

The Norwegian national programme for adult numeracy: A presentation of the national standards, teacher's guide and test material

Våril Bendiksen

*Vox, National Institute for
Adult Learning
Varil.Bendiksen@vox.no*

Svein Kvalø

*Vox, National Institute for
Adult Learning
Svein.Kvalo@vox.no*

Eystein Raude

*Vox, National Institute for
Adult Learning
Eystein.Raude@vox.no*

Vox has been responsible for developing a framework for adult numeracy in Norway. In February 2006, the Ministry of Education and Research assigned Vox the responsibility for developing national standards for basic skills for adults: numeracy, literacy and basic ICT skills. These standards were officially approved by the Ministry of Education and Research in October 2007. We are currently developing guidelines for teachers, screening and diagnostic tests and a system of further education for teachers. In this article we will describe the Norwegian Framework for Adult Numeracy and all the work connected with it.

Background

The task for Vox was to establish a framework, recognizable as a part of the curricula for Basic Skills established in Norwegian Primary and Secondary School, but adapted to the needs of adults. The framework was to include a system of competence targets and guidelines for teachers and be complemented by diagnostic tests and self-tests, and a system of further education for teachers.

Through participation in ALMAB, Adult Life Mathematics across Borders, a project financed by the Grundtvig action of the Socrates program, we were introduced in early 2002 to the numeracy system which is part of the Danish Preparatory Adult Education (Groenestijn 2003). This was very inspiring for us and we thought that a similar system could be used for Norwegian learners.

From teachers in adult education centres we have frequently heard that some of the learners do not benefit from ordinary maths lessons at lower secondary school level. According to the Middletown study approximately 15 % of the pupils who leave lower secondary school perform like an average fourth grader (Engström and Magne 2003), p 127. When these learners later on realize they need to increase their level in basic skills, many of them will need to start at a more basic level than what has normally been offered at adult education centres. The results from the ALL-survey (Adult Literacy and Life Skills Survey) were maybe the most important factor that made Norwegian politicians see the need for a national framework for basic skills for adults. According to the ALL-survey as many as 10 % of the Norwegian adults score at what ALL defines as level 1 in numeracy skills. Around 30 % are defined as level 2. The proportion of adults scoring at the desired 3, 4 and 5 levels is quite low (60 %)(Gabrielsen, Haslund

et al. 2005), p. 21 – 22. Even though one can argue that the OECD exaggerates when defining what is the desirable numeracy level needed in order to manage tasks in today's labour market and everyday life, the results from the ALL survey indicate that there is a need for a framework for numeracy training for adults.

Target group

Who is the national framework for adult numeracy meant for?

Adults who wish/need to raise their basic skills in everyday life mathematics constitute the immediate target group. As mentioned earlier in this article, there are many adults who didn't profit from the maths teaching they received in their school days. Some may lack motivation for a variety of reasons and some may have maths difficulties. The latter will benefit from working with the competence targets corresponding to level 1 and maybe also at level 2 in the national framework for adult numeracy.

Adult learners who have bad memories from their school experience with mathematics will lack the motivation needed to start again. A different approach, provided by the new national framework, may help increase their confidence and motivation.

In addition, approximately 10 % of the population suffer from such severe maths difficulties that they don't benefit from the maths they learn in lower and upper secondary school (Ostad 2004). The national framework for adult numeracy can also be applied for this group of learners.

How to get learners to enrol in numeracy courses: a major challenge

Many of the weak performers in the Norwegian Adult Literacy and Life Skills Survey did not recognize their numeracy skills as insufficient (Lundetræ, Gabrielsen et al. 2006), p. 45 – 49. They seem to manage their everyday life quite well and they don't see the need to learn basic skills.

The second Vox Barometer 2007⁵ “Befolkningens holdninger til opplæring og egen kompetanse” (*Attitudes to training and own competence in the population*) was a survey that intended to assess the adult workers' attitudes to further education and training. The workers were also asked to assess their own job-related competences. The survey showed that the respondents with the lowest education were the least likely to participate in any kind of training. Another interesting result from the same survey was what the respondents within this group regarded as the main obstacles to participating in further training and education: lack of financial support, lack of adequate training, and the management not providing sufficient opportunities for the employees. It is also within this educational group that most adults respond that their unwillingness to participate in further training is caused by a general lack of ease in learning situations and by having had negative school experiences. (Vox 2007) p. 66 – 67.

In our opinion the above-mentioned factors are circumstances worth paying attention to when approaching the learners who will attend numeracy courses for adults. And this is especially the case for learners who start a course at level 1.

⁵ The Vox Barometer is a nationwide biannual, quantitative survey monitoring the basic skills situation in the adult population in Norway

A system of three levels of competence targets

How did we work?

It was important for us to study different kinds of national numeracy frameworks before we started to develop our own. The Danish and the English numeracy frameworks have been our main sources of inspiration.

We invited partners such as trade unions and employer organizations and important institutions in mathematics education in Norway for a meeting in June 2006. Lena Lindenskov, who developed the numeracy part of the Preparatory Adult Education in Denmark together with Tine Wedege presented the experience the Danes have had with their numeracy education for adults. Some of the participants from this meeting formed an external working group, consisting of two teachers from adult education centres, the head of the Norwegian Center for Mathematics Education, a representative of the National Parents' Committee for Primary and Lower Secondary Education and one person who had worked on the numeracy part of the Norwegian ALL survey.

The competence targets

The competence targets are divided into three levels. Level 1 is defined as the capacity to understand simple mathematical information and applying simple computations. Level 2 is defined as being able to actively relate to mathematical information, processing information and to using numeracy/mathematics in new situations. Level 3 is defined as understanding and using complex mathematical information actively to draw one's own conclusions and communicate independently.

At each competence level the targets are grouped according to three main mathematical topics: numbers, measuring and statistics. (Including probability at level 3).

In connection with the competence targets we have listed some examples where numeracy can be applied. These examples are grouped according to the different arenas in which the adult person will make use of his skills: 1) In private and social life, 2) In working life and 3) In education and training.

An English translation of the competence targets will be available on www.vox.no in the near future.

Guidelines for teachers

The guidelines for teachers contains a general part, for all basic skills, including topics such as general andragogy, the use of different assessment tools and ways of approaching learners in different arenas.

What is numeracy?

The national framework has been based on the principles of the numeracy concept. We have, however, chosen to use the term everyday life mathematics instead of numeracy. We have elaborated on this concept in the guidelines for teachers. It has been important for us to emphasize that numeracy is a dynamic concept. Thus several different

definitions of it exist. In the ALL Survey *numeracy* is defined as follows (OECD 2005), p 6.: “*Numeracy is the knowledge and skills required to efficiently manage and respond to the mathematical demands of diverse situations*”. Numeracy is in other words a technical term for the mathematically related skills needed to cope in everyday life. It has been important for us to emphasize the difference between school mathematics measured in comparative surveys such as TIMSS (Trends in International Mathematics and Science Study) and numeracy.

Denmark is so far the only Nordic country offering systematic basic skills training in adult everyday life mathematics. The Danes have translated the concept “*numeracy*” into “*numeralitet*”, (Lindenskov and Wedege 2000). They have defined it as follows: “*Numeracy consists of functional mathematical skills and understanding that in principle all people need to have. Numeracy changes in time and space along with social change and technological development*”.

Teaching in different arenas.

Who are the guidelines for teachers intended for?

The national framework for basic skills will be adopted by adult education centres and workplaces supported through the Programme for Basic Competence in Working Life. The guidelines are developed for teachers who will teach basic skills according to the national frameworks. The teachers mainly work in ordinary adult education centres or within the Study Associations, although there are also some private providers.

The arena in which the learning occurs is an important factor to consider when choosing didactic models and materials. The guidelines for teachers will give examples on how to adapt the teaching to the context in which it takes place.

Learning at the work place: the Programme for Basic Competence in Working Life

Vox has the administrative responsibility for the Programme for Basic Competence in Working Life directed towards developing basic competence for employees and would-be employees. The idea is to fund and monitor basic learning projects in enterprises.

The programme concentrates on literacy, numeracy, and ICT skills. Any enterprise in Norway, private and public, can apply for funding from the programme. The programme started in 2006 and has been running for two years. For the second programme year, 20 mill NOK was allocated to 70 enterprises and 25 mill NOK will be given to enterprises for 2008. This funding presupposes that the learning activity is based on the national frameworks for basic skills.

A most heterogeneous target group

In the guidelines for the teachers we have tried to emphasize the importance of being aware of the numeracy competence adults already have. The experiences adults have are an important foundation to build upon in a learning situation. Many adults have little confidence when it comes to everyday mathematical skills. Some activities where mathematical operations are involved are of such a routine character that the adults do not see the mathematical content. One way of making the adult participants conscious about such activities is to identify situations where money is involved, weights and

quantities are being counted, measured and calculated, and where time and distances are estimated.

Cultural aspects are also important. Some adult immigrants may have just had a few years of schooling in their mother country. They may be able to handle money, but may have no experience with text book mathematics. Other adults with little schooling may have worked in situations where they used certain mathematical operations, for instance as shop assistants. They can weigh up and calculate how much the customers have to pay for their shopping, without necessarily having acquired skills and competence in other areas. In an actual training situation some of the participants may have partial competence and skills equivalent to some of the targets at level 2, while their skills and competence in the other areas may correspond to level 1. Studies in the field of ethnomathematics (D'Ambrosio 2001), show that there are many mathematics in the world, and that Western Mathematics is just one of many. So even if immigrants don't have training in school mathematics, e.g. Western Mathematics, that does not mean they don't have any numeracy competence, and it is therefore important to focus on cultural and social aspects when teaching numeracy (Bishop 1991) (Bishop 2002).

Norwegian adults don't put mathematics into practical use today compared to what they did a few years ago. The reason for this is the fact that maths has become a hidden world: We receive our salaries directly into our bank accounts, we pay our bills via the Internet, when we shop we pay with our credit cards. We do not even have to count the money we have to pay, or the money we receive in return if we pay with cash. The income tax return form is already filled in when we receive it. We can just check it and return it via the Internet. We can buy soft drinks, chocolate etc. from machines that pay back the change automatically. When we are shopping, we don't have to do the measurements we used to do. As a result of this technological development adults seem to lose their calculation skills. "If you don't use it you'll lose it". (Berg 2006) p. 78.

It is important for teachers who will teach according to the national framework for adult numeracy to be aware of all the above-mentioned factors. Thus it is essential to make individual training courses where some of the competence targets in certain topics may quickly be ticked off as good enough and others may be studied more closely.

During lessons it is important to take time for a conversation to find out what the participants' knowledge really is. Through conversations and by having enquiring attitudes teachers can gain insight into what the participant knows and how she or he is thinking. This is of considerable importance when one is to make a tailored course for an adult participant in numeracy training. "The teacher is no longer merely the-one-who-teaches, but the one who is himself taught in dialogue with the students, who in turn while being taught also teach." (Freire 1970)

Diagnostic test and self-tests

Vox has, in cooperation with Olav Lunde (Sørlandet kompetansesenter), Kjersti Lundtre (University of Stavanger) and Ingvill Stedøy Johansen (Norwegian Center for Mathematics Education, The Norwegian University of Science and Technology), been working on the development of a diagnostic test that is primarily meant as a means of placing the candidate on the right level, but which can also function as a means (for the

tutor) of uncovering common misconceptions in mathematics and give hints on steps to be taken to mend these misconception. The instrument can also be a pointer to the candidates' learning potential.

The mapping instrument consists of three parts:

- an interview
- testing of number comprehension and number treatment
- test of skills in everyday life mathematics

The interview is intended to be used to map the participant's earlier experience in mathematics, school background, working experience, and so on.

Number comprehension and number treatment will map the participant's understanding of numbers and how they deal with numbers. For this part there is an instruction book on how misconceptions can be interpreted and how one can work in order to straighten them out. (McIntosh, Setten et al. 2007)

The everyday life mathematics part will test the candidate's competence in solving every day life mathematical problems. The test is built on Olav Lunde's ideas on principles of *dynamic testing* (Lunde 1997). The intention is to learn something about the candidate's learning potential.

Not all course participants need to take the diagnostic test. Some learners have very low self-esteem when it comes to numeracy and mathematics. Thus they choose to start on a level 1 course. A mapping is recommended if the candidate wishes to start on level 2 or 3.

The results of the testing of number comprehension, number treatment and everyday mathematics can be used by the teacher who is going to teach the tested candidates. The information gained from the tests may be used when tailoring courses to each individual's needs.

In addition to using the information that the mapping instrument gives, we recommend the tutor to find out as much as possible about the participants' starting points for learning and how they think when doing mathematics. On the whole, conversation with the participants is highly recommended.

Experiences from piloting the screening tests

We have tried out the screening test in various adult education centres and in different workplaces. In the adult education centres we have basically tested immigrants and in the workplaces we have tested ethnic Norwegians.

Our main impressions so far have been:

Immigrants with poor Norwegian language skills experience the language as an obstacle and thus they use quite a long time to go through the test. The results from piloting the diagnostic test in the workplaces have been very good. The reason for this has, according to the management, been the difficulty to get hold of the employees with the poorest numeracy skills.

Self-tests

Vox plan to develop self-tests to be published on www.vox.no. They will be based on the national numeracy framework for adults. The intention is that adult learning centres and organizers of training programmes at the work place can encourage potential learners to take the self-tests in order to get some insight of their own numeracy capacity. Self-tests enables them to reflect on themselves as thinkers and learners.

Further education for teachers

Background

Vox has developed a framework, in cooperation with external experts, for a further education for teachers who are going to teach numeracy to adults. A similar education is also being developed for literacy and ICT skills. The teacher training centres at the University Colleges will be responsible for the provision of the education, which is meant for already qualified teachers.

Why a system of further education for teachers?

The teachers will need to gain awareness about numeracy and how numeracy teaching differs from traditional mathematics teaching. They also need to be able to plan and run numeracy lessons for adults that are based on the everyday life of the adults, and specially tailored for the workplace and the individual. The teaching should take into account the qualifications the adults already have in the form of their experience from school, private and working life.

Adults who decide to start an education in basic numeracy come with their experience from school maths lessons. Many of them will probably feel that they have trouble with mathematics in one way or another. This trouble can have a wide range of reasons, from having forgotten how to do mathematics to severe maths difficulties. Thus it is necessary for teachers at this level to be aware of maths difficulties of all kinds, in order to be able to reflect on what to do about it and to put their thoughts into action.

Should this education be compulsory for the teachers?

This education for teachers will probably be compulsory in the future. When the Preparatory Adult Education was introduced in Denmark in 2001 a further education was intended to be compulsory for teachers teaching numeracy and literacy. Today, most of the teachers who teach adult numeracy in Denmark have such a qualification, but the principals in the adult education centres are still entitled to give dispensations to teachers without such an education. At Vox, we are convinced that teaching adults at a basic level is so different from teaching children and youths that a special education should be required.

Organisation of the education

The education is organised in modules and corresponds to half a year of full-time studies which is equal to 30 ETCS. 10 ETCS constitute a course on general pedagogy and didactics for adults, and is common for all the three subjects – numeracy, literacy and digital competence. The remaining 20 ETCS are subject specific. In the case of numeracy this corresponds to the four modules described below. The reason for dividing the education into short modules is to make it more manageable for the students. They can take one module at a time and gradually build up their competence.

Provision

The education will probably be provided as a combination of Internet-based self-studies and a few classroom meetings. It is possible that different modules will be provided by different universities and university colleges, so that the students can combine the modules and to some extent construct their own education.

In the case of numeracy it is intended that most of the modules will be compulsory, but the last 5 ETCS are meant to be part of a pool of crossover modules from which one can choose freely. By crossover in this context we mean modules that combine topics from numeracy and literacy, or numeracy and ICT skills and so on. For the time being only one such module has been described – *the relation between maths difficulties and reading difficulties*.

Content of the education

The content of the education is divided into four modules as follows

1. theory on basic numeracy for adults (5 ECTS)
2. diagnostic testing, maths difficulties and assessment (5 ECTS)
3. organizing for learning (5 ECTS)
4. the connection between maths difficulties and reading difficulties (5 ECTS)

Theory on basic numeracy for adults

This module focuses on numeracy – the definitions of it and how it is different from traditional mathematics, on the didactics of numeracy and on the teaching of numeracy to ethnic minorities. We think it is of vital importance that the teachers are aware of the fact that they will teach learners having different backgrounds. They will teach in different workplaces with different working competences. The numeracy competence a worker has in a garage is different from the numeracy competence of an auxiliary nurse (Groenestijn 2002). They will also learn that individual adults may have very different numeracy backgrounds. The ethnomathematical approach is important because it focuses on building numeracy competence based on the learners own experience. The adults carry a lot of knowledge and experience which it is important to utilize in a learning situation (Bishop 1988). Teaching materials will be based on a booklet containing a selection of relevant articles.

Diagnostic testing, maths difficulties and assessment

This module deals with diagnostic testing and especially dynamic testing to use in the teaching both for assessment and as a tool that may help the teacher get an insight into the learning potential of the learner. Further, there will be an introduction to maths difficulties at a basic level so that the teacher will become familiar with the topic. The third main topic is various methods of assessment, where a special emphasis is put on formative assessment. Teaching materials will be based on a booklet containing a selection of relevant articles such as this article on maths difficulties (Lunde 2005).

Organizing for learning

By organizing for learning we mean how to apply meaningful models and methods for teaching which are adapted to the level of the courses, the arena for the courses (workplace, adult learning centre, etc.) and the qualifications of the learners. Emphasis is also put on how to develop own material based on the competence targets of the

national standards for numeracy and the mathematics from everyday life. The module also deals with teaching at the workplace, and how to make this successful.

The connection between maths difficulties and reading difficulties

Research has shown that there is a considerable correlation between maths difficulties and reading difficulties (Ostad 1998) (Reikerås 2007). In this module this is studied and emphasis is put on making the teachers able to recognize reading difficulties among the learners and on developing suitable teaching methods for them.

References:

- Berg, C., Kvalø, S. (2006). *Spesialpedagogikk*. [Oslo], Utdanningsforbundet.
- Bishop, A. J. (1988). "Mathematics Education in its Cultural Context." *Educational Studies in Mathematics* 4(2): 179 - 191.
- Bishop, A. J. (1991). *Mathematical enculturation : a cultural perspective on mathematics education*, Kluwer Academic.
- Bishop, A. J. (2002). Numeracy and lifelong teaching in a multicultural world: challenges and possibilities. *Plenary lecture at Numeracy and Mathematics: the Challenges for Lifelong Learning conference, Dec, 2002, Institute of Education, University of London, UK.*
- D'Ambrosio, U. (2001). *Ethnomathematics link between traditions and modernity*. Rotterdam, Sense Publishers.
- Engström, A. and O. Magne (2003). *Medelsta-matematik : hur väl behärskar grundskolans elever lärostoffet enligt Lgr 69, Lgr 80 och Lpo 94?* Örebro, Örebro universitet, Pedagogiska institutionen.
- Freire, P. (1970). *Pedagogy of the oppressed*. New York, Seabury Press.
- Gabrielsen, E., J. Haslund, et al. (2005). *Les- og mestringskompetanse i den norske voksbefolkningen : resultater fra "Adult literacy and life skills" (ALL)*. [Stavanger], Nasjonalt senter for leseopplæring og leseforskning, Universitetet i Stavanger.
- Groenestijn, M. v. (2002). *A Gateway to Numeracy*. Utrecht, Utrech CD β Press.
- Groenestijn, M. v. (2003). *Adults Learning Mathematics Across Borders: A Grundtvig project of Belgium, Denmark, the Netherlands and Norway*. 's-hertogenbosch, Cinop.
- Lindenskov, L. and T. Wedege (2000). *Numeralitet til hverdag og fest om numeralitet som hverdagskompetence og om internationale undersøgelser af voksnes numeralitet*. Roskilde, Center for Forskning i Matematiklæring.
- Lunde, O. (1997). *Kartlegging og undervisning ved lære vansker i matematikk : Bob-Kåres vei gjennom matematikkens verden*. [Klepp st.], Info vest forl.
- Lunde, O. (2005). *Fra vansker til mestring II: Om matematikkvansker: Årsaker, forekomst, kjennetegn og sammenheng med andre vansker*, Forum for matematikkvansker.
- Lundetræ, K., E. Gabrielsen, et al. (2006). *På lik linje? : om voksnes mestring av matematikk i dagliglivet*. Stavanger, Universitetet i Stavanger, Lesesenteret.
- McIntosh, A., A. K. v. Setten, et al. (2007). *Alle teller! : håndbok for lærere som underviser i matematikk i grunnskolen : kartleggingstester og veiledning om misoppfatninger og misforståelser på området : tall og tallforståelse*. [Trondheim], Matematikksenteret.
- OECD, S. C. a. (2005). "Learning a Living: First Results of the Adult Literacy and Life Skills Survey. Ottawa/Paris." 6.

- Ostad, S. A. (1998). "Comorbidity between mathematics and spelling difficulties." *Log Phon Vocol* **23**: 145 - 154.
- Ostad, S. A. (2004). *Matematikkl ring og matematikkvansker : en artikkelsamling*. [Oslo], Institutt for spesialpedagogikk, UiO.
- Reiker s, E. (2007). **Spesialpedagogikk.** . [Oslo], Utdanningsforbundet.
- Vox (2007). *Vox- Barometeret – Befolkningens holdning til oppl ring og egen kompetanse*. Oslo.