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# Newly arrived students in mathematics classrooms in Sweden

Eva Norén, Jöran Petersson, Cecilia Sträng and Petra Svensson

Stockholm University, Stockholm, Sweden, [eva.noren@mnd.su.se](mailto:eva.noren@mnd.su.se)

*In this paper, we discuss how newly arrived students experience, and perform in, school mathematics. There is little research on immigrant students' initial time in Swedish school, and it is methodologically underdeveloped. Our own research will be revisited, and we give an account of the methodologies we have developed. We look for analytical tools using both qualitatively as well as quantitatively, to interpret classroom interaction, social practises, individual performance and achievement. Our attention to diversity and equity issues includes avoiding deficit discourses explaining both success and failure in school mathematics, in relation to backgrounds, language and culture.*

**Keywords:** Newly arrived, mathematics education, methodology, foreground.

## INTRODUCTION

Sweden today is a multilingual and multicultural society. Some suburban schools in the largest cities, Stockholm, Gothenburg and Malmö have schools with up to 98 % of students speaking first languages other than Swedish. 44 % of the total amounts of immigrated students, 7–19 years of age (Statistics Sweden, 2014), are from outside Europe. Several of these countries suffer from political instability and some of them are developing countries. Newly arrived student numbers increase as the world's hot spots spread. The term *newly arrived students* is used in Swedish education policy and academic discourse. It defines students arriving from abroad during the time of primary or secondary school as newly arrived (Utbildningsdepartementet, 2013). In Sweden, students can be regarded as newly arrived up to four years from arrival. Resources are tied to that time span within the educational system, and offers optional teaching in both mother tongue and Swedish as a second language (Utbildningsdepartementet, 2013).

The students cannot yet speak Swedish, and are entitled to a special introduction to school. The present years Arabic is the most common mother tongue spoken after Swedish (Skolverket, 2013/14).

There is little research on immigrant students' initial time in a Swedish school, and there are no studies comparing Sweden with other countries. Bunar (2010) mapped and reported research on newly arrived students in Sweden. He found the Swedish research is "scarce and theoretically and methodologically underdeveloped" (p. 6). It is impossible to draw certain conclusions and the Swedish research does not support understanding of learning conditions for newly arrived students. Bunar also states there are, to a high degree, local variations and a lack of a common educational policy, that might lead to arbitrariness and uneven quality in education. This paper is a response to Bunar's call for more research on newly arrived students in Sweden and the purpose is to discuss the question:

*How do newly arrived students experience, and perform in, school mathematics in Sweden?* To do this we look at data from our own research retrospectively. An underlying aim is to pay attention to diversity and equity issues in mathematics education, and to develop theoretical and methodological tools for research on newly arrived students in Swedish mathematics classrooms.

In the following section, a brief review of research on newly arrived students in Sweden is given, and thereafter our own earlier research will be summarised. The methodologies of our presented work will be indicated and then some final remarks for future research will be made.

## BACKGROUND

Studies on newly arrived students that have been undertaken in Sweden are divided into mainly three areas: 1) A social and individual perspective that include mostly identity formations among adolescents, the power relations in the society, and how students integration are affected by these factors. 2) An institutional perspective that focus on transitions and on measurements of the importance of migration age for students' achievement. 3) A pedagogical perspective that focus on second language development and learning in a second language (Bunar, 2010). The studies come from a variety of academic disciplines.

Newly arrived students contribute to characterize the Swedish school with an increased diversity of languages, ethnicities, cultures, religions and nationalities. Their introductory time in school is crucial to their continued performance in the Swedish school. Introductory teaching differs greatly between different schools and we know very little about what works (OECD, 2006; Nilsson & Axelsson, 2013). Education for newly arrived students is commonly arranged in introductory classes, providing a basis in the Swedish language for later transition to mainstream classes. In order to deal with language requirements of academic school work in the language of instruction (Swedish) it is necessary to develop what Cummins (2008) refers to as Cognitive Academic Language Proficiency - CALP. That means to be able to use language in context-reduced situations such as advanced school mathematics. In a second language environment it may take about seven years to fully develop CALP skills, in the second language. Hakuta (1986) suggests that CALP skills are transferable across different languages.

Criticism from both researchers and authorities inform us that students are retained in introductory classes for too long. In fact, it is the individual student's progress that determines when s/he will be integrated into a mainstream "regular" class. The rules on how the assessment of this progress is done and by whom is unclear. And as researchers have pointed out this assessment could be disastrous for the newly arrived students' motivation to study if there are delays in their transition to mainstream classes (OECD, 2006). In their recent study, Nilsson and Axelsson (2013) analysed the social and pedagogical resources in the contexts of introductory classes and how newly arrived students experienced the time in and transition

between introductory and mainstream classes. The students had arrived during the last years of lower secondary school. The result points to a tendency of allocating responsibility for newly arrived students' education solely to the introductory classes or the individual student. Nilsson and Axelsson (2013) argue that this is an insufficient praxis, and that pedagogical and social provisions also have to be made in the mainstream system in order to fulfil inclusive and educational aims.

In an introductory class where students have different backgrounds, different educational background and knowledge of the Swedish language, there are often also various forms of trauma in the picture. One important factor for integration in school is that teachers take into account the interactions and, above all, to create a supportive network around the individual student (Rodell-Olgac, 1999).

## EARLIER AND ONGOING STUDIES IN SWEDISH MATHEMATICS EDUCATIONAL CONTEXTS: DRAWING FROM OUR OWN RESEARCH

Norén (2007, 2010) investigated bilingually instructed mathematics classrooms where teachers and students used Arabic and Swedish. Some of the students in her study were newly arrived and attended introductory classes except for mathematics and physical education classes. According to Norén the newly arrived students, benefited largely from the bilingual education. Knowing and using several languages opened up an opportunity for mathematics development. The bilingual teaching of mathematics favoured learning the Swedish language as Swedish mathematics text books was used and Swedish was focused for mathematical concepts.

An example from the study (Norén, 2007) was centered on Nada, a 15 year-old girl originally from Iraq, Arabic as mother tongue. According to Nada, from interviews and participating observations, when she as a newcomer arrived into Swedish school, she was immediately placed in an introductory class where the focus was on learning the Swedish language at the expense of continued learning in mathematics. Nada was self-conscious about priorities in the introductory class, saying:

Then we worked almost nothing with math. It was just numbers (arithmetic) and plus and minus.

No texts. We invested in Swedish. Nothing in the maths. I have never got a passed grade in mathematics, I didn't know any maths. (Nada, from interview in eighth grade)

Her account is a reflection of a strong influential discourse "Swedish only", to learn Swedish first and fast. It is an everyday opinion that it would enable her to quickly start studying mathematics in her second language Swedish (Sjögren, 1996; Runfors, 1993). When Nada started eighth grade, she was offered, and said yes to participate in the bilingual mathematics education program. In a later interview Nada said:

I have learned more (mathematics and Swedish) /.../ Arabic makes it easier and possible to learn more /.../ Language is an important issue. /.../ When I started the bilingual program with other Arabic speaking students, when they got grades like pass and higher, I thought I could get grades as well. (Nada, from interview in ninth grade)

Heading towards the end of ninth grade Nada started to identify herself as an engaged student working hard to pass the examinations in mathematics. That was also the expectations from her mathematics teacher. In the end of the ninth school year Nada got grades in mathematics good enough to get into the upper secondary school program she wanted.

In another example Norén (2010) informs us of a group of three newly arrived students from Iraq, 15, 15 and 16 years old. When working with text problems in mathematics, they had access to dictionaries. The context in the text problems was arranged around a fishing trip. Although students with help of the dictionaries, and a voluminous workload, managed to translate the information word for word the context was shrouded in mystery. With the help of the bilingual mathematics teacher who clarified the cultural contexts, the students solved the tasks. It is not common with fishing trips in Iraq, the teacher explained, and it is not that the translations of words and sentences from Swedish into Arabic help students solve text data in mathematics. By working with text data, students in addition to working with mathematics also learn some Swedish, and they learn something about the Swedish culture.

In an ongoing study Petersson (2012, 2013) investigated newly arrived immigrant students' achievement on

various mathematical tasks on a test in mathematics. The tasks are formulated as to not cause language obstacles for second language learners, and to involve algebra, statistics, proportional reasoning and negative numbers. The performances of the newly arrived students, defined as those who immigrated during school years 8–9 are compared with students who immigrated during school year 1–7, and Swedish native students. One important result is how the achievement for the different student categories was distributed over different topics in mathematics. On most tasks newly arrived and early arrived immigrant students achieved similarly and on a level of about two thirds of the level of the native students. For tasks on advanced school mathematics, such as algebra and negative numbers, the newly immigrated students performed as native students or better while the earlier immigrants performed significantly lower than both native and newly immigrated students. Petersson concludes that there is a need for research on how different student categories perform in specific topics in mathematics. That is, how achievements and various solution strategies are distributed among newly and early arrived students. It is not sufficient to draw conclusions that immigrant students in general perform lower than native students or that immigrant students perform lower in mathematics the later they immigrated, like, for example, Böhlmark (2008) does. An assumption, by Petersson, is that early arrived students have had most of their mathematics instruction in their second language Swedish, while newly arrived immigrant students have had instruction and textbooks mainly in their first language. That newly arrived students in average perform better on some tasks and native Swedish students perform better on other tasks may have to do with the fact that teaching of mathematics in countries over the world put emphasis on different mathematical topics.

Svensson (2014) examined how immigrant students experienced their possibilities to learn mathematics. This was done to broaden and critique common explanations given concerning immigrant students' unsuccessfulness with mathematics. In their narratives in which, the fifteen years old students positioned themselves in discourses that contributed to poorer performance in school mathematics than Swedish native students. The students were often confronted with not belonging to the normal i.e. Swedish students and describing their experiences of alienation and a sense of injustice. The students seemed to create themselves

as individuals with limited room for manoeuvre in the present and in the future as they identified themselves as belonging to a problematic group of students. One of the students in the study, Khaled from Afghanistan, had been going to a introductory class for as long as three years, only the last year of compulsory school (ninth grade) was in a regular mainstream class. He expressed the need of knowing Swedish to be able to manage mathematics instruction and the text books in Swedish, when he was talking to his fellow students in a focus group interview:

Yes, but like this, I cannot so good language, I do not understand certain questions in math when they say it, I read it several times but I do not get it anyway, because I can not handle it. You have lived long time here, and know good Swedish so you can do it better than me. (Jo, men en del typ jag kan inte så bra språket, jag fattar inte vissa frågor på matematik när de säger det, jag läser det flera gånger men jag fattar det ändå inte för jag inte klarar det. Ni har bott länge här, och kan bra svenska så ni klarar det bättre än mig.)

Further on he says:

It is not so easy to learn so quickly the Swedish and then change it to a maths language, to then I do not understand so much at math, some questions you do not understand so well / ... / like full sentences / ... / when I read it gets, it becomes quite strange to me so I do not understand so I skip it. (Det är inte så lätt att lära sig så snabbt svenskan och sen ändra det till mattespråket, till sen man fattar inte så mycket på matte, vissa frågor förstår man inte så bra / ... / typ hela meningar / ... / när jag läser det blir det, det blir helt konstigt för mig så förstår jag inte så hoppar över.)

Khaled tells about his experiences of being taught mathematics in Afghanistan. He does not believe that mathematics in Swedish schools is the same as in Afghanistan. He managed mathematics quite well there but not in Sweden. He says it may be because of language issues, and “I am mostly used to that, the Afghan maths one can say, what I did there”. He also states that his father cannot help him with his mathematics homework because the father knows Afghan mathematics, not Swedish mathematics.

In a recently started study Norén and Sträng (in preparation) investigate how newly arrived immigrant students get access to mathematics teaching when starting school in Sweden. They will also investigate how the newcomers experience their education in Swedish mathematics classrooms. Sträng does participant observations during mathematics lessons in introductory classes. Norén interviews students, who just have been transferred to mainstream classes. Also their parents are interviewed as well as their teachers. The study is part of mapping mathematics education for newly arrived students in a Stockholm suburban municipality. There are yet no results reported from this study.

## METHODOLOGICAL ISSUES

As this paper is a response to Bunar's (2010) call for more research on newly arrived students, and to develop theoretical and methodological tools, we give account of the methodologies we have developed in our research respectively. As we have concerns for equity in mathematics education we have to problematize how our research is carried out, in terms of “normality”, Swedishness, and newly arrived students who not speak yet Swedish. It is about power relations as well as communication difficulties. To do so we use discourse theory in line with Foucault (2008). In classroom research, students' experience, performance and achievement analysis require a variation of research methods. So far we have used both qualitative and quantitative methods. Both may use document analysis and interviews while they typically differ in the use of classroom observations and statistical analysis of the outcome. So what are the methodological concerns when the focus is on how newly arrived immigrant students' experience, and perform in, school mathematics in Sweden?

## NEWLY ARRIVED IMMIGRANT STUDENTS' EXPERIENCES OF MATHEMATICS CLASSROOMS

Part of our research is mainly qualitative, using participant observations (Hammersley & Atkinson, 2007), individual interviews, and focus group interviews (Kvale, 1997). The research is inspired by critical mathematics education research. Skovsmose (1994, 2005) has had a major impact as we are using his theoretical construct *foreground* (Norén, 2010; Svensson, 2012, 2014). According to Skovsmose (2005), a foreground

represents a student' interpretation of his/her learning opportunities and life choices in relation to what the student finds acceptable in the current socio-political context, but also what a student in question perceives as available for him/her. Skovsmose (2005) writes:

Intentions do not spring to life from nothing. They are grounded in a landscape of pre-intentions or dispositions, and I divide these into "background" and "foreground". The background of a person can be interpreted as the socially constructed network of relationships belonging to the history of the social group to which the person belongs. When one tries to understand an individual's intentions, one often refers to his or her background. But equally important is the persons' foreground. By this, I refer to those opportunities that the social situation makes to the social group to which the person belongs. Opportunities are not to be understood as sociological facts but as collectively or individually interpreted opportunities (p. 89).

Using *foreground* as an analytical tool, we have noted that students' success in school mathematics associates with the opportunities they have to positions formed in classroom practices. These practices are affected by public discourses on immigrant students and mathematics that occur on a societal level. Our focus is on the opportunities made available for the students to get involved in school mathematics, and in the long run, the hopes for the future that they will persevere through mathematics classroom practices. In line with Rodell-Olgac (1999) we argue for schools and teachers to take into account the social interactions in classrooms, and to create a supportive network around the individual newly arrived student. The contrast is what has been shown in earlier research: A focus on solely language aspects might position newly arrived students as "problems", and the answer to that will be the remedy "Swedishness" with a quest to homogenize (Sjögren, 1997; Runfors, 2003; Norén, 2010; Svensson, 2014). Students will be viewed and treated at the basis of what they lack, and what knowledge they don't have, in relation to how Swedish students the same ages are viewed and treated. The Swedish students will be the role model of what is "normal" while students whose mother tongue is not Swedish will be regarded as deviant with "weak language skills"

(in Swedish). We name these aspects deficit discourses. In our research we look for other types of discourses.

Another part of our research is to compare how newly and earlier arrived students perform in different topics in mathematics. Seen as a sample for educational statistics purpose, immigrants are in many aspects a heterogeneous group. As discussed earlier they are a diverse group with respect to how recent they immigrated, their socio-economic situation, and their earlier experiences of schooling.

### **NEWLY ARRIVED IMMIGRANT STUDENTS' PERFORMANCE IN SCHOOL MATHEMATICS**

Newly arrived students are rare. About 9% of the students are born abroad; about 4% are newly arrived the first school year and about 1.6% of the 16-year-old students. The difference in percentage is mainly due to the longer stay of the older students and not due to age of immigration. This is a challenge when studying achievement data of newly arrived immigrants, since the sample must be large enough for conducting quantitative research. One example is Heesch (2000) who re-used TIMSS 1997 data for a study on Norwegian immigrants. In their study, there were few immigrants and the authors often failed to reach statistically significant results despite sometimes large differences in achievement. Secondary data may also have other limitations. For example test questions may be under secrecy and the sample may not be purposeful for the research question.

Another factor to consider is the socio-economic situation of newly arrived students. Some of them come as refugees, some with less schooling than others. For this reason there is residential area segregation due to economic resources of individual families. In larger cities with many schools, this causes school segregation since most students are enrolled in a nearby school. This indirectly has consequences for students' achievements. Schools with a high proportion of first and second-generation immigrants, also have a slightly lower ratio of qualified teachers and slightly higher ratio of turnover of employed teachers (Skolverket, 2004, p. 57). Hansson (2012) found a positive correlation between student achievement and whole class instruction in mathematics. She also found a correlation between high proportions of students' individual work and students with immigrant background or low socioeconomic status. This means

that the students, who can be seen as in more need of teacher support, get less teacher support. Hansson interpreted this fact as existence of segregation in Swedish mathematics classrooms.

A challenge for quantitative studies is that random samples of entire classes needed for collecting a large enough sample of, say, newly arrived immigrants, and would be unmanageably large. An alternative to random samples is purposive sampling when designing a student sample (Cohen & Manion, 1994). Petersson (2012, 2013) used a purposive sample with the aim of decreasing the sample size needed as he selected schools with an over average proportion of first generation immigrants. There are challenges also with purposive sampling since the samples can be biased. There is a risk of comparing students from a similar background instead of comparing students that represents a national random sample.

Petersson (2012, 2013) handled the possible bias by comparing the achievements on the compulsory national test of the purposive sample with a national random sample. The latter sample was the same as was used for the evaluation of the national test.

## FINAL REMARKS

This paper is a response to Bunar's (2010) call for more research on newly arrived students. Our focus on a particular school subject is important, as mathematics education has limited space in earlier research on newly arrived students. Newly arrived students must learn the new language while also having to acquire knowledge in other school subjects. For this to be possible, second language instruction has to be related to teaching in the school's all subjects. The effects of the positive impact mother tongue has for newly arrived students must not to be forgotten.

Our aim in this paper was to pay attention to diversity and equity issues in mathematics education includes avoiding deficit discourses explaining both success and failure in school mathematics, in relation to backgrounds, language and cultural issues. As shown in this paper, we look for analytical tools, qualitatively as well as quantitatively, to interpret classroom interaction, social practises, individual performance and achievement. Multiculturalism and multilingualism do not have to be constructed as obstacles to learning mathematics.

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