

Why teach math to the “excluded”?

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In my research project “Looking for the Concept of Bildung in math education of adults - Adults, Mathematics, the Concept of Bildung and Qualification” I am specifically interested in the reasons for providing math education to adults with a lack of basic mathematical skills. I have chosen to focus on the kind of explicit reasons Danish society give for providing mathematical education to adults. It is only in rare cases that reasons for providing mathematics education are explicitly formulated, but I have been fortunate. Denmark has just had a reform of the adult and further education system. A new element of this reform is to strengthen basic skills such as reading, writing and mathematics, and the reform comprises an additional education level, "Forberedende Voksenundervisning" named FVU or in English "Preparatory Adult Education". According to the Act FVU will be offered to all persons over 18 who wish to improve their general skills to become better equipped for the labour market and as citizens in a democratic society. I want in this paper to focus on which explicit reasons the Danish politicians are giving to justify FVU and which arguments the politicians give for providing FVU-mathematics to adults. To the question “Why teach math to the “excluded”?”. I feel that the politicians in their argumentation leave me without good reasons for providing mathematics education to adults who lack basic skills. I conclude that the question remains: how is it possible to reach the target group for FVU-mathematics if we are not able to answer their question “Why should I join the FVU-mathematics course?”

Introduction: The justification problem

The justification problem in mathematics education concerns the following questions. Why teach mathematics? What is the philosophy of mathematics education in terms of the purposes, goals, justifications, and reasons for teaching mathematics? How can current plans and practices be justified? What might be rationale for reformed, future or possible approaches for mathematics teaching? What should be the reason for teaching mathematics, if it is taught at all? (Ernest, 1998)

It is easy to ask these questions but it is not so easy to answer them. As Mogens Niss (1996) stated, explicit reasons for mathematics education are seldom formulated in society, more often the real reasons remain implicit. Only in rare cases we get direct access to explicit reasons for providing mathematical education for a specific group of students.

There are different reasons and interests in discussing “why teach math to a specific group of students”. Looking at society as a whole there are at least two different perspectives. One is concerned with the *enrolment problem* (Jensen et al, 1998, Jørgensen, 1998; Schögelman, 1998) when students seem to opt out of education, which involves mathematics at a certain level. Another perspective is concerned with the general level of mathematical skills in specific parts of the

population and the need for improving the level of basic mathematical skills (Cockcroft, 1982; OECD, 1995; OECD, 2000; Jensen, 2000).

Jens Højgaard Jensen, Mogens Niss and Tine Wedege introduce what they call a *justification matrix* (Jensen et al, 1998:10)

Agent level Extent	Objective ('system') reasons	Subjective ('individual') reasons
Global reasons	The <i>objective</i> reasons for the very <i>existence</i> of studies involving mathematics. (1)	The <i>subjective</i> reasons for engaging in studies involving mathematics <i>at all</i> . (2)
Local reasons	The <i>objective</i> reasons for the specific <i>design, organisation, and implementation</i> of specific programmes. (3)	The <i>subjective</i> reasons for engaging in <i>particular</i> aspects and activities of a programme in particular ways. (4)

They distinguish between the *objective* reasons given by the system or society for providing mathematical education and subjective reasons. They also distinguish between reasons at a *global* level and at a *local* level. At the *global* level the *objective* reasons can answer the question "What should be the reason for teaching mathematics, if it is taught at all?" and the answer is linked to the historic and cultural situation. At the *local* level it is possible to find *objective* reasons for providing mathematics education to a specific group of students and for the content and curriculum for specific educations involving mathematical teaching. On the other hand there are the *subjective* reasons for joining a math class. And again they distinguish between the *global subjective* reasons, which can answer the question "why do I have to learn mathematics at all", and the *local subjective* reasons "why should I join this specific math class?"

In the literature it is possible to identify two different categories of issues in the discussion of the relevance of studying the justification and goals of mathematics education (Niss, 1996). A *descriptive/analytic* category which gives answer to the question "For what reason does society provide mathematics education to so and so categories of pupils or students?" and a *normative* category which give answer to the question "What reasons do we want to put forward for providing mathematics education to so and so categories of pupils and students?"

In my research project “Looking for the Concept of Bildung¹ in math education of adults - Adults, Mathematics, the Concept of Bildung and Qualification” I am specifically interested in the *objective* reasons - *global* as well as *local* - for providing math education to adults with lack of basic mathematical skills. I have chosen to focus on the *descriptive/analytical* category by looking at the kinds of explicit reasons Danish society gives for providing mathematical education to adults.

As mentioned in the beginning, it is only in rare cases that reasons for providing mathematics education are explicitly formulated, but I have been fortunate. Denmark has just had a reform of the adult and further education system. A new element of this reform is to strengthen basic skills such as reading, writing and mathematics, and the reform comprises an additional education level, "Forberedende Voksenundervisning" named FVU or in English "Preparatory Adult Education". FVU is split into two separated educations FVU-literacy for which a New National Adult Literacy Curriculum has been designed and FVU-mathematic for which a New National Adult Numeracy Curriculum has also been designed. According to the Act FVU will be offered to all persons over 18 who wish to improve their general skills to become better equipped for the labour market and as citizens in a democratic society.

There has been a political debate in the Education Committee before the government carried the Acts of the reform of the adult and further education system and the Act of FVU out. The bill was read three times in the Education Committee and the discussion is public so far as everybody can read the political debate on the Governments Internet page.

I want in this paper to focus on which explicit reasons the Danish politicians are giving to justify FVU and which arguments the politicians give for providing FVU-mathematics to adults. I have used the Internet pages of the Danish government to reach the debate.

¹ The Danish term *dannelse* comes from the German term *Bildung* but the term has roots in the Greek term *Paideia*. historically the concept has been developed through two different aspects. On the one hand *Bildung* can be associated with ‘form’ or ‘shape’; on the other hand it can be associated with ‘picture’ or, more specifically, with ‘ideal’. The first line of association tells about the process where humans develop and change personality through life. This process can be individual and active or social and more passive; for example parents form their children or schooling forms the pupils. The other line of association refers to what ought to be the result of this forming or shaping; through history there have been different kinds of ideals for humankind. For example, in times for Christianity the goal of e human development was to be like Jesus Christ; or in times of enlightenment the goal of human development was to be like the ancient Greeks. Through history there have been different kinds of theories for the concept of *Bildung*. In 1974 the Danish Professor Carl Aage Larsen wrote: "A theory for the concept of *Bildung* has as foundation an understanding of humanity (?) and Society and includes an ideal of *Bildung* and the means/ways to reach this *Bildung*." (Larsen 1974)

Why teach math to adults according to the Danish politicians?

The bill was read three times in the Education Committee before the Acts of the reform of the adult and further education system and the Act of FVU were carried out in the government. In the discussion about FVU the delegates from the parties who voted for the bill used the following arguments:

- 1 They argued referring to the “Information Society”
- 2 They argued referring to the demands of the labour market and link this with keeping up the Welfare Society.
- 3 They argued referring to the democracy

They use the Danish results (Jensen, 2000) from “(S)IALS” (Second International Adult Literacy Survey (OECD, 2000) as a main argument for introducing FVU in the adult education programme

Introducing the bills

Mr. Carsten Hansen from the Social Democratic Party introduced the bill for the Education Committee. Mr. Hansen opens the discussion by claiming that it is a problem both for democracy and for individuals that a huge part of the adult population lacks the kind of basic skills there are necessary to participate in our democracy. He founds this claim referring to the recently published Danish results from SIALS². By doing so, he implicitly claims that an adult has to be in possession of basic skills to be able to participate in a democratic society.

Secondly Mr. Hansen claims that these adults need to get further educated³. He is talking about one million adults attached to the labour market, who according to him are unable to act in the Information Society again referring to the results from SIALS.

Mr. Hansen claims that the early school leavers are among those with the greatest lack of basic skills⁴. Again he refers to the results from SIALS where

² *A number of surveys recently published by the Danish Institute of local Government Studies indicate that a huge number of adults are lacking basic skills necessary to participate in a democratic society, in spite of nine years of compulsory school attendance. It is a problem for the individual of course but also indeed a problem for the democracy.* (Hansen, 2000 - [http://www.folketinget.dk/Samling/19991/salen/L250_BEH1_79_2_\(NB\).htm](http://www.folketinget.dk/Samling/19991/salen/L250_BEH1_79_2_(NB).htm) - My translation)

³ *“The survey showed that one million Danes connected to the labour market need to improve their knowledge in order to act in a modern information society with its demands for abilities to understand and use printed information.”* (Hansen, 2000 - [http://www.folketinget.dk/Samling/19991/salen/L250_BEH1_79_2_\(NB\).htm](http://www.folketinget.dk/Samling/19991/salen/L250_BEH1_79_2_(NB).htm) - My translation)

⁴ *“Among the persons with great problems when it comes to reading and mathematics we count the early school leavers. It comes to no surprise that the survey showed that education is the essential single factor causing the lack of basic skills in mathematics and reading.”* (Hansen, 2000 - [http://www.folketinget.dk/Samling/19991/salen/L250_BEH1_79_2_\(NB\).htm](http://www.folketinget.dk/Samling/19991/salen/L250_BEH1_79_2_(NB).htm) - My translation)

one of the conclusions was that lack of basic skills is closely related to lack of education. By claiming this, he implicitly claims that education will automatically solve the problems and that the target group for FVU includes the early school leavers.

He continued the discussion claiming that further education of the adult population attached to the Labour market is important to maintain and eventually develop our Welfare society⁵. He refers to the fact that a huge part of the older population soon will retire from the labour market and that there are very few young people to join the Labour market.

Mr. Hansen states that the government by introducing FVU wants to provide an opportunity to those who lack basic reading, writing and mathematical skills⁶.

At the same time he claims that there will be a large piece of work to motivate the target group for FVU and that this group will be very difficult to reach⁷. Thus we cannot put nice brochures at the library, meaning but not saying, "The target group are unable to read a brochure" and "if they can't read they won't go to libraries". He also claims that several of the people in the target group have had unpleasant experience with the education system implicitly saying, those who lack basic skills have or often will have unpleasant experiences if they join the formal education system, and therefore are unmotivated for rejoining school.

Democracy

In the more general discussion of the bill including the reform of the adult and further education systems several of the politicians referred to the democracy. The politicians from the right wing worry about the adults' capability to participate in the public debate. They refer to SIALS and conclude that if an

⁵ "It is no secret that these years we have the smallest group of youth seen in many years, together with the fact that a large group of people born at the time of blackout retire from the labour market in the years to come. The consequence of this is that we, as politicians, face the future challenge of having to provide further education for the adult part of the population at the labour market in order to keep and develop the knowledge and competencies within the society, if we want to secure today's welfare at the least." (Hansen, 2000 - [http://www.folketinget.dk/Samling/19991/salen/L250_BEH1_79_2_\(NB\).htm](http://www.folketinget.dk/Samling/19991/salen/L250_BEH1_79_2_(NB).htm) - My translation)

⁶ In FVU we emphasize that people who struggle with disabilities in reading, writing and mathematics are offered some possibilities." (Hansen, 2000 - [http://www.folketinget.dk/Samling/19991/salen/L250_BEH1_79_2_\(NB\).htm](http://www.folketinget.dk/Samling/19991/salen/L250_BEH1_79_2_(NB).htm) - My translation)

⁷ However, when regarding the target group we cannot reach it by putting nice, printed papers at the libraries. There is a lot of work to be done by seeking out and motivating the entire target group by giving it the information. Many members of the group may have experienced several setbacks in the established education system." (Hansen, 2000 - [http://www.folketinget.dk/Samling/19991/salen/L250_BEH1_79_2_\(NB\).htm](http://www.folketinget.dk/Samling/19991/salen/L250_BEH1_79_2_(NB).htm) - My translation)

adult lacks basic reading, writing and mathematical skills they are not able to participate in democratic processes. The right wing politicians take an objective or a society view at the problem. The left wing politicians look at education as a possibility for an adult to get better equipped to cope with life in general, to “become wiser on life”.

Information- or knowledge society

It is right wing politicians and Mr. Carsten Hansen from the left wing that uses the demands from the information- or knowledge society as an argument for the reform. And they state that knowledge has become more and more important in the change from an industrial society to a knowledge society.

The Labour Market

In the general discussion according to the demands from the labour market the right wing politicians worry that factories have to close down if they are unable to get qualified employees or that Danish industry will be unable to cope with the competition from other countries. The left wing politicians worry about the employees becoming unemployed if they do not get any further education. Mrs. Susanne Clemensen from the Centre Democrats claims, “[...] *Many machines and technologies demands that an unskilled worker be able to read, write and do arithmetic*”⁸.

The right or the duty to participate in education

The politicians bring the question of right or duty into the discussion. And also here it is possible to distinguish between the right and left wing. In the discussion about the reform and about FVU it seems as all the politicians agree that this is an opportunity for adults to join the education programme. But a delegate from the Liberal party states: “*the individual must renew, the individual must develop her or his qualifications*”⁹ I read this as the Liberal party claiming that it is the duty of every adult to get further education. A delegate from one of the parties from the left wing Mr. Søren Kolstrup states that it should be a right for everyone to participate in further education and that every factory should make a scheme for education for every employee.¹⁰

The politicians and FVU-mathematics

As I have described the politicians’ used different general arguments to get the reform and FVU through but in the discussion no one questioned the relevancy

⁸ (Clemensen, 2000 - [http://www.folketinget.dk/Samling/19991/salen/L250_BEH1_79_2_\(NB\).htm](http://www.folketinget.dk/Samling/19991/salen/L250_BEH1_79_2_(NB).htm) - My translation)

⁹ (Bech, 2000 - [http://www.folketinget.dk/Samling/19991/salen/L250_BEH1_79_2_\(NB\).htm](http://www.folketinget.dk/Samling/19991/salen/L250_BEH1_79_2_(NB).htm) - My translation)

¹⁰ (Kolstrup, 2000 - [http://www.folketinget.dk/Samling/19991/salen/L250_BEH1_79_2_\(NB\).htm](http://www.folketinget.dk/Samling/19991/salen/L250_BEH1_79_2_(NB).htm) - My translation)

of FVU-mathematics. The politicians use SIALS to refer to the adults' lack of basic reading writing and arithmetic skills. But three times in the discussion a politician forgets the mathematical skills or the arithmetic skills and only refers to the lack of reading and writing skills or the literacy course without mentioning the mathematical course.

Discussion and implications

The title of this paper is “Why teach math to the “excluded”?”. The title includes three key words. The key words are “Why”, “mathematics” and “excluded” and in the following text I will focus on these three keywords.

Reasons for providing mathematics education to adults

I will start with the word “why teach math ...”. Going through history Mogens Niss has identified three different fundamental reasons for providing mathematics education to different groups of the population (Niss, 1996, p. 13)

1. Contributing to the technological and socio-economic development of society at large, either as such or in competition with other societies/countries;
2. Contributing to society's political, ideological and cultural maintenance and development, again either as such or in competition with other societies/countries
3. Providing individuals with prerequisites which help them to cope with life in the various spheres in which they live: education or occupation; private life; social life; life as a citizen

These three fundamental reasons all relate to the *Global objective* reasons in the *Justification matrix*. They can be used to justify providing mathematics education to children, and young people as well as to adults. In analysing the arguments given by the Education Committee I have identified three explicit reasons for providing FVU for adults with lack of basic skills. FVU is offered to adults with lack of basic skills to meet

- 4 The demands of the Information Society
- 5 The demands of the Labour market
- 6 The demands of the democratic society

These three reasons at first glance all relate to the first of fundamental reason for providing mathematical education – contributing to the development of the society. But if we look specifically at the different types of arguments it is seen that especially the left wing politicians also refer to the third of the fundamental reasons – providing individuals with the prerequisites to cope with life. Taking these two fundamental reasons in account the arguments of politicians are in agreement with the aim for Preparatory Adult Education (FVU) as it is described in the words of the Act of May 31, 2000 (my translation):

§1. The aim of Preparatory Adult Education is to give adults the possibility to improve and supplement their basic skills in reading, spelling and writing as well as in arithmetic and basic mathematical concepts in preparation for further

education and to strengthen the adults' prerequisites to actively participate in all parts of life in society. (Undervisningsministeriet, 2000)

The Danish politicians use only general *global objective* reasons for providing mathematics education to adults.

The "excluded"

The next question is "who are the target group or the target groups?" In the discussion about FVU in the Education Committee it seems all the politicians assume that FVU is an education only for the early school leavers – adults with no formal education qualifications. The politicians characterise the target group as a group of people who are unmotivated for further education. People, who did not succeed in school, people who have been defeated in school and people who are therefore not able to fulfil the demands of everyday life. People who have low abilities in reading, writing and mathematics. They are also described as people who are excluded of the democratic society because - according to the politicians – they are unable to understand and take part in public debate.

The politicians refer to SIALS as the only and main argument to justify their claims. I see two problems in the arguments of the politicians. First, according to SIALS (Jensen, 2000) it is 54% of the early school leavers (around 418.200 Danes) who lack basic mathematical skills, but it is also 26% of the skilled craftsmen (around 325.000 Danes) who lack the basic mathematical skills, and also 11% of the population with a University degree (around 86.500 Danes). If the target group is indeed excluded from the society, it is not only the early school leavers but also a large group of skilled workers and people with a higher education that are excluded. Second, the politicians characterise the target group as unmotivated for further education, but how come the huge group of skilled workers? I think that both the group of skilled workers and the people with a higher degree show that it is possible to take an education even that you lack some basic skills and in this specific case some mathematical basic skills.

According to SIALS (Jensen, 2000) 23% of the working part of the Danish population, meaning that around 540.000 Danes with lack of mathematical basic skills are employed in the Labour market. I would like to ask the question "Are all these people really excluded from society?"

Mathematics

The last question to be asked is "What kind of mathematics should be offered to the adults with lack of basic mathematical skills?" The Danish politicians give no direct answer to this question. It seems as if the politicians have a common understanding of what they mean when they use the term mathematics. Perhaps they think that mathematical basic skills are equal with the skills tested in SIALS. If we look at SIALS we will see that it is not the adult population's mathematical skills that have been tested only their quantitative literacy skills which means:

Quantitative literacy – the knowledge and skills required to apply arithmetic operations, either alone or sequentially, to numbers embedded in printed materials, such as balancing a chequebook, figuring out a tip, completing an order form or determining the amount of interest on a loan from an advertisement. (OECD, 1995, p. 14)

Could it be that the politicians think that if the adults are able to use the four arithmetic operations they are able to meet the demands of the Information Society, the demands of the Labour market and the demands of the democracy? If so, then I disagree with the politicians.

Is it possible to find the answer to the question “What kind of mathematics should be offered to the adults with lack of basic mathematical skills?” in the literature of mathematics teaching and learning. Looking through the literature, it is difficult to identify what should be the mathematical content if FVU-mathematics is to:

- Contribute to providing adults with the prerequisites for coping with life in an Information Society and in a democratic society.
- Contribute to provide adults with prerequisites with help them to cope with the demands from the labour market and help them to keep their jobs.

In the New National Adult Numeracy Curriculum the aim for FVU-mathematics is described as follows:

§5. The aim of the education is to develop the numeracy of the participants. It is expected that the participants clarify, improve and supplement their number sense and functional arithmetic skills for everyday practical use and personal organisation. The education is to ensure participants the possibility of developing their mathematical awareness and the ability to deal with, process, evaluate, and produce math-containing information and materials, as well as being able to communicate about these things. (Lindenskov & Wedege, 2001)

A new term or a new concept is introduced in the Danish adult education context it is the term numeracy in Danish “numeralitet”.

Depending on where the discussion is taking place, the socio-cultural surroundings, two different terms are used whenever “adults and mathematics” is the subject of the discussion (Fitzsimons et al, 1996, p.756). In the German-speaking and the Nordic countries the term “mathematics” is used in the scholarly and the public discussion (until now). In Anglo-American areas the subject is often termed “adult numeracy”. Using the term numeracy the curriculum planners open a much wider perspective on adults learning mathematics!

Numeracy consists of being able to make an appropriate response to a wide range of personal, institutional or societal needs. To participate fully in everyday living, adults need the ability to understand broader contexts in which numerical demands are located, to make use of appropriate communication skills, to be able to collect, present and interpret information presented in a variety of mathematical ways and to judge according to the nature of the activity and the desired outcome. (Benn, 2000, p. 80)

“Why teach math to the “excluded”?”

Back to the question “Why teach math to the “excluded”?”. We have now listened to the politicians. Returning to the *justification matrix* I would say that the arguments given by the Danish politicians are of a kind which could be placed somewhere between the *global* and *local objective* reasons. They do in fact argue for a specific education, namely FVU, and they relate their arguments to a specific target group, but it would be possible to use the same arguments in a discussion “Why teach mathematics at all”. As seen the arguments given by the politicians also match two of the three fundamental reasons for providing mathematics education that Mogens Niss has identified through his historical analysis. It will be very difficult to argue against these kinds of reasons, and they would logically speaking be just fine if they were brought into a discussion justifying mathematics education for a group of pupils/students who had no choice to opt out of mathematics. But in this specific case, where the target group is adults who have the opportunity to choose or to opt out of mathematical education there is a need for other reasons. The problem is, how is it possible to reach the target group or the target groups for FVU-mathematics if we are not able to answer their question “Why should I join the FVU-mathematics course?” Will these adults feel satisfied with the answer “You will be better equipped to cope with the demands of the information society, the demands of the Labour Market and the demands of the democracy it will help you to cope with life”? I think the answer will be no! How can we cross the line between the *objective* and *subjective* reasons? Most adults do not feel a need to learn mathematics and neither do they see the use of mathematics in their work or in their daily life (Wedegé, 2000). It seems we have difficulties finding good reasons and arguments to convince the group of people with a lack of basic skills that this offer to join FVU-mathematics is a marvellous opportunity for them.

If we go through the literature there are several attempts to justify mathematics education to all kinds of pupils/students, children as well as adults. It is possible to categorise these reasons as *objective global* or *local* reasons. And it is also possible in the literature to find a lot of good suggestions of how to meet the adults in the class, what kind of content should be taught, how to teach adults mathematics. But in this part of the literature the adults have already joined the mathematics class. I feel that both the Danish politicians and the research in this area have been blind to the fact that there is a great need for good *subjective* reasons to be used to motivate the adults with lack of basic skills to join a math class. And I fear that if we are not able to find these good reasons for why to join FVU-mathematics, joining FVU-mathematics will end up being, not an opportunity for the adults, but a duty.

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