MATHEMATICS EDUCATION IS UNDETERMINE

Ole **Skovsmose**

Abstract: Mathematics education could be disempowering by submitting students to a "regime of truths". Through sequences of exercises mathematics education could prepared for a prescription readiness. Mathematics education may also be empowering by bringing about a critical citizenship. However, "empowerment" and "disempowerment" are contested concepts: the meanings of both can go in different directions. Therefore, it might be possible to claim that mathematics education is disempowering, and also that it is empowering. Both statements, contradictory as they appear, seem possible to support with a wealth of observations.

This brings us to acknowledge that mathematics education as undetermined, and that it can be acted out with many different social and political implications. This observation is important for developing a critical mathematics education.

Key words: prescription readiness, critical citizenship, empowerment, disempowerment, mathematics education as undetermined, critical mathematics education

1. Introduction

In order to understand what "mathematics education is undetermined" could mean, let me start by saying a few words about "mathematics", "mathematics education" and "undetermined".

I consider "mathematics" an open concept, which, depending on the discourse we use, might get many different possible meanings. In *Philosophical Investigations*, Ludwig Wittgenstein presents the notion of language game, and "mathematics" might well be operating in a variety of such games. While mathematics as a research field includes a vast domain of unsolved issues and conceptions in development, mathematics as a school subject refers to a well-defined body of knowledge parcelled out in bits and pieces to be taught and learned according to pre-formed criteria. Mathematics could, however, also refer to domains of knowledge and understanding that are not institutionalised through research or curriculum structures. Thus, we can locate mathematics in many work practices. It is part of technology and design. It is part of procedures for decision making. It is present in tables, diagrams, graphs. We can experience a lot of mathematics just leafing through the daily newspaper. According to the language-game metaphor they need not be different expressions of the same underlying "genuine mathematics"; instead very different concepts of mathematics could be in use. We might only have to do with the same word. As a consequence, perhaps we had better give up the assumption that it is possible to provide a defining clarification of mathematics. Well-intended definitions, as for instance suggested by logicism or by formalism, might just be shrouding the possibility that there are no unifying characteristics of mathematics. I shall try to keep these observations in mind when I talk about mathematics.

'Mathematics education' also refers to a variety of activities. We could think of both teaching and learning and the very many different contexts in which they occur. Mathematics education is taking place in schools, where the teaching is mainly taken care of by the teacher, and the learning by the students. But mathematics education could also refer to activities outside of school. Mathematics could be taught and learnt at work places and in many daily activities; it could be taught and learnt even when the whole setting has little to do with mathematics, say, when someone is doing a bit of shopping, checking accounts, discussing news, etc. I will keep all such examples of mathematics education in mind.

And "undetermined"? What could that mean? A social process could be undetermined in the sense that it could result in very different things. The situation is open, and so is its outcome. The use of "undetermined" could remind us of a common use of "critical" in medicine. One could find the situation of a patient to be critical. This means that his or her situation is not stable. It could turn "both ways" – and it certainly makes a dramatic difference which way it turns. In general, I consider something to be undetermined if it could develop very differently, depending on factors which might not be possible to comprehend; or if the development is simply out of control and proceeds randomly.

This gives the following reading of the headline of this chapter "mathematics education is being undetermined": mathematics education – understood in a broad sense – can be acted out in very many different ways, depending on the social, economic, political and cultural contexts. Mathematics education does not have any intrinsic qualities, but comprise instead a wide range of possible functions and dys-functions.

2. Mathematics education is disempowering

In literature we find many examples of a horrible mathematics education, often personalised by a mathematics teacher who dominates the students and, with a devastatingly cold sarcasm, castigates those who do not grasp the elegance of a mathematical proof.

Mathematics education may operate with socio-political naivety and blindness. The film *Life is Beautiful*, directed by Roberto Benign, includes a scene which provides a grotesque illustration of this. The first, more humorous part of the film takes place in a provincial Italian city before the Second World War, where the fascination with Nazi Germany was part of the fascistic outlook. In a short scene, we listen to an Italian educator who has visited Germany and was impressed by what she saw. Thus 7 year old German children are able solve a problem like the following:

> A lunatic costs the state 4 Marks per day. A cripple 4.5 Marks per day. An epileptic, 3.5 Marks per day. The average is 4 Marks per day, and the number of patients is 300,000. How much would we save if these individuals were eliminated?

The Italian educator could not believe that seven year olds had to solve a problem like this: These are difficult calculations! The children would need at least some notion of algebra. A man listening to the educator's explanation emphasises that it is just a multiplication: "300,000 times 4. Killing them all we will save 1.200.000 Marks a day. It is easy, right?" The educator agrees, but her point is that in Germany, 7 year old children can do it, while such a problem is far beyond the capacity of Italian children that age.

Exercises play a crucial role within the *school mathematics tradition*. Thus, during their time in school, most children will be solving more that 10.000 exercises. Apparently, not much mathematical creativity is cultivated through such procedures. Could it be that some deep socio-economic irrationality is maintained as part of mathematics education? Could it be that this part of the educational system the world over sustains a dysfunction? Or could it be that we have to do, not with any dysfunction, but with a kind of functionality which is appreciated in today's labour market, but which we as mathematics educators are not really prepared to acknowledge? Let us take a more careful look at a possible exercise:

> A shop is offering apples for 0.12 Euro apiece, and for 2.8 Euros for bags containing 3 kilos. There are 11 apples to each kilo. Calculate how much Peter will save if he buys 15 kilos of apples in bags of 3 kilos instead of buying them individually.

As most other exercises from the school mathematics tradition, this exercise has just been invented at a desk. There is no need of doing any empirical investigation in order to formulate exercises within this tradition. Furthermore, we can observe the following concerning the exercise:

The information given can be considered to be exact. Thus, when doing the calculation, one can be sure there are 11 apples, and exactly 11 apples, to each kilo, just as we can be sure that the price is exactly 0.12 Euro for one apple. That we are dealing with two different kinds of truths is of no significance, and need not be addressed in any way as part of formulating the solution.

Any information provided in the text of an exercise can be considered exact.

Furthermore, the provided information given in the exercise is both sufficient and necessary for solving the problem. Based on the given information, it is possible to calculate the one and only correct answer. It is not necessary for the students to try to get more information. Certainly there is no need for them to, say, leave the classroom in order to search for supplementary information about prices. This could remind us of the principal step in industrialisation: controlling the workers. A simple device was to bring the workers together in factories, and here to provide them with all the necessary tools. All possible reasons for the workers to leave the factory should be eliminated. A similar logic of control also makes part of the school mathematics tradition. All necessary information is provided and the students can solve the exercise while remaining seated at their desks. An exercise establishes a micro-world, where all measures are exact, and where the information given is necessary and sufficient in order to calculate the one and only correct answer.

Exercises have to be solved correctly. The correctness of the answer depends on many things. A student may have made a wrong calculation. It could also be that he or she has chosen a wrong algorithm. A student might have copied the exercise wrongly from the textbook and, for instance, written 0.22 instead of 0.12. Such a mistake will result in a wrong answer. One can also have solved the wrong exercise: "Oh, Lucas, this exercise is not for today. Right now you have to do the exercises on page 34."

Michel Foucault has talked about a "regime of truths". According to him every society endorses some categories, which come to designate what counts as true. The establishment of 'regimes of truth' is a historical process, as all categorical frameworks are part of an epoch. All discourses are culture- and context-bound, and thus come to determine what to count as true: "Each society has its regime of truth, its 'general politics' of truth – that is, the types of discourse it accepts and makes function as truth; the mechanisms and instances that enable one to distinguish true and false statements; the means by which each is sanctioned; the techniques and procedures accorded value in the acquisition of truth; the status of those who are charged with saying what counts as true." (Foucault, 2000: 131) The school mathematics tradition also exercises its regime of truths.

From the perspective of understanding mathematics many procedures, so characteristic for the school mathematics tradition, appear irrational. When students have been directed through the 10.000 exercises, they might have learnt something which, however, need not have much to do with mathematical understanding. Their learning might crystallise into a *prescription readiness*.[1] Just take a look at the formulations of exercises: "Reduce the expression…!" Solve the equitation …! " "Find *x*, when …!" "Calculate how much Peter will save …!" The exercises seem to take the form of a long sequence of orders. Could it be that the school mathematics tradition cultivates a prescription readiness, which prepares the students for participating in work processes where a careful following of prescriptions is essential? Could it be that such a prescription-readiness is serviceable for very many job functions in our society and that the school mathematics tradition serves society perfectly well in exercising this readiness? Could it be that a prescription-readiness, including submission to a regime of truths, cultivates a socio-political naivety and blindness that is appreciated in today's labour market?

3. Mathematics education is empowering

"Empowerment" can be interpreted in different ways with reference to mathematics. Let me just mention three. First, we can consider a classic notion of intellectual empowerment.

---

[1] For a discussion of "prescription readiness", see Skovsmose (2008a). See also Christensen, Stentoft and Valero, P. (2007). For a discussion of the related notion of "bureaucratic absolutism" see Alrø and Skovsmose (2002). A revised version of the first four chapters of this book is published as Alrø and Skovsmose (2006).

Second, we can talk about empowerment in pragmatic (and individual) terms. Third, we can think of empowerment in socio-political terms. I am sure that there are many other interpretations of empowerment with reference to mathematics, but for the moment I restrict myself to consider these three.

The classic idea of intellectual empowerment through mathematics education draws from a long tradition in philosophy and epistemology. It has been pointed out that while many sorts of assumed knowledge and ways of thinking have deceived the human mind, mathematics has not. Instead mathematics represents a unique example of knowledge. Since ancient Greek philosophy, the notions of knowledge and certainty have been related. Thus, by arguing that uncertainty can never be eliminated, the sophists claimed that no knowledge was possible. It was possible to doubt anything whatsoever. Plato, however, claimed that certainty was within human reach and, as a consequence, it was possible to obtain knowledge. In fact the most splendid example of how to obtain certainty was mathematics. According to Plato, intellectual capacity enabled human beings to discover properties of the world of ideas. Later, through the scientific revolution, the powers of mathematics reached a new format. It became recognised that the laws of nature had a mathematical format. Thus, through mathematics, and only through mathematics, it became possible to grasp basic features of God’s creation. Both lines of argumentation – concerning certainty and insight into nature – established mathematics as a sublime form of intellectual empowerment.

The pragmatic (and individual) interpretation of empowerment developed along a different line of argumentation. It emphasises the power that mathematics brings to bear through its applications. By suggesting an close connection between knowledge and power, Francis Bacon opened this line of argument. But it is only as part of the industrial revolution that the applications of mathematics demonstrated their tremendous technological power. There are many examples of this power to highlight: both spectacular applications in engineering and design and applications that makes part of economy and money processing. Furthermore, it is pointed out that mathematics education can empower people by providing them with qualifications that are important for participating in a variety of practices. In particular, mathematics education could ensure many people a good position in the labour market, which means (personal) empowerment.

A socio-political interpretation of empowerment brings the discussion in a different direction. Here I can refer to very may different formulations of mathematics education for social justice.[2] The claim is that through mathematics education it is possible to develop an insight that has a broad social and political significance. This has been expressed through different conceptual frameworks drawing from more general formulations of critical education. Thus Paulo Freire has talked about an education that brings about a *concienziação*; Theodor Adorno has talked about an education for *Mündigkeit*; many have talked about 'emancipation' as an educational notion; others have talked about an education that could bring about critical citizenship.[3] It should also be noted that many of these formulations belong to a first phase of critical education. There is a real need for new considerations.

In order to illustrate an attempt to provide a socio-political interpretation of empowerment with reference to mathematics education, let me refer to the project "Energy".[4] The students that participated in the project were 14-15 years old. The overall "empowering" idea was that the project was to bring about an insight that made the students able to understand and address some socio-economic issues of general relevance, but which at the same time could be explored more specifically through mathematics. The notion of exemplarity concerns the idea that by investigating a particular issue one may obtain an insight of general nature. This also applies to the project 'Energy'.

The project addresses input-output models for energy. The students were invited to have breakfast at the school. Here they

---

[2] See, for instance, Jablonka, Gates (2006), Gutstein (2006), and Sririman (Ed.) (2008).

[3] See, for instance Freire (1972), and Adorno (1971).

[4] For a more detailed description for the project, see Skovsmose (1994).

carefully measured everything they drank and ate, and then they calculated how high an energy input the breakfast represented. The calculations were based on all the information available about the energy content, measured in kJ, that any kind of food contains. The energy output was obtained through the activity of biking. It was calculated how much energy each student used on a particular trip on bike. The calculation was based on simplified formulas from sports research. The formulas expressed the use of energy as a function of different parameters like speed, length of the trip, type of bike, and the "frontal area" of the cyclist. It was possible to measure the length of the trip, which was the same for all students, and the speed, which was individual. The 'front area' of each of the cyclists was a parameter more difficult to handle. However, a method was found and the students could complete their calculations of the consummation of energy. Bringing the two calculations together they could get a first experience of what input-output calculations with respect to energy could mean.

After this introduction, the project turned to a major issue, namely input-output figures for farming, in particular with respect to food production. The calculations were carried out with reference to a particular farm, not far from the school. The first step in the input calculation was to estimate how much energy, in terms of petrol, was used in order to cultivate a particular field in the space of a year. The field had to be gone over several times with different tools: the plough, the harvest, the sprayer etc. The students took notes of all the procedures and measured the breadth of the different tools. They measured the size of the particular field to which all the calculations were related, and they calculated how many kilometres a year the farmer had to drive the tractor in preparation of the field. The students were notified of the tractor's use of petrol per kilometre , and on this basis one part of the energy-input was estimated. The field was used for the growth of barley, and the energy content in the seeds used for sowing was also estimated.

The next step was to estimate the energy output from the field. At this time, students found out how much barley could be produced on the particular field, and they looked up statistics on how much energy was contained in the produced amount of barley. From these calculations the first input-output factor was estimated. According to the students' calculations, the harvested barley contained about 6 times the energy that had gone into the field. There seems to be a good "energy growth" in such a field. As energy does not come from nothing, there must be some important supplier, and sure enough, the sunlight activates the processes of growth. The students' calculation could be compared to the official statistics in Denmark revealing that the actual factor is only about 3. Thus there are many more parameters to consider, for instance all the transports that are necessary in order to complete the field work. At any rate , the students got a fairly good idea about one example of input-output calculations with respect to farming.

The next step in the input-output calculations was to investigate what happens in meat production. Barley can be used for feeding pigs, as was the case on the farm in question. The feeding process could be observed almost directly, as an automatic feeding machinery was geared in such a way that barley was transferred from the pile in the barn in proper measures and at the proper times to each of the pigs' feeding troughs. The transfer was made in accordance with an algorithm that considered the number of pigs and their size. This transfer also represented a transformation of food from barley to meat, and one could then look at this transformation in terms on input-output figures. The students calculated the energy that was contained in the barley that the pigs were eating and compared it to the energy contained in the meat from the pigs when slaughtered. The students collected the information about how much barley a pig will eat, depending on their weight, and what their weight is when sent to the bacon factory. The ratio between the weight of a pig and the amount of meat in represents when slaughtered was also clarified, together with the energy content of meat. On this basis the students estimated a new input-output figure, namely 0.2. From an energy point of view, meat production has a really bad deal. The statistics provided by agricultural research show that also in this case the students' results were similar to the official results with respect to Danish farming.

During the project the students became familiar with input-output calculations with respect to energy. The whole project was related to a particular farm, but the issue that was addressed was of a general format. In this sense, the project was "exemplary": Through a study of a particular case the students got an insight into a problem of a general format.[5] Naturally the students' calculations were based on some extreme simplifications; nevertheless the project illustrated some of the principal ideas in input-output calculations with respect to farming. In particular, the role of mathematics was important in order not only to conduct the calculations, but also to formulate the whole idea of input-output estimations.

The project "Energy" provided a basis for addressing many principal discussions with respect to farming, the uses of energy, and the supply of food on a global scale. One can compare input-output figures with respect to different types of production and for different countries. By looking through statistics, the students found that farming in the USA demonstrated the most problematic figures, as the highest amount of energy supply, not least in terms of petrol, was used in this type of farming. Through the project "Energy" the students were able to address several issues of global relevance. In this sense one could think of the project as illustrating how mathematics education could empower students and contribute to the development of a critical citizenship.[6]

4. Mathematics education is undetermined

---

[5] For a discussion for "exemplarity" as an educational concept, see Skovsmose (1994).

[6] For a discussion of other examples of project work in mathematics, see for instance, Alrø and Skovsmose (2002), and Nielsen, Patronis, and Skovsmose (1999).

We might have run into some confusion. Some observations could bring us to see mathematics education as disempowering, others as empowering. Mathematics education being undetermined has to do with the open character of both empowerment and disempowerment.

Very different perspectives can be applied with respect to empowerment and disempowerment. It is, for instance, possible to extract from a conservative economic discourse categories of competencies, and claim that a main element in empowering people through mathematics education is to ensure that they obtain competencies to meet the demands of the labour market. And these demands can be thought of both from the perspective of the individual (an empowered person will get an adequate salary) and from the perspective of the company (employing empowered persons will lead to an adequate profit). According to this perspective, empowered persons can be compared to well-functioning batteries; and a mathematics education has to ensure that the batteries become charged in a proper way. In fact, according to such a perspective, "prescription readiness" can be seen as relevant competency. However, the discourse of empowerment and disempowerment has also taken a completely different route. Thus, the discourse about mathematics education for social justice has outlined how, through mathematics education, students can develop a new self-esteem that makes it possible for them to "talk back to authority" as might be illustrated by the project "Energy".[7]

Empowerment and disempowerment are contested concepts: the meanings of both can go in different directions. Therefore, it might not be surprising that it is possible to claim that mathematics education is disempowering, and then follow that up with the claim that it is empowering. Both statements, contradictory as they might appear, seem possible to support

[7] See also Skovsmose, Alrø and Valero in collaboration with Silvério and Scandiuzzi (2008); Skovsmose, Scandiuzzi, Valero and Alrø (2008); Alrø, Skovsmose and Valero (2009), for a discussion of the notion of students' foreground; and Penteado and Skovsmose (2009) for a discussion of the introduction ICT with reference to students' experiences of meaning.

with a wealth of observations. This brings us to see *mathematics education as undetermined*.[8]

This means that one cannot attach any essentialism to the functioning of mathematics education. This means that the whole picture of possible disempowering functions of mathematics education could turn out true, buy it *need not* be true. Nor do the possible empowering functions of mathematics education necessarily become a fact. There are no essentials in mathematics education. This, however, does not imply that mathematics education operates in a neutral way. In one context it could appear a disaster, while in another it could provide wonders.

It should also be noted that the two-dimensional formulation, that mathematics education could be either empowering or disempowering, is highly problematic. Mathematics education could have very many different functions, which cannot simply be labelled "good" or "bad". A mathematics education could be empowering in different senses of empowerment. It could be empowering for some, and disempowering for others. It could be empowering for some as they could obtain competencies that are valued at the labour market. It could also be considered disempowering precisely because people may come to assume a prescription-readiness. So when I describe mathematics education as undetermined, I refer to a great uncertainty with respect to the possible functions mathematics education might have in a particular socio-political situation. This uncertainty reflects the openness of the situation as well as the openness of the conceptual framework through which we try to grasp the situation. The undetermined nature of mathematics education is important to acknowledge. If mathematics education was a closed process without social significance, there would not be much for a critical mathematics education to be concerned about. But there is.

---

[8] This observation makes part of the outlook of critical mathematics education. See, for instances, Skovsmose (2005, 2006, 2007, 2008b, in print). See also the following books in Portuguese, Skovsmose (2001, 2007b, 2008c).

References

Adorno, T. W. (1971). *Erziehung zur Mündigkeit*. Frankfurt am Main: Suhrkamp.

Alrø, H and Skovsmose, O. (2002). *Dialogue and Learning in Mathematics Education: Intention, Reflection, Critique*. Dordrecht: Kluwer.

Alrø, H. and Skovsmose, O. (2006). *Diálogo e Aprendizagem em Educação Matemática*. Belo Horizonte (Brazil): Autêntica. (Translated into Portuguese by Orlando de Andrade Figueiredo.)

Alrø, H., Skovsmose, O. and Valero, P. (2009). Inter-viewing Foregrounds: Students' Motives for Learning in a Multicultural Setting. In M. César, and K. Kumpulainen (Eds.), *Social Interactions in Multicultural Settings* (13-37). Rotterdam: Sense Publishers.

Christensen, O. R., Stentoft, D. and Valero, P. (2007). Power Distribution in the Network of Mathematics Education Practices. In E. de Freitas and K. Nolan (Eds.), *Opening the Research Text: Critical Insights and In(ter)ventions into Mathematics Education* (131-146). New York: Springer.

Foucault, M. (2000). *Power*. Edited by James D. Faubion; translated by Robert Hurley and others. New York: The New Press.

Freire, P. (1972). *Pedagogy of the Oppressed*. Harmondsworth: Penguin Books.

Gates, P. (2006). The Place of Equity and Social Justice in the History of PME. In A. Gutérrez and P. Boero (Eds.), *Handbook of Research on the Psychology of Mathematics Education: Past, Present and Future* (367-402). Rotterdam: Sense Publishes.

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

Jablonka, E. (2003). Mathematical Literacy. In A. J. Bishop, M.A. Clements, C. Keitel, J. Kilpatrick and F. K. S. Leung (Eds.), *Second International Handbook of Mathematics Education* (75-102). Dordrecht: Kluwer.

Nielsen, L., Patronis, T. and Skovsmose, O. (1999). *Connecting Corners: A Greek-Danish Project in Mathematics Education*. Århus (Denmark): Systime.

Penteado, M. G. and Skovsmose, O. (2009). How to Drag With a Bad Mouse? Searching for Answers Through Collaboration. *Journal for Mathematics Teacher Education* (on-line publication).

Skovsmose, O. (1994). *Towards a Philosophy of Critical Mathematical Education*. Dordrecht: Kluwer.

Skovsmose, O. (2001): *Educação Matemática Crítica: A Questão da Democracia*, Papirus, Campinas. (Translated into Portuguese by Abigail Lins and Jussara de Loiola Araújo.)

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

Skovsmose, O. (2006). Research, Practice, Uncertainty and Responsibility. *Journal of Mathematical Behaviour, 25*(4), 267-284.

Skovsmose, O. (2007a). Mathematical Literacy and Globalisation. In B. Atweh et al. (Eds.), *Internationalisation and Globalisation in Mathematics and Science Education* (3-18). New York: Springer.

Skovsmose, O. (2007b). *Educação Crítica: Incerteza, Matemática, Responsabilidade*. São Paulo: Cortez Editora. (Translated into Portuguese by Maria Aparecida Viggiani Bicudo.)

Skovsmose, O. (2008a). Mathematics Education in a Knowledge Market. In E. de Freitas and K. Nolan (Eds.), *Opening the Research Text: Critical Insights and In(ter)ventions into Mathematics Education* (159-174). New York: Springer.

Skovsmose, O. (2008b). Critical Mathematics Education for the Future. In M, Niss (Ed.), *ICME-10 Proceedings and Regular Lectures* (on CD). Roskilde: IMFUFA, Department of Science, Systems and Models, Roskilde University, Denmark.

Skovsmose, O. (2008c). *Desafios da Reflexão: Em Educação Matemática Crítica*. Campinas: Papirus. (Translated into Portuguese by Orlando de Andrade Figueiredo and Jonei Cerqueira Barbosa.)

Skovsmose, O. (in print). *In Doubt – about Language, Mathematics, Knowledge and Life-World*. Rotterdam: Sense Publishers.

Skovsmose, O., Alrø, H. and Valero, P. in collaboration with Silvério, A. P. and Scandiuzzi, P. P. (2008). "Before you divide you have to add": Inter-viewing Indian students' foregrounds. In B. Sriraman (Ed.), *International Perspectives on Social Justice in Mathematics Education* (209-230). The Montana Mathematics Enthusiast, Monograph 1. Charlotte, NC: Information Age Publishing, Inc.

Skovsmose, O., Scandiuzzi, P. P., Valero, P. and Alrø, H. (2008). Learning Mathematics in a Borderland Position: Students' Foregrounds and Intentionality in a Brazilian Favela. *Journal of Urban Mathematics Education*, *1*(1), 35-59.

Sriraman, B. (Ed.) (2008). *International Perspectives on Social Justice in Mathematics Education*. The Montana Mathematics Enthusiast, Monograph 1. Charlotte, NC: Information Age Publishing, Inc.

Wittgenstein, L. (1958). *Philosophical Investigations*. Translated by G. E. M. Anscombe, Second Edition. Oxford: Blackwell. (First published 1953).

Department of Education, Learning and Philosophy
Aalborg University
Fibigerstræde 10
DK-9220 Aalborg East, Denmark
osk@learning.aau.dk

Short CV:

Ole Skovsmose has a special interest in critical mathematics education. He has investigated the notions of landscape of investigation, mathematics in action, students' foreground, and ghettoising. He is professor at Department of Education, Learning and Philosophy, Aalborg University, Denmark. He has published several books including *Towards a Philosophy of Critical Mathematics Education*, *Dialogue and Learning in Mathematics Education* (together with Helle Alrø) and *Travelling Through Education*.