Basic Mathematical Skills and Empowerment: Challenges and Opportunities in Finnish Adult Education

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Abstract

This paper first looks at the contexts and situation of Finnish adult education in basic mathematical skills. Challenges for and observations of adults' learning of basic mathematics in Finland will be illustrated. Studying mathematics and numeracy are considered against its role in social and personal empowerment. Case studies of Finnish adults' experiences of and personal empowerment by learning mathematics are described by using interview data from two different learning contexts. The first case study deals with older women taking basic mathematics courses in a folk high school and the second one describes learning and teaching of basic mathematics in a prison. Finally, suggestions are offered for future perspectives and education research on adults' basic skills in mathematics in Finland.

Key words: Adult Education, Basic Skills, Empowerment, Mathematics, Numeracy

Introduction

Finnish education and schooling systems have encountered a lot of international interest during the last years. Finland has been acknowledged as a country of education, known for its efficient basic schools and also for high quality adult education. Special attention has been paid to the equality and the accessibility of high standard schooling for all citizens. Finnish school students' good results in the international comparative studies of PISA and TIMMS on mathematics have been recognized internationally and show that the Finnish pupils do rather well in mathematical basic skills (Kupari & Törnroos, 2004). Support for high standard

comprehensive school for all children in Finland and Scandinavian seems to have guaranteed Finnish school students' high achievement in mathematics. As well, the Finnish adult education has achieved high ratings in international comparisons including successful lifelong learning strategies, equality and people's high participation, which may be the highest in the world (Antikainen, 2008). In 2006 about 1,7 million people – that is, half of the 18-64 year old population – participated in adult education of all types: formal, nonformal, vocational, and education organized by employers (Pohjanpää, Niemi & Ruuskanen, 2008). The number of adults with college and university degrees was also among the highest of all OECD countries in 2005. Moreover, results from the IALS (Second International Adult Literacy Survey) study indicated a high level of literacy skills among Finnish adults (Linnakylä, 2000).

The current education in Finland can be connected to the national, social and economical development of the country. During the 20th century, Finland, as a state, moved from a dependent country to an independent, democratic civic society and welfare state. As recent as the 1960's, Finland was more an agrarian society, compared to the other western European countries. During the 1960's and 1970's Finnish society underwent one of the fastest structural transformations in Europe, moving from an agrarian, then an industrial society, and into a Nordic welfare state (Antikainen & Luukkanen, 2008). Education had an essential role in this development and a lot of effort has been put into the development of education and education systems in Finland. The most important changes were represented by the educational reform during the 1970's. This reformed the previous divided, and unequal, schooling system into a nation-wide integrated 9-year comprehensive education system. This new school system is called *basic school*. In addition to this large comprehensive school reform, the teacher training moved to universities and required a Master of Science or Arts degree for all students to be qualified as a school teacher at the elementary or secondary school level (Antikainen & Luukkanen, 2008). These two features of Finnish education system have guaranteed the high standard of education that shows in high achievement levels of, and low differences between, the current school students' as well as younger adults' basic skills.

In contrast to Finland's results in international comparative studies, some adults in this advanced welfare state and successful information society, lack basic skills, including mathematics skills. Several concerns have been identified regarding Finnish adult education. Specifically, the differences in participation by age, socio-economic status and previous education are greater in Finland than in other Nordic countries and slightly above average in OECD countries (Antikainen, 2008). The rising level of education in Finland during the last 25-30 years, accompanies rather large differences between younger and older people's education. The younger generation represents one of the best educated people in the world, whereas the older generation, including the "big age classes" (born in the 1940's and 1950's) who are still at work, are less educated than their age groups in other developed countries (Kiander, Pekkarinen, Vartia & Ylä-Anttila, 2005). The rapid aging of population together with the society's need for longer careers and also adults' willingness to work longer before their retirement strongly call for the development of basic adult education in Finland. Moreover, Finland is one of the countries where the number of immigrants is increasing. [1]They often lack basic skills both in literacy and numeracy. Even though efforts for improving this kind of adults' basic education has increased in the country, there is a clear lack of research and knowledge in the area. In this article, we will explore the present opportunities and challenges in studying basic skills in

[1] In 2007, there were 189 995 immigrated people with Finnish nationality, that is, only 2.5% of the whole population. In addition, 132 708 foreign citizens lived in Finland in 2008, with the largest groups represented by Russians, Estonians, English speaking people, and Somalis. (Finnish National Board of Education, 2009; Statistics Finland, 2009)

Finland, and how personal experiences of learning basic mathematics may empower Finnish adults.

Features of Finnish Adult Education

Such factors as the need for occupational proficiency, employment and economic growth, together with increased discourse of competition and efficiency during the 1990's, have strongly influenced Finnish adult education (Antikainen & Luukkanen 2008; Niemelä, 1999; Pellinen, 2001). In addition to the emphasis on the development of personality or personal empowerment, current principles of Finnish adult education include aspects of social empowerment expressed in principles such as the development of, and support given to, democratic society, increase in social cohesion, and creation of opportunities for citizens' welfare (Ministry of Education, 1999). The core of Finnish adult education, with it's liberal education ideology of personal fulfillment or empowerment, has been institutions such as Municipal Adult Education Centers, Study Centers of Non-Governmental Organizations and physical education, folk high schools and summer universities. Geographically, adult education is spread all over Finland and about 1 million adults, 71% of whom are women, participate yearly in the courses. Municipal Adult Education Centers are the most popular, with 58% of all students in this area. In 2007, Finnish adults took 1.6 million courses that were organized by the liberal adult education institutes (Kumpulainen, 2009).

Today all forms of education and training offered for young people, ranging from comprehensive school and vocational education to university studies, are also provided for adults (Finnish National Board of Education, n.d.). Adults have also various possibilities to improve their basic education. These include Adults' Classes of ordinary comprehensive schools, Adults' High Schools, vocational schools, and institutions of the traditional liberal education such as folk high schools and municipal adult education centers. They may take a degree or singular subjects of basic school, upper secondary school or vocational studies including languages and mathematics. Since 2005, both basic studies at the secondary level and upper secondary studies have had their own curriculum for adults (Ministry of Education, 2006) that determines the core objectives for teaching and also describes the content of subjects and evaluation. But, unlike the curriculum for regular students, adults' curriculum recommends taking into account local circumstances, local history, culture and students' living conditions. In addition, every student prepares his/her individual study programme (Finnish National Board of Education, 2004).

Basic studies are also provided for self-directed students by Distance High School and through the general learning material available on the internet. As an example, the National Board of Education offers open virtual courses on its' website. With respect to numeracy skills, the adult education provided by the formal education system is more popular among Finnish adults, than the studies offered by liberal adult education institutions. Traditionally, liberal adult education has concentrated on the cultural and social sciences by offering opportunities for personal fulfillment and improvement of civic facilities. The portion of natural sciences including mathematics, is still only 4 % of the offered subjects in liberal adult education institutions (Kumpulainen, 2009). Only one folk high school (http://www.paivola.fi) currently specializes in mathematics and offers studies, from basics to university level, for any adult in the spirit of the liberal adult education. However, the co-operation between various adult education institutions today offers Finnish adults more choices to improve their basic education and skills, than was previously offered.

During the last decade's, the degree-oriented adult education, labor market education and education at work have clearly increased, as compared to the traditional liberal adult education. Furthermore, the previous distinction between formal, or occupational adult education, and liberal adult education is today much less clear, as the same institutions may offer both occupational studies and liberal adult education courses (Nurmi, Kontiainen, & Tissari, 1996; Pellinen, 2001). For example, immigrants are often in need of both occupational and all-round education to integrate into Finnish society (Ministry of Education, 1999). The observed challenges of the Finnish adult education system and the expected lack of Finnish labour in the future, have made national socio-economical policy pay attention to adults' basic skills and education, especially to adults with the lowest participation in educational programs. This especially applies to aging people without the comprehensive school degree, to immigrated people, and to marginalized groups such as ethnic Romany adults and adults in prisons. Current efforts attempt to secure for these adults access to education and to offer them enough guidance and counseling in their efforts for learning. This supports the need for the increased acknowledgment of adults' learning difficulties and the increased opportunities for special education among Finnish adults.

Difficulties in Basic Mathematical Skills

The international comparative results of both TIMSS and PISA studies show rather equal mathematical knowing among school students (Kupari & Törnroos, 2004). The general deviation of the scores is one of the smallest among the included countries. Moreover, the differences between girls and boys, as well as between different schools, are rather small. However, larger differences in education and basic skills appear between the older and younger Finnish generation. Furthermore, a rather large number of younger adults do not participate in post-secondary education. More than 300 000 Finnish employees lack any kind of post-secondary education and every year nearly 20% of Finnish young adults (10 000) finish their school without pursuing any kind of post-secondary education (Finnish Adult Education Council, 2005). These problems are even more apparent among older adults whose education may be well below the education level of younger Finnish adults. Poor basic mathematical skills, or previous difficulties in learning mathematics, often prevent adults from continuing their studies or make them drop off from post-secondary education (Räsänen & Ahonen, 2004; Suomalainen, 2004).

The differences of Finnish adults' education along with age and socio-economic status are clearly larger than in other Nordic countries (Antikainen, 2008). These differences are also related to the socio-economic variations between different parts of Finland. Adults with the weakest education live in the Norwest of Finland, whereas the adults in the South have the highest level of education. A typical active adult student is a 24-44 year-old female in South-Finland with a university or college degree. By contrast, 60-plus year-old low-paid males with weak educational and socio-economic backgrounds, from the northern countryside, are typically left outside the adult schooling system (Pohjanpää et al., 2008). This kind of regional difference among adults at the post-secondary level seems to also apply to basic mathematical skills of students in North-Finland, indicating lower skills than students in other parts of the country (Suomalainen, 2004). Moreover, participation in adult schooling is higher among employed Finnish people (70%) compared to those unemployed (30%), and among well-educated people (71%) compared to people with basic or secondary educations (35-36%). Another challenge is related to the continuously increasing number of foreign-born adults immigrating with poor basic skills and the inability to study in regular Finnish classrooms. Also those immigrants who

relocate to Finland due to work have different educational needs than other immigrants (Finnish Adult Education Council, 2005).

Current research defines adult numeracy as the 'basics' of the four computation operations, but also includes aspects of algebraic, geometric, statistical thinking or quantitative literacy, and problem solving (FitzSimons, 2008). In addition, this is seen to involve "informal and non-standard mathematics practices and processes in adults' lives, which may bear little relation to formal, taught mathematics." (Coben, 2002, p.27) Furthermore, as adults' numeracy draws upon mathematical skills and knowledge developed over a lifetime, the area is seen as more complex than 'applied' or 'everyday' mathematics (FitzSimons, 2008; Menéndez & Civil, 2008). Unlike in countries such as UK and Australia (ALM-A Research Forum; Coben, 2006), only recently have these kinds of issues of basic mathematical skills been considered a significant obstacle to the learning, working and living everyday lives of some Finnish adults. For example, in the Second International Adult Literacy Survey (SIALS) study, Finnish adults' quantitative literacy skills were internationally only at the average level (Linnakylä, 2000).

No large studies can be found clarifying the situation of adults' basic skills in mathematics, but adults' difficulties in mathematics have been frequently observed in vocational education. Mathematics teachers have noticed that current students' mathematical skills are lower than generally assumed. According to the surveys taken by different Finnish vocational schools, about 25 - 29 % of the students have difficulties in learning mathematics (Alhonen, 2008). The problems seem to be related to things such as fractions, decimals and understanding of percentages (Suomalainen, 2004). One reason for this can be attached to the lack of numeracy content in current basic school mathematics textbooks. School students do not get a good basis in computation. The studies of Finnish students' numeracy skills in vocational schools (e.g., Huhtala, 2000; Makkonen, 2006; Suomalainen, 2004) have revealed these difficulties. Consistent with studies in other countries (Coben, 2009), a study of Finnish nurses showed deficient mathematical and dosage calculation skills (Grandell-Niemi et al., 2003). Every second arithmetic operation was calculated incorrectly and only 17% of the nurses attained a score of 100% and passed the test. The nurses also considered dosage calculation problems difficult. The results further varied along with the age groups and basic education. The youngest nurses performed significantly better than the oldest nurses. Also other observations from Finnish nursery schools point to students' difficulties in concepts such as verbalized calculation and fractions. Moreover, students have difficulties in choosing between the division and the multiplication operation, especially when the task includes decimals. (Huhtala, 2000)

The perceived difficulties have been connected to other various obstacles including negative previous experiences with mathematics, poor skills in literacy, and diverse neurological symptoms (Huhtala & Laine, 2004; Kiipulasäätiö, 2008; Räsänen & Ahonen, 2004). For example, according to different surveys, 3-7 % of the population has neurological learning difficulties in mathematics (Räsänen & Ahonen, 2004). Also, adults with poor basic education have difficulties in starting or continuing their education and they need a lot of support in improving their motivation, self-confidence and general learning skills. These obstacles derive often from previous negative experiences with school mathematics that result in strong negative attitudes towards and avoidance of mathematics (Malmivuori, 2001; Schlöglmann, 2006). Many adults experience mathematics as frightening and unpleasant. Negative attitudes to mathematics tend to develop very early, during the first school years, and the memories of failures and anxiety stay in vocational school, in university and in working life (Evans, 2000; Huhtala & Laine, 2004). For example it has been found, more than 50% of the first-year students (82) in a vocational college of social studies reported previous difficulties in

learning mathematics, even though only a quarter of them had obstacles in basic mathematics (Suomalainen, 2004). Students get early distracted from mathematics. Moreover, students often do not find any practical meaning of mathematics in their own lives and they consider mathematics, and calculation as something studied and needed only in schools. For example, a student nurse might give 8 million tablets or 4 liters of insulin for a patient in a mathematics exam, whereas in a real nursing situation she would not do so (Huhtala, 2000).

Basic Skills and Empowerment

Studies of adults' basic skills in numeracy and literacy have recently increased throughout the world while education policies have recognized the high importance of education for each nation's economy and welfare. In general, education and adult education are promoted as one of the core features of the 21st century. Life-long learning and development of new skills are considered as important factors for individuals' employment and their level of income, as well as for sustaining the competitiveness of companies in the global market and for the success of the nations in global competition (Field & Leicester, 2000; FitzSimons, Coben, & O'Donoghue, 2003; Niemelä, 1999). The future will be most difficult for those adults with the weakest basic skills and the lowest basic educational background. This has created needs of and efforts for improving adults' basic skills in numeracy and literacy. A traditional theoretical context for improving and studying adults' basic skills is offered by discussions on equality especially in critical learning theories (Freire, 2000; Giroux, 1983), transformational learning (Mezirow, 1991) and feministic studies of education (Van Den Bergh & Cooper, 1986; Walkerdine, 1998). These viewpoints are consistent with the notions of empowerment that in sociological theories of emancipation are used to denote *power and power relations* within a society (Cummins, 2000). For example, Robbins, Chatterjee and Canda (1998, p.91) consider empowerment as "a process by which individuals and groups gain power, access to resources and control over their own lives." Consistently, educational sociologists use the term to refer to enhancement of political rights, social justice and equality through education. The goals of this *social and political empowerment* through individuals are to increase people's academic and social skills in order to enable them to take better use of their social and economical environment; to learn to act along with the structures of a society; and also to actively impact on the development of these structures and their everyday social and cultural environments (Berry, 2005; Giddens, 1984). These aspects are also closely related to the notions of inclusion against exclusion in education (e.g., OECD, 1999).

In addition to this kind of social and political empowerment, we may consider the emancipation from a *personal empowerment* achieved by enhanced skills and education. Zimmerman (1995) presents three components of empowerment: intrapersonal, interactional, and behavioral. The idea of personal empowerment can thus be connected to an individual's intrapersonal empowerment (i.e., competency, self-esteem, and locus of control) that is further closely connected to interactional and behavioral empowerment through things such as social skilling and ability to efficiently act on learning situations. This individual – or micro-level (Sadan, 2002) - approach to empowerment can be seen to include both empowered outcomes (e.g., perceived control and competence) and the processes (e.g., skillful problem solving activities) through which individuals gain personal power (see Perkins & Zimmerman, 1995; Rappaport, 1984). Personal empowerment then also represents traditional psychological constructs of empowerment in the form of enhanced self-esteem, self-efficacy, competence, and locus of control, as opposed to community-based research on empowerment (Perkins & Zimmerman, 1995). However, the two perspectives, of personal versus social or community level empowerment, are clearly intertwined as the level of knowing, self-determination and

ability to act in, and impact on, social and cultural environments, are affected by personal empowerment and by social interactions and various political or cultural practices, resources and constraints of a society or community (e.g., Lave & Wenger, 1991).

In the context of mathematics education context, related studies on equity and empowerment have focused on things such as gender issues, increasing the representation and achievements of minorities in studying mathematics (Nasir & Cobb, 2002; Secada, Fennema, & Byrd, 1995; Walkerdine, 1998), and capacity building of adults with poor basic mathematical and numeracy skills, especially among minorities and adults in undeveloped countries (e.g., Barwell, 2005; Matthews, 2003). On the other hand, current global economics and policy put a strong pressure also on increasing people's level of education and skills in well-developed countries. Recent adult education research pays more and more attention to enhancing skills in numeracy and literacy among major population in these countries (Coben, 2006; Fitzimmons, Coben, & O'Donoghue. 2003; Safford-Ramus, 2008). Better skills in mathematics power people socially by helping them to more efficiently understand and act in the modern society. At the personal or micro-level these skills importantly empower adults by enhancing their cognitive skills as well as self-confidence and the quality of life in general (Benn, 1997; FitzSimons, Coben & O'Donoghue, 2003). Moreover, the increased significance of mathematical and numeracy skills in societies contrasts with often expressed concerns about the scarcity of students studying mathematics or science and the level of mathematical skills among older students (e.g., Barry & Davis, 1999; Kantner, 2008; Safford-Ramus, 2000). Various suggestions have emerged to increase the number of students in these academic fields and to empower post-secondary students by enhancing their mathematical skills (e.g., Benn, 1997; MacKenzie, 2002; Manigault, 1997; Safford-Ramus, 2008). These attempts also apply to the situation in Finnish adult education. We will first report of current efforts in improving adults' basic skills in Finland and then move to our case studies of Finnish adults' personal empowerment by learning basic mathematics.

Current Efforts to Empower Finnish Adults

In accordance with the objectives of current adult education policy in Finland (Ministry of Education, 2002), during the last few years the Ministry of Education has established special programs in order to increase educational opportunities for those Finnish adults who do not participate in education at all or to a smaller extent. Some of these programs are targeted also to adults' basic mathematic skills. The 2003-2009 governmental program, Noste, (the name refers to upgrading adult skills) was targeted to improve the career prospects and satisfaction at work of poorly trained adults, and also to increase the employment rate and to decrease the labor shortages coming from the large number expected to leave the labor market in the near future. The focus was on 30-59 year old working adults who had no post-compulsory qualifications or who could complete their basic education (Ministry of Education, 2008). Findings from the Noste Program indicate that the project has reached most of its' goals. While low-skill men are usually under-represented in adult education, their proportion in the program, compared to women, was 48 %. Moreover, adults in the northern region of Finland actively participated in the program. Good practices have been established for adult education during the program, such as out-reach methods; guidance practices; networking with school organizations; and also cooperation between schools, workplaces and Trade unions (Ahonen, 2009; Pakaste, 2009). Since the Noste program acted mainly on vocational education, mathematics was not particularly emphasized in it, but it facilitated learning basic mathematics by providing

individual tutoring and counseling for students with learning difficulties or with poor learning skills.

The Adults' Basic Studies program offers a possibility for 18-59 year-old adults to take compulsory basic school courses free of charge. In addition, every adult can take singular courses in basic studies. This "second chance" is suited to aging people who lack the basic school degree or some parts of it, to immigrants who need basic courses, to drop outs, and to some young people who are willing to improve their grades for getting into upper secondary school. These studies offer the option to learn basic mathematics systematically, starting from the elementary courses and continuing to upper level. The studies are arranged in Adult High Schools or in some of the folk high schools. In 2008, there were 952 participants in adults' basic studies programs. The participating adults, both in the NOSTE and Adults' Basic Studies program, are also encouraged to continue their studies from the basics to upper secondary school courses.

"Learn to Learn" (2006-2010) is the largest of the recently started projects of special education for adults. There are many older people in Finland who suffer learning difficulties and, because these kinds of problems were not recognized at the time, had no special education during their basic school years. The project called "Learn to Learn" is organized by the Rehabilitation Foundation, which is a non-profit organization supporting social welfare in Finland. The foundation works together with other Non-Governmental Organizations, various adult education centers and also with the Finnish Trade Union. This project offers adults information, guided peer-group studying, workshops and individual neuropsychological rehabilitations (Kuntoutussäätiö, 2008). It is aimed at creating new opportunities especially for those adults who had learning difficulties during their primary school years and also for those older adults who did not participate in any kind of education after their primary education but later start to improve their basic skills. This kind of a support helps Finnish adults overcome the learning obstacles encountered from poor basic skills, learning disabilities, or previous highly negative school experiences.

Methodology for Empirical Findings

We will provide insights into Finnish adults' experiences of, and personal empowerment by, studying basic mathematics and numeracy. A case study strategy was applied in two different educational contexts. The first case relates to a folk high school located in the northern Finnish countryside. In addition to traditional folk high school courses, it offers formal basic school education in the form of Adult High School and Senior High School. Prisoners represent another group of Finnish adults with poor basic mathematics and numeracy skills. The education offered in prisons is part of the general Finnish adult education system. It is governed by the general Finnish policy on adult education and the same objectives, decisions and developmental schemes determine the objectives and organization of the studies in prisons. The second case study focuses on a large prison in the Finnish capital area that collaborates with an adult high school by providing basic education for prisoners. Both case study contexts offer basic and upper secondary school mathematics courses for adults with a curriculum adjusted especially for adults (Ministry of Education, 2006).

For gathering data from adults' experiences, we first visited the folk high school, observed a mathematics class for adults, and interviewed a few voluntary students and their mathematics teacher. The first data set is based on interviews with three ladies: Riitta, Aili, and Aune (age ranging between 50 and 65 years), and their teacher Jaana (names are pseudonames). All ladies had their basic education before the large educational reform in Finland in the 1970's.

Riitta and Aili wished to complete their old civic school by studying current basic school topics and courses. Aune had already finished her studies at the time of our interview. She is an example of an adult student who systematically aimed at a matriculation examination, which she also passed in 2006. Because she had attended the comprehensive school over 40 years ago, she first brushed up her skills by taking singular courses in secondary mathematics before studying high school mathematics. Our second case study of personal empowerment by improvement of basic mathematical skills consists of data from an interview with a male prisoner, his mathematics teacher, and the student advisor of the prison. The adult student, a 30 year-old male called here Pekka, represents a mathematics student in a very special environment attached to life in a prison. At the time of the interviews he had been in prison for five years and had few more to serve.

In conducting the interviews, we applied unstructured form of interviews that focused on particular themes and personal experiences of studying mathematics in the educational contexts. This kind of interview provides opportunities for participants to formulate their own answers and also to reflect their thoughts (Hirsjärvi & Hurme, 2008). The approach in the conducted interviews, especially with adult students in the folk high school, was conversational. Riitta and Aili were interviewed together at their school. Aune told about her learning experiences at her home, whereas the teacher of these students answered questions in a written form by using regular mail. Due to the restricted access to prisoners under the prison regime, the prisoner Pekka was first asked to write down his answers to an open-ended questionnaire. Later, we were given the possibility to have a face-to-face discussion with him. His mathematics teacher and the prison's student counselor were interviewed in their offices at the prison.

Findings from Finnish Adults' Empowerment by Learning Basic Mathematics

Studying Mathematics in a Folk High School

The group of adults attending Adults' Basic Studies in our first case study started two years ago with only four students in the group, whose ages varied between 21 and 54 years. Some of the students attended the basic school classes due to their lack of education, but some studied only due to their intrinsic interest in studying; yet others planned to take later high school courses. We interviewed older adult students, Riitta, Aili, and Aune, who took courses in secondary mathematics, and also their mathematics teacher.

Mathematics was the favorite subject for Riitta and Aili. They found it interesting and studying mathematics gave them experiences of success: "…can think and use brains." The joy of understanding from their own effort rewarded the work. After studying mathematics in the program, Aune enjoyed doing homework with her grandchildren. For these women, learning mathematics was a personal joy, full of challenges and feelings of success. Aune also thought about continuing her mathematics studies, because "Such a subject as mathematic, there is something in it…" Nevertheless, mathematics was not at all easy for these students, and sometimes they had to work very hard. However, Riitta and Aili expressed one of adult students' strengths, that is, persistence: "I don't give up, I try and try, and then I am happy when I can solve the problem." Aune found mathematics positively challenging so that she felt encouraged after positive experiences in studying mathematics.

> When I travelled in the train I immediately opened the book and began to do exercises; as well, I studied every evening. I worked hard. I had ahaa-experiences and the feelings: 'that can't be true, I got it'!

These women were aware of the challenges that the teacher faced while teaching older adults mathematics. These included things such as a need to work in a small group, strong support needed from the teacher and preparation of special material suitable for these students. “In a bigger group I was too shy to ask a question if I didn’t understand. I didn’t want to look stupid.“ Due to her life situation, Aune had an opportunity to get almost private instruction from the teacher. She found this a marvelous opportunity and very helpful for her learning.

> She worked very hard for me; she explained and advised me. She demanded me to do the exercises and told me that they help me to understand them. And I learnt. I was terribly enthusiastic.

However, after continuing her mathematics studies in high shcool, Aune experienced difficulties due to lack of help from the teacher. She had to learn more on her own and she longed for an opportunity to get individual guidance. “The groups with 15–20 students are too big for adults with different backgrounds and knowledge.” But, the teacher’s devotion during the classes of basic mathematics increased these adult students’ encouragement to get deeper into the problems, and they found this highly important, especially in studying mathematics in which “it is important to learn well the basics.” Even though these women did not have any particular fears or negative attitudes towards mathematics, their teacher told that the adults often had either strong negative or positive views of mathematics or about themselves as mathematics learners. Their personal relation to mathematics was rarely neutral. She had taught mathematics for two Adult Basic Studies groups and both had needed a lot of encouragement in the beginning. Some of the students had experienced mathematics as a boring subject during their earlier school years but now as adults they found it interesting. Other adults considered themselves as good learners and they had previous good experiences with mathematics.

Adult mathematics students in this folk high school tended to emphasize skills in computations without paper and pencil, but they rarely said that they were good at making conclusions or solving problems on paper. The importance of numeracy skills and the ability to use mathematics in everyday situations was also evident among these adults. Aune trusted in her ability to do mental calculations, which had been important when she was in business. Riitta and Aili considered that their ability to do mathematics was based on the strong practice in basic calculation and, because of that, they felt that they had strong routines in numeracy.

> I and Riitta do well with the basics. In that time (in the old civic school before 1970’s) numeracy was taught us better than for the current children. We can count all the percentages and fractions better than these school students; we had to learn the multiplication tables by rote.

These statements point to the issue that younger Finnish adults may not have as strong numeracy skills as older adults. One the other hand, for Riitta, Aili and Aune, life experiences increased their ability to better see the bigger pictures, and to also understand more abstract mathematics, that they did not study during their school years. Their current mathematics teacher agreed on their views: adults’ life experiences give a lot of material and possible links between mathematics and the everyday life. However, those adults who had a long professional career but not much education faced difficulties when they needed to make computation with paper and pencil. These adults were used to doing mental calculations and perceived it helpful in their current mathematics studies.

Studying Mathematics in a Prison

Our second case study deals with basic mathematics studies in a prison. Although the secondary school curricula are very much the same for prisoners as for other adult students, there are aspects that create a very different context for the adult learners in a prison. A prisoner is under an obligation to work unless she/he is exempted because of studies, illness or other allowed reason. According to the current Finnish legislation, captivity consists of labor and vocational education or voluntary studies. Those prisoners who study can be fully or partly exempted from labour if "the studies are considered useful for prisoners in liberty" (Law: RTA 3:8 §, 1 mom.). As prison labor is often considered by prisoners to be unpleasant, studies of various subjects may help them ease their frustration (Byrne, McElligott, & O'Hara, 2008; Frezzotti, Lastaria, & Mortola, 2000). Prisoners may be given a permission to undertake either part-time or full-time studies and studying is one of the few prisoners' privileges. Students in Finnish prisons receive a small amount of money for general purposes, less than what is paid for prison labor. They also receive some money for the education materials needed or the prison provides the materials.

Many of the Finnish prisons co-operate with other educational institutions and their teachers usually also work in regular adult schools. There is also a rule (Enactment for Correctional Treatment, 431/75, p. 45) requiring prisoners receive as much support and guidance in their studies as possible and their achievements should also be overseen. This implies that various kinds of advice and supervision are offered in Finnish prisons. The results of a study of Finnish prison students by Autio and Hautamäki (1991) indicated that most of them had a kind of a neutral or anxious attitude towards studying in a prison. The study also showed that 71% of the prisoners lacked full basic education, 73% lacked vocational education, and 25% were unemployed before coming into the prison. At that time 56.7% of the students took courses in basic education, 36.7% took upper secondary school courses, and 6.7% took both. In most cases the instruction was offered in one place and one room, and there were few chances to apply the subjects studied.

In the studied Adults' School, the curriculum and lower secondary school courses in mathematics for prisoners were very similar to the regular curriculum for other adults, except only six mathematics courses were compulsory for the degree in basic (lower secondary school) mathematics. Similarly as in other adults' secondary schools, all the mathematics textbooks used were the same as for other secondary school students, and the mathematics courses were assessed by a final examination.

Pekka's empowerment by studying mathematics differed from the women's process described above. This was partly due to the special context of being a prisoner but also to his already good skills in basic mathematics. He had been good at mathematics and wanted to learn more, but also considered studying mathematics as an important way to stay well by keeping his mind occupied. He was highly motivated to study mathematics but also disappointed that he could take only the shorter upper secondary mathematics program, as advanced mathematics syllabus and courses were not offered for prisoners.

> When you are in prison you have a lot of time to spend doing nothing and thinking. You just waste time and often you end up being crazy. I like to put my head into something, and since I have been given the opportunity to study, I do my best.

By studying mathematics Pekka avoided falling into the degradation of self-esteem or depression. He also had future plans for using mathematics. He planned to apply to the Open University to study physics or economics, and therefore mathematics was meaningful and valuable for him. While studying mathematics in the prison, Pekka considered himself to be

lucky because he only had a few problems where he needed the teacher's help. This encouraged him in his study of mathematics. However, there were also some problems that he faced while studying mathematics. The first was that the instruction was addressed to all studying prisoners, regardless of their level of mathematical knowledge and the skills of the students varied a lot. The qualification needed for the courses were rather low and Pekka told us about how even the least advanced students passed the tests. Another issue related to the quality of the applied instructional material. He could not get mathematics problems that would have challenged him enough to spend more time in solving and thinking out the problems. Pekka would have liked "extra material to consult" in mathematics. The library of the prison, which was the only one he had access to, did not have any further materials on mathematics. Moreover, he considered that the textbooks were not adequate for the kind of adults who had not studied for years.

A wider perspective to studying basic mathematics in the prison was gained by interviewing Pekka's mathematics teacher and also the student counselor. This *teacher* had 15 years experience as an instructor but she indicated that her own university education was of no use in adult instruction and everything that she had learned was by own experience. During all the years as a teacher for prisoner students, she had found that one of the main problems was the poor reading and writing skills of the prisoners. This interfered with the mathematics classes. Another challenge was that she could not give any homework since it was most likely that the prisoners would not complete them. She agreed with Pekka on the lack of materials and the need for more adequate mathematics books for adults. The only extra materials they had available was a pack for learning fractions and probability, and sometimes she used the Excel statistical program to create diagrams and graphs in her teaching.

The interviewed student counselor of the prison had 10 years experience as a social worker and 5 years experience as a student counselor. Part of her role was to interview the prisoners who were interested in attending classes and to learn of their educational backgrounds. According to her experience, most of the prisoners had been problematic young people during their basic education. She offered some figures on the current state of education in Finnish prisons. According to her, about five to ten percentages of the inmates lacked basic education. Almost half of them were gypsies.[1] Although the official education applies to all citizens, the educational level especially among aging Romany people is under the average in the population. Only recently, the active cultural work and efforts against discrimination by Romany organizations and public authorities have enhanced their participation in basic schooling (Ministry of Social Affairs and Health, 2004). Sometimes the prison had prisoners who could not read. Generally, "there was nothing to offer for them" but occasionally some private lessons were arranged for this kind of prisoner students. The educational system seemed to have a gap in this sense. However, even though prisoner students often had difficulties in reading and writing, they tended to manage when they studied mathematics. According to the counselor, only 20% of the students who received education in prison finished their studies and graduated from the basic school. The reasons for quitting their studies related mainly to the movement of prisoners from one prison to another, or to their withdrawal from the classes due to being caught doing something not allowed, such as using drugs or other improper conduct.

Discussion

[1] The traditional linguistic and cultural minorities in Finland are the Roma, estimated 10 000 or 0,1 % of the whole population, and the Sámi with estimated 9 000 representatives (Ministry of Social Affairs and Health 2004; Samediggi, 2008).

The Finnish adult education system offers quite good opportunities for adults to complete their basic education and be personally empowered by studying basic mathematical skills even well after their regular school years. The large number of various adults' high schools, the co-operation between different institutions of liberal adult education, and also the large amount of public funding make the basic studies accessible for adults all over the country. In addition to basic studies, adults' have many opportunities to continue their studies at the upper secondary level in adults' high schools and further at university level in summer universities and open universities. This means that the nation-wide education system in Finland has a strong tradition and also governmental support for adults' studies at all different schooling levels. Finnish adults throughout the country have very good chances to take both basic and upper level courses in mathematics. The question of whether or not to improve one's own basic skills is more related to the adults' own needs, motivation, previous schooling experiences, and their forms of living in the culture and society.

Some critical views of adults' mathematic studies have emerged from our studies. For instance, both the syllabi and material in teaching adults mathematics rely too much on the content and forms of formal comprehensive school mathematics courses. This implies that even though liberal adult education is well grounded in Finnish adult education system, the opportunities for non-formal studies of basic mathematics or, for example, ethno-mathematics are very restricted. These difficulties and perspectives appear also in other countries (e.g., FitzSimons, 2008; Menendez & Civil, 2008). There is a strong tradition of formal mathematics education and it may provide a strong basis for post-secondary studies, but it may not be useful for adults with a lot life experience and different needs for studying mathematics. On the other hand, various kinds of non-formal education settings, more appropriate for adult learners, are not usually supported and e.g., the lack of materials diminishes adults' interests in and possibilities for acknowledging and strengthening their mathematical skills. Older adults' life experiences create a basis different from those of youngsters. They long for understanding mathematics against their previous studies and personal experiences and skills.

Our examples of adults' possibilities for and experiences of personal empowerment by studying basic mathematics raised some other questions regarding adults' basic education in Finland. One is related to the contradiction between practical numeracy and abstract mathematics. The latter is currently emphasized in formal comprehensive schools. On the other hand, older adults who take basic mathematics courses in adults' programs and schools are not familiar with the abstract mathematics or problem solving taught in regular schools for children. These adults studied content prioritizing basic computation during their earlier schooling years. In contrast, younger adults who study in vocational schools may have problems in basic calculations and numeracy. This means that older and younger adults bring different skills and needs to mathematics learning. Adult education programs will have challenges in facing these varying needs. In addition, the continuously increasing number of adult immigrants in Finnish adult schools represent a different kind of adult population that often lack of basic skills, both in literacy and numeracy.

Adult education in general, and studying mathematics in particular, may be highly empowering for adult students. In our case studies of Finnish adult students, and of their experiences of studying mathematics, the students did not stress any issues of social or political empowerment. Instead, they referred to powerful positive experiences such as enjoyment, joy and personal challenge even though they didn't see the mathematics they learned very useful for their everyday life. Studying mathematics enhanced their personal empowerment by increasing knowledge and understanding of mathematics but also by strengthening their identity as learners. Empowerment was enhanced by an encouraging and supportive learning environment.

According to Keskitalo-Foley (2000), things such as positive teacher-student –relation, sharing of experience, and support of the student group create an empowering environment, especially for adult female students. Similar important features of learning mathematics were also expressed by the interviewees in our case studies. Even though Pekka as a prisoner had a learning context quite different from that of the studied women, personal success experiences importantly encouraged also him, also, to continue his study of mathematics in the prison. Unlike with these women, his empowerment was enhanced by the chance to do formal studies while being jailed and by the positive effects of studying mathematics for mental wellbeing and for his future plans. This reflected also his efforts to be socially empowered by studying mathematics for the future life after his release from the prison.

Social and political empowerment by learning basic skills is also apparent for immigrated adults in Finland. By studying literacy and basic mathematics they will gain cognitive skills, confidence, and also establish an identity as members of Finnish society. The provided adult education thence empowers them personally in the way that is essential for their citizenship in Finland and for their living in, and acting on, Finnish society. Our case studies revealed that there are enthusiastic adult students and teachers who have found opportunities to study mathematics inside the adult education system. This is highly pleasing since both the research and development of adults' mathematics learning have clearly been neglected in the current discussion on adult education in Finland. This article presents possibilities and challenges for adults who study basic mathematics, but it also offers perspectives to future research on adults' learning of mathematics. Firstly, more comprehensive knowledge is needed from Finnish adults' state of arts and difficulties in basic mathematics. This includes knowledge of the nature of poorly educated adults' specific educational needs and learning difficulties, but also knowledge of the variation of these between different adult groups. Secondly, Finland has a rather comprehensive educational system, but we will need more teachers who are specialized in adult education, who have adequate knowledge of adults' basic skills, their specific needs for learning mathematics, and their ways to learn mathematics.

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