, but then in the real world. "He lacked the pious respect for everything that modernity had believed in - science, intellect, truth and development" [my translation] (Berg Eriksen, 1992: 9), and "marked an incision in the history of Western thought because he posed a number of fundamental questions to the metaphysical and the religious tradition that it was unable to answer" [my translation] (Berg Eriksen, 1992: 9). Ulrich (The man without qualities) tries to find meaning in several places. Neither life as an officer nor an engineer convinces him, but:

> *Then mathematics becomes his companion. The mathematician thinks differently from the ordinary person, mathematics' break with "common sense" makes it possible to distance oneself from the flattened normality. But the price for a career here would be an impoverishment of life. (...) In a larger context, Musil here adopts a dismissive attitude towards a basic feature of the culture of his time: the belief that one undertakes an ideological systematization of the real, the belief in reality as a well-built pyramid where everything has its fixed place.* [my translation]
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> (Elsbeth Wessel: page V in the preface to Musil, 1978a).

Berg Eriksen (1992: 208) [my translation] nuances the perspective on mathematics in this:

> *Technology and mysticism are dimensions that no longer need to be opposites. Musil (and Ulrich) dream of a reconciliation between nature and culture, where the precise calculations of mathematics will map and unleash the infinite possibilities of the soul. Mathematics is precisely a game of abstract possibilities. Mathematics assembles and separates immutable elements into an infinite number of configurations. Mathematics does not allow itself to be confused by reality. All its truths are hypothetical – like those of art and life. Mathematics plays with infinitely interchangeable properties.*

This is a conclusion that Nietzsche also emphasizes and highlights. For Nietzsche, knowledge will always be the result of interpretative processes that make the world appear to us in different ways (Lillejord, 2003). Humans therefore do not have access to objective knowledge, the individual's knowledge is the result of the individual's interpretation of what is observed. Science is a work of interpretation, and not representative of reality, Nietzsche claimed – an opinion he to some extent shared with the science theorist Thomas Kuhn (Kuhn, 1996). Nietzsche believed that only fiction is offered through sciences since the logic of science is mathematical and mathematics has nothing to do with reality. For Nietzsche, this meant, according to May (1993), that science should be respected, but be exposed to a continuous evaluation from each and every one of us in society, based on the individual's personal wisdom and wit. And Nietzsche did not give up on this. He further claimed that "science does indeed boast that it has thrown all old beliefs overboard and only deals with reality. Science will not accept anything that cannot be counted, calculated, weighed, seen or grasped. That in this way one degrades “life into a calculation exercise and a puzzle for mathematicians” is indifferent to modern learning” [my translation] (Nietzsche, 1903: in Steiner, 1992: 51-52). This view of science Musil also puts in the mouth of his *man without qualities*. Kimball (1996: 14) describes Musil's presentation of science's position as follows:

> *Scientific rationality in this sense is not merely disillusioning; it is radically dehumanizing. It replaces the living texture of experience with a skeleton of "causes", "drives", "impulses," and the like. The enormous power over nature that science has brought man, Musil suggests, is only part of its attraction. Psychologically just as important is the power it gives one to dispense with the human claims of experience. How liberating to know that kindness is just another form of egotism! That beauty is merely a matter of fatty tissues being arranged properly! That every inflection of our emotional life is nothing but the entirely predictable result of glandular activity! Just another, merely, nothing but... How liberating, how dismissive are these instruments of dispensation – but how untrue, finally, to our experience.*

Therefore, science and mathematics cannot be based exclusively on the observable. Here there is something more that has an impact, and that means that science cannot be given the unassailable position that it tries to usurp. In the light of this; How do Musil and Nietzsche really see mathematics?

A different expectation for mathematics

> *Ulrich stubbornly explained: What you need in life is the sole conviction that your business is doing better than your neighbor's. In other words: your pictures, my math, someone's child and wife; all that gives a man the certainty that he is indeed in no way extraordinary, but still, in the way in which he is in no way extraordinary, does not so easily find his equal!* (Musil, 1978a: 190) [my translation]

In a speech to ICM (*The International Congress of Mathematicians*), reference is made by Hoffmann (1998) to an opinion and expectation Musil has for the subject of mathematics, laid out in one of his essays: "Mathematics (as a science) is the bravery of pure reason, one of the few we have today … It can be said that we live entirely on the results … This whole being that runs … and stands around us not only depends on mathematics for its comprehensibility, but has effectively been created by her, rests in its ... existence upon her". This acceptance of, and emphasis on, the subject of mathematics as difficult to criticize is also shown by Musil in *The Man Without Qualities*, at the same time that he depicts a comprehensive attack on the subject of mathematics from forces that do not understand and like the subject of mathematics (as for

instance Hustad (2002) also does in his attack on the political left in Norway and the treatment mathematics received in Norwegian educational policy in the post-war period and onwards towards the turn of the millennium), and embroiders a defense of mathematics that could just as well have been put forward today:

> *You don't really need to say anything special about it, it is now immediately clear to most people that mathematics is fast as a demon in all the practical applications of our lives. Perhaps not all these people believe in the story of the devil to whom one can sell one's soul; but everyone who understands a little about the soul, because those who, like clergymen, historians and artists, get a good income from it, can testify that it is destroyed by mathematics, and that mathematics is the origin of an evil mind, which certainly makes man master of the earth, but also to the machine's slave. The inner desiccation, the monstrous mixture of sharpness in the detail and indifference in the whole, man's immense abandonment in a desert of particulars, his restlessness, malice, unprecedented insensitivity, seasickness, coldness and violent mentality, which characterizes our time, shall, according to these accounts, unite and alone they are due to the loss a logical sharp thinking adds to the soul! And so there already existed when Ulrich became a mathematician, people who predicted the collapse of European culture, because there was no longer faith, love, simplicity and goodness in people, and significantly enough they had all been weak in mathematics in their youth and school years. This was later for them a proof that mathematics, which is the mother of the exact natural sciences and the grandmother of technology, is also the progenitor of the spirit from which poison gases and fighter planes ultimately arose.*
> *The only ones who lived in ignorance of these dangers were really the mathematicians themselves and their disciples, the naturalists, who in their souls took as little notice of this as the bicycle rider who treads hard on the road and has no eye for anything but the rear wheel of the man in front. About Ulrich, on the other hand, one thing could be said with certainty: he loved mathematics because of the people who couldn't stand it. He was not so much scientifically as humanly in love with science. If instead of scientific beliefs one put outlook on life, instead of hypothesis experiment and instead of truth deed, then there would not be a single significant naturalist's or mathematician's life's work which did not far surpass in courage and subversive power the greatest achievements in history. The man has not yet been born who could say to his believers: "Steal, kill, commit fornication - our teaching is so strong that it turns the manure waters of your sins into clear, foaming mountain streams"; but in science it happens every couple of years that something that until then had been considered wrong suddenly overturns all views, or that a disreputable and despised thought becomes the ruler of a new realm of thought, and such events are not upheavals, but lead as a sky ladder upwards. In science, things are as strong and carefree and wonderful as in a fairy tale.* (Musil, 1978a: 35-36) [my translation]

The power and conviction of mathematics therefore lies in understanding. One can be impressed by the results of mathematics and its influence through scientific development, but without understanding it becomes like blind faith, and thus threatening to followers of other faiths. The danger, then, in striving to adapt mathematics to those who do not understand mathematics, is that it is no longer learning mathematics on the premises of mathematics, but based on human traits such as charity, a sense of community and inclusion. Such considerations do not lead to development. The understanding that some people do not master mathematics is nevertheless not loving or democratic, it is, on the contrary, selfish (Kimball, 1996), as those who show this understanding are themselves among those who do not understand! The attempt to change the mathematics comes instead of the attempt to change oneself.

Another broadside towards the will to understanding of the lack of acquisition of knowledge, this time more generally, Musil brings forward towards the end of *The Man Without Qualities*:

> *..., yes he did not even shy away from concessions to Nietzsche's "man of power", as for that time bourgeois spirit was still a stumbling block, but for Lindner [character in the novel] also a whetstone. Of Nietzsche he used to say that no one could call him a bad person, but that his views were certainly exaggerated and alien to life, and that was because he rejected pity; for thus he had not recognized the wonderful gift of the weak: that this makes the strong gentle!* (Musil, 1978b: 348) [my translation]

Nietzsche referred to mathematics as the closest representative of an iconic worldview, free of conventions, free of social influence, free of reason, and exemplified this in connection with the argument for science as incomplete: "The invention of glasses, binoculars and magnifying glasses showed that the natural ability to see was unclear and deficient. With the new instruments, one could see a whole world that was otherwise hidden from the senses, so that the mathematical calculations could transcend all common sense" [my translation] (Berg Eriksen, 1992: 285). Incidentally, it is not only Nietzsche who asks mathematics to be free of all conventions. The renowned mathematician G. H. Hardy (1941: 49) also does so in his book *A Mathematician's Apology*: "I have never done anything "useful". No discovery of mine has made, or is likely to make, directly or indirectly, for good or ill, the least difference to the amenity of the world." A mathematics free of control and expectation gives room for imagination and development, which may well result in nothing of value outside the mathematical sphere, but which may also result in the development of mathematical results for application, first in science and then in social life. Throughout history, it has been shown several times that mathematical results that for a long time have been safely placed in the first of these two categories, such as for instance Lie groups, Galois theory and number-theoretic results from G. H. Hardy, have found application in fields that the mathematicians who have been given the credit for the development of the results had not foreseen. We cannot know once and for all, either the limitation of a mathematical theory's validity or its application.

A new utopia

> *He hated those who, in Nietzsche's words, are unable to "suffer hunger in the soul for the sake of truth"; those who turn back, the timid and weak, who comfort their souls with nonsense about the soul, and feed it with religious, philosophical, and made-up sentiments, which are like loaves soaked in milk, because the mind supposedly gives it stones for bread. His opinion was that humanity and everything human in this century was on an expedition, that pride demanded that one cut off all useless questions with a "Not yet", and led a life built on interim principles, but in the consciousness of a goal ones' successors, would reach. The truth is that science has developed a concept of the hard, sober, spiritual force, which makes the old metaphysical and moral conceptions of the human race simply unbearable, even though in their place it can only put the hope that in the distant future there will come a day when a race of spiritual conquerors descends into the valleys of spiritual fertility.* (Musil, 1978a: 41) [my translation]

The mathematician Hardy (1941: 43) also states that "...real mathematics, [which] must be justified as arts if it can be justified at all." Another who has spoken about the self-justification of mathematics is the Russian mathematician Igor Shafarevich, here reproduced in Fosgerau (1992: 33):

> *Shafarevi[t]ch interprets the more than two thousand-year history of mathematics as proof that mathematics itself cannot formulate the ultimate goals that can guide its progress. This goal must be found outside of mathematics, and since this for Shafarevi[t]ch is an expression of a supernatural spiritual activity, he expresses "a hope that... mathematics can now serve as a model for the solution of the main problem of our era: that to reveal a supreme religious goal and to embrace the meaning of the spiritual activity of mankind.* [my translation]

Furthermore, Berg Eriksen (1992: 282, 307 [my translation]) describes how Nietzsche viewed the relationship between art and science: "The relationship between the arts and sciences is more than a competitive relationship or a kinship. In historical times, they have more than once switched roles, taken over each other's functions in the human experience - and will hopefully do so again." (...) "In our time, the sciences have been completely integrated into the production

apparatus." "The artist is not a restricted scientist, but the scientist is a practicing artist". Considering mathematics as art, and thus as embracing both abstract art, realism and applied art, is an alternative that can certainly find its acceptance. In any case, it becomes easier to hide behind another myth about mathematics – that it takes talent to be good at mathematics (Ernest, 1998). On one level, this is probably still true, in the same way that some take it to a higher level in both music, painting, sculpture design and drawing, or in philosophy, sports or oenology for that matter. But this is neither sufficient nor conclusive as an argument. Nietzsche arrests those who would claim that mathematics and mathematicians alone, in the form of standing outside all conventions, should decide how the world should look at and use mathematics and science:

> *The representatives of the dominant and totalitarian science dogmatics that devalue existence as an accounting exercise for mathematics, he meets with the objection: ...for them only an interpretation of the world applies where science in their opinion... can count, calculate and measure - and does not allow anything else. It means systematic idiocy..., and can only lead to the stupidest and most senseless of all possible world interpretations. (...) The old Enlightenment project has not taken the loss of transcendental absolutism seriously, according to Nietzsche. God is dead, and that means that there is no longer any basis for a meaning-creating faith of the optimistic type of the Enlightenment. The triumph of atheism opens up a gaping void. (...) There has arisen an explosive crisis of opinion and legitimation that "science" cannot solve for us. It cannot give us norms of action.* [my translation]
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> (Berg Eriksen, 1993: 586-587)

It becomes a challenge to find an argument for prioritizing mathematics, whether it is in relation to all citizens of society or for a few.

In the Norwegian school system, you do everything you can to attract everyone. "Everyone must join", is a slogan the Norwegian Labor Party has used for many years. This has meant facilitating other forms of work in the mathematics subject, requirements to see practical benefits, requirements and expectations for how the subject is taught, and last but not least significantly lower academic requirements for the pupils. Put into practice it actually requires that pupils work less with theoretical mathematics, and that more pupils learn more mathematics through this. The pupils are therefore supposed to learn more by working less. This is an interesting expectation. In any case, this means a flattening of the acquisition of knowledge, with fewer pupils and students who learn extensive and advanced mathematics - and can contribute to moving the field forward. This kind of pathological altruism brings with it self-confidence and superficiality, but not a single innovative mathematical thought. The pupils in the Norwegian school system are therefore served mathematical, tasteless canned food, based on the assumption that everyone should get something, and no one should starve. With such a utilitarian view of the intrinsic value of mathematics, we are on the way to a flattening that means losing the diversity of expertise, and the opportunity for new knowledge within mathematics. This means that the ground-breaking artistic ideas get little or no opportunity to grow.

It is legitimate to ask what could be the alternative to such a development. Society needs both expertise, for progress and development, and a basic level of mathematical competence among citizens, for society to function. And in this situation, great emphasis is placed on facilitating this broad basic level, with measures and demands for change to accommodate objections regarding the learning of mathematics. On the other hand, society does not demand everyone

to be good at drawing or painting, run long distances, or possess other artistic skills. It is sufficient to be able to paint a fence, ride the electric bike to the grocery store and download music on the cell phone. You also do not have to profess any faith. The Norwegian society is a secularized society. You have to choose to believe yourself, no one believes for you. In such a situation, where many citizens do not see and do not believe in the need for mathematical competence, and believe in society instead of God, despite the political perception that mathematical competence is important for all citizens, more and more arrangements are made so citizens do not need to learn mathematics. Based on the points of view and position regarding school and the teaching of mathematics that come to light in Musil's *The Man Without Qualities* and in Nietzsche's authorship, there are alternatives to this development. And this is where the need for a new utopia emerges, as Kahane (1998: 87) describes it:

> *I was just expounding a little piece of utopia that may lead to immediate new orientations and realizations. I believe that we need changes in society as well as in education and in scientific practice, and we need utopian views in order to find the right directions. In some circumstances utopian views may lead to actual changes. In any case, whatever its name – democracy, human liberation, quest for truth – utopia deserves attention because it challenges the prevalent realism of our time and may prepare for another realism for the future.*

A first (utopian) alternative is that some should do mathematics, while others should not. And then it will be the case that those who do it must do it properly. But not everyone should do mathematics. Those who then work with mathematics must represent us in society, by meeting society's demands for mathematical competence and mathematical perspective. They must be given conditions for this, much like artists are given it. If the mathematician is an artist, he or she must be given the conditions to practice the art, both at the level of theory and at the level of application. The catch with this alternative is much like with the church's historical position going forward against the art of printing and church language in the form of a language everyone in the congregations understood. For many hundreds of years, the men of the church safeguarded the congregation's perceptions and expectations in a language that was not understandable to others (Latin). This can be the case with mathematics too, with such a development. And with such a development, the transition from theory to application will become narrower and more difficult. Because how can one make use of a theoretical result in practical application, if one does not see and understand a possible connection with practice? Yes, this part of the mathematics subject is also left to the few in that case. Then we get an all-encompassing, mathematics based teaching, and little else. That means moving away from the unitary school. It produces an elite, almost modeled on the boarding school principle, although not in ways that literature has exemplified for us, with Guillou's (1993) horror version on the one hand, and Monthy Python's surreal version in the film "The Meaning of Life" on the other. Rather, we are talking here about a school more like J.K. Rowling's *Hogwarts High School for Witchcraft and Wizardry* in her Harry Potter books, where students are recruited according to ability and interest, completely free of all conventions, and learn both theory and application related to their "expertise". For us, such a school would be about a school of thought and application, with mathematics as the centering point. The utopian idea, seen from Musil's and Nietzsche's point of view, is on the other hand rather to imagine that all teaching in all compulsory schools is based on mathematics! It can be context-based, or context-free. As long as mathematics is outside reality, it needs not concern itself with the sensible. This will be a school with parts free of questions about the usefulness or applications of mathematics, and parts concentrated on the application of mathematics within other subjects. This means a fascination and joy for the few, and an ordeal for the others. At the same time, the school as an

educational institution will experience a revolutionary renaissance. The position of mathematics will be strengthened in school and in society, and be given both the artistic and practical reputation it is today striving to achieve, without replacing any belief system as the only right thing to believe in.

When such a utopia is presented, free of all conventions, both humanistic and more mathematics education-related limitations and objections arise. On the one hand, there is no doubt that quality is linked to expectations. Man will stretch to fulfill expectations that are placed on him. But not always. Furthermore, there will be pupils and students who will have problems accepting the prioritization of a mathematical point of view in one and all. Who, by the way, would not have such problems, as long as one feels a certain relationship with society's conventions? The growth conditions for feelings of hopelessness (Celine, 1996), redundancy (Turgenjev, 1996), paradoxicality (Heller, 1994), indoctrination (Huxley, 2000) and desperation (McCarthy, 2010) will therefore be present. It will be a high price to pay, both for the person concerned, those who are directly affected, and for society. Is it worth it, and is society willing to pay for it?

Albert Camus (1995: 293) states in an argumentation with Nietzsche the need the artist has for coexistence with society: "Art, too, is this impulse which glorifies and denies at the same time. "No artist tolerates reality," says Nietzsche. It is true; but there is also no artist who can do without reality." For what is the artist without a reality, and not least a society to mirror his work in relation to, and an audience to communicate with? The same applies to mathematics and the mathematician; applied mathematics communicates unashamedly with society, but also mathematics which basically has no application is in a dependent relationship with society and the public that makes it up. The mathematician can indeed work concentratedly and in his own eyes undisturbed with a mathematical, theoretical challenge (Doxiadis, 2001) or devote his whole life to "useless pursuits" (Hardy, 1941), but the work will not be free of impact on society. In this sense, the artist/mathematician cannot ask to be freed from conventions or social responsibility. Musil nevertheless sees the liberated nature of mathematics as a parallel to the possibilities of art and the expectations placed on art: "Musil is no postmodern hedonist. He defends the abstract in modern art precisely because the abstract work - like mathematics - is a reflection on possibilities and does not give in to the temptation to imitate the present" [my translation] (Berg Eriksen, 1992: 213). More theoretical mathematics must therefore be introduced into schools, not primarily for the sake of society or the pupils, but for the sake of mathematics and art. In the next round, society and pupils will enjoy such prioritization. This also leaves room for mathematics education development, because as Berg Eriksen (1992: 209) puts it: "Like Nietzsche and Foucault [see for instance (Foucault, 2008)], Musil will show that evil and goodness, untruth and truth are not fixed in a timeless metaphysics, but is something that emerges in a social definition process" [my translation]. Therefore, mathematics teaching cannot be definitive either, but must always be defined in relation to the society for which it is being taught. Thus, the didactic approach must also relate to conventions and expectations, although one of course must, based on mathematics education (read: artistic) needs, be given the opportunity to choose how to safeguard this balance. Anything else would be utopian.

Closure

It is not certain that we need more utopian thoughts about mathematics in school. Perhaps we have had, and have, more than enough of them already, through for instance physically active learning, removal of the blackboard from the classroom, project work, outdoor schooling and

more practical mathematics at the expense of theoretical mathematics. In any case, these proposals mean that mathematics and the teaching of mathematics are constantly evolving, even if realism overtakes the proposers and testers of the proposals time and time again. We see that mathematics is now on its way to finding acceptance linked to the other school subjects, both through the requirements for practical application and the incorporation of the basic skill *to calculate* in all subjects. Kahane's (1998) utopian thought is about to find its realization. For Musil's and Nietzsche's utopian proposals, on the other hand, it looks somewhat less bright, at least for now. The political desperation has not reached that far yet. And that applies both to the idea of mathematics as the dominant school subject, and to seeing the mathematician as an artist. Because, as the philosopher Immanuel Kant (1995: 190) says:

> *Despite the fact that mechanical and fine art are very different, in that the one only requires diligence and acquisition, and the other genius, there is nevertheless no fine art without a mechanical element which can be grasped and followed with the help of rules - so that something* school-like *belongs to the essential conditions of art. (...) The genius can only provide* rich material *for the products of fine art; the processing and the form require a trained talent who uses the material in such a way that it can be accepted by the power of judgment.* [my translation]

Agreeing with Kant on this could be a start.

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