

The Gatekeeping Role of Mathematics Education in Migration Contexts – A Visit to Malmö

Petra S Källberg & Ulrika Ryan

Petra Svensson Källberg and Ulrika Ryan both have PhDs in Mathematics Education and work as senior lecturers in the Department of Natural Science, Mathematics, and Society at Malmö University in Sweden. Their research interests concern mathematics education and migration, including sociopolitical and sociolinguistic dimensions of multilingualism, and equitable mathematics education for citizenship and social justice. Their research takes on empirical, theoretical, critical, and socio-political perspectives. E-mail: petra.svensson@mau.se; ulrika.ryan@mau.se

I. INTRODUCTION

Education is crucial for personal fulfillment and for successful integration into society, which means that school is a key arena for integration. In cities like Malmö, Sweden, which are characterised by extensive migration-driven superdiversity, there is often a need to strengthen integration. In 2020, two-thirds of school age (5–19 years) youth in Malmö had a migration background, meaning they were either foreign-born or born in Sweden to at least one foreign-born parent¹. In Malmö, and elsewhere in Sweden, students with immigrant backgrounds generally have lower levels of achievement in primary and secondary school than their non-immigrant peer². Students with immigrant backgrounds form a broad category, encompassing significant variation in academic achievement, influenced by factors such as age at time of immigration, previous access to and experience of schooling, and parents' level of education. Low achievement at school restricts progression in the educational system, financial

and societal status, and, ultimately, integration. Hence, the educational system can open or close gates to further education, to the labor market, and to integration. In public debate, mastery of the Swedish language and immigrants' education in the Swedish language are often given key roles in integration. Given the high proportion of immigrant youth in Malmö, it is surprising that mathematics, rather than Swedish language, is the subject that most often closes gates to upper secondary school, according to Malmö statistics³. Mathematical knowledge is required for access to the labour market, personal decision making about political, financial, or health issues, and so on⁴. Hence, exclusion from mathematical knowledge can prevent integration and restrict life opportunities for Malmö's youth.

One way to measure school segregation is by comparing schools in high- and low-index residential areas. The index is based on several factors, including parents' education level and immigration background. In low-index residential areas in Malmö, nearly 100 per cent of the students were eligible for national upper secondary education programmes, compared to 50 per cent in high index areas. This means that youth who attend schools and grow up in high-index areas face a significant risk of not gaining access to any national upper secondary programmes, whether university preparatory or vocational. This means that these areas run the risk of being permanently high-index areas with low levels of integration.

To be eligible to apply for a national programme in upper secondary school, students are required to have passing grades in Swedish or Swedish as a second language, English, and mathematics, as well as five additional subjects if applying for a vocational programme or nine additional subjects if applying for a university preparatory programme⁵. Malmö statistics showed that, at the end of the 2023/2024 school year, almost 15 per cent of Malmö youth lacked passing grades in mathematics when finishing compulsory school. In contrast, the proportion of youth that lacked passing grades in Swedish and Swedish as a second language was 12 per cent, and the corresponding proportion in English was around 8 per cent. Although the most important factor determining progression in the educational system for immigrant youth is mastery of Swedish⁶, mathematics plays a significant but often ignored role as a gatekeeper, particularly for immigrant students who grow up and go to school in socio-economically disadvantaged areas⁷.

These facts lead us to explore the gatekeeping role of mathematics education⁸ for youth in Malmö (and elsewhere) with immigrant backgrounds from classroom perspectives. Classroom perspectives inform how gatekeeping materialises in mathematics learning situations. Here we offer three snapshots from classroom situations to illustrate how gates to mathematics learning can open and close.

II. KNOWING AND DOING MATHEMATICS AT SCHOOL – A MIGRATION PERSPECTIVE

Mathematics is commonly regarded as neutral regarding language, culture, and epistemology. However, school mathematics in Sweden is governed by local, national, and international policies that reflect language, epistemological, and cultural dominant Western ways of knowing mathematics⁹. Consequently, mathematics activities at school are framed within the logic of

Western ideals, which are enacted by means of policy and school culture. For example, in Middle Eastern countries, knowing mathematical formulas by heart indicates mathematical knowledge, while Western traditions prioritise reasoning and verbal explanations of mathematical thinking¹⁰. Problem-solving tasks are framed in Western contexts, and non-Western algorithms for calculation and students' home language as resources for mathematics learning may be rejected at school¹¹. These examples show how Western hegemonic language, epistemological, and cultural mathematical values materialise in mathematics education in Sweden, while at the same time alienating that which is "other"¹².

The three snapshots below illustrate the gatekeeping role of mathematics education based on problematisations of mathematics as neutral in terms of language, culture and epistemology.

III. SNAPSHOTS OF GATEKEEPING IN MATHEMATICS LEARNING SITUATIONS

Snapshot 1: Closing the gate to Khaled

The first snapshot consists of an excerpt from a focus group interview with four ninth-grade immigrant students¹³. We focus on Khaled, a newly arrived 15-year-old male student from Afghanistan who has lived in Sweden for four years. By investigating Khaled's experiences with mathematics learning we illustrate how gatekeeping can operate for immigrant youth in monolingual Swedish mathematics learning situations. The excerpt also demonstrates that Khaled has experienced cultural and epistemological differences between school mathematics in Afghanistan and in Sweden:

I (interviewer): Did you go to school before you came to Sweden?

K (Khaled): Yes.

I: Right, so you must have learned a lot of maths?

K: Yes, but it's not the same maths as here.

I: How is it different?

K: They [school mathematics in Sweden and in Afghanistan] are different. It's a big difference between them. I managed well there. When I came here, I didn't do so well with this maths.

I: Why do you think there is a difference?

K: I don't know, maybe it's a bit about the language and formulas and such. It's completely different things

I: Mm, so it's both the maths and the language, you think?

K: Yes, because I'm mostly used to the Afghan maths the maths I did there.

Khaled said that he experienced difficulties with mathematics learning in Sweden due to his limited proficiency in Swedish language. However, he also emphasised differences in mathematics itself when he compared Swedish and Afghan school mathematics. He said, "It's completely different things," which suggests two different ways of knowing and doing school mathematics. From these two epistemologically and culturally different views on school mathematics follow differences regarding what it means to be mathematically proficient at school in Sweden and in Afghanistan. It seems that Khaled experienced difficulties in navigating the epistemological and cultural differences. This illustrates how Khaled is linguistically, epistemologically, and culturally restricted when learning mathematics in Sweden. Hence, the gates to mathematics learning appear to be closing, since Khaled cannot use his mother tongue and Afghan ways of knowing and doing mathematics.

Snapshot 2: Opening the gate to a newly arrived student

In contrast to the first snapshot, in the second snapshot we illustrate how mathematics education can open gates to mathematics learning for immigrant youth when they are encouraged to use their full language repertoires, including their home language, as resources for mathematics learning. This snapshot consists of field notes and an excerpt from an interview with a mathematics teacher who participated in a school development project, the aim of which was to implement translanguaging pedagogy¹⁴. The participating mathematics teacher, a middle-aged male who had Arabic as his home language and was fluent in Swedish, orchestrated a mathematics lesson based on translanguaging pedagogy for the first time when visited by the researcher. The following vignette is based on fieldnotes and excerpts that come from the follow-up interview with the teacher:

The teacher arranged the eighth-grade students in language-homogenous groups according to their home languages to work on curriculum mathematics. He wrote tasks on fractions on the whiteboard and then asked the students in Swedish to use both Swedish and their home languages when solving the tasks in the groups. The teacher then invited students from different groups to the whiteboard to write their solutions and orally explain them using their home languages. Immediately after the lesson, the teacher was interviewed about the mathematics lesson. In the interview, the teacher referred to a specific event from the lesson. He explained that a newly arrived Arabic-speaking boy from Syria, who had been silent in class for several months despite being good at mathematics, was finally able to verbally explain his mathematical solution and consequently fully participate in the mathematics lesson:

T (teacher): Did you see the boy? He does not know Swedish. He has been in Sweden for four months. He was at the whiteboard and talked [in Arabic] since he saw that others were talking in the same language. It is the first time he asked to come to the whiteboard and talk in front of the class.

I (interviewer): Was it the first time?

T: Yes, it was the first time. He did it because some others had come to the whiteboard and talked in Arabic. He might have thought: "Why not me? I can present myself as knowledgeable of mathematics to my classmates and the teacher." He knows mathematics very well, he's only missing the language. If we get to the point where he speaks in Arabic, yes, he can do mathematics then.

The teacher seemed to value the use of the student's home language in the mathematics classroom, which permitted the student to perform as a learner who knew mathematics in front of the class. The student's mathematical knowledge and skills became visible to the teacher and his classmates. Hence, the student appeared as a mathematically knowledgeable student who could explain his mathematical thinking. This is important because it relates to how students can develop positive identities as learners of mathematics. In contrast to the snapshot of Khaled's experiences, this example illustrates how the gates to mathematics learning can be opened for newly arrived students.

Snapshot 3: Closing the gate to students with immigrant backgrounds

Snapshot 3 comes from a group interview with five students with immigrant backgrounds, aged 13 to 14 years old¹⁵. Here, immigrant background means that some students had experiences of schooling in other countries. Some were born in Sweden to immigrant parents. All students were fluent in Swedish. The students talked about how their

parents' way of knowing and doing mathematics was different from the way that mathematics was known and done at school in Sweden. They also said that their mathematics teacher considers their parents' ways of doing mathematics to be incorrect:

I (Interviewer): I think I know some maths. But if I were to move to an Arabic-speaking country and I don't know Arabic – does that mean I can't do maths?

S 5 (Student 5): No, no. So...

S 3: Yes.

S 2: Your way of doing maths is different. Because I've noticed that when dad, who was a maths teacher before we migrated, helps me with my maths homework it's completely different things that he learned and taught. So, he shows another way of doing the maths to me. When I show my father's ways of doing mathematics in class my teacher says that it is wrong. The teacher says: "This is the way you should do it. So, it is not wrong, but this way I ask you to do is not the way that you showed". So it depends.

Interviewer: But then you know two ways, right?

S 2: Yes, sort of. But my father's way will not help me. Because as far as I know it depends on in which country you are learning mathematics. My dad is from the Middle East, so it's kind of weird for him.

The mathematics teacher does not seem to accept the students' parents' ways of knowing and doing mathematics. Hence, students who do not use, for example, mathematical methods advocated in the mathematics classroom can be viewed as less mathematically knowledgeable. This snapshot illustrates how epistemologically and culturally non-dominant ways of knowing and doing school mathematics may be excluded when Western approaches prevail in the mathematics classroom. Not valuing students' and their parents' ways of knowing and doing mathematics is likely to have a negative impact on immigrant students' engagement with

mathematics, which may close the gates to mathematics learning to students with immigrant backgrounds.

IV. REFLECTING REMARKS ON GATEKEEPING

We conclude this paper by reflecting on mathematics education as gatekeeping. The snapshots illustrate small-scale examples of gatekeeping in specific mathematics learning situations in migration contexts. Accumulations of experiences of opening or closing gates influence immigrant youths' mathematics learner identities in positive or negative ways. Statistics from Malmö are a result of accumulations of gatekeeping experiences in classrooms. Since the subject of mathematics is the largest gate-closer to Malmö youths' possibilities for advancements in the educational system, it is important to recognise that there are subject-specific dimensions beyond the focus on mastering Swedish. While mastery of Swedish is key to integration, focusing solely on the Swedish language conceals how other school subjects, such as mathematics, operate as gatekeepers for integration. We stress that mathematics education appears to play a particular role for immigrant students' advancement in the educational system and ultimately for integration. Opening the gates for immigrant students in mathematics classrooms requires recognition of their full linguistic repertoires, and their epistemologically and culturally influenced mathematical repertoires, as learning resources. This means that the educational system, including policymakers, mathematics teacher education and teachers

of mathematics, must recognise non-dominant languages and ways of knowing and doing mathematics as pedagogical learning resources and ethically embrace plural epistemologies and ontologies of mathematics.

Acknowledgments

This study was supported by the research programme *Literacy and Inclusive Teaching* (LIT) at Malmö University, by the Malmö Institute for Studies of Migration (MIM) and by the Swedish Research Council through the research project *Spaces for Multilingualism? An Interdisciplinary Study of Pedagogical Potentials*

and Limitations of Multilingual Approaches and Activities in Mathematics and Science Education (grant number: 2021-04155).

REFERENCES

- [1] Righard, E. 2022. *Integration i städer med en omfattande diversitet i befolkningen: Teoretiska perspektiv, empirisk forskning och en diskussion om implikationer för politik och praktik i Malmö*. Malmö stad.
- [2] SNAE (Swedish National Agency for Education), 2023. *PISA - 15-åringars kunskaper i matematik, läsförståelse och naturvetenskap*. Skolverket.
- [3] Personal conversation with a research secretary at the *Compulsory School Administration* in Malmö, August 23rd 2024.
- [4] Jablonka, E. 2003. Mathematical literacy. In J. Bishop, M.A. Clements, C. Keitel, J. Kilpatrick and F. K. S. Leung (Eds.), *Second international handbook of mathematics education* (pp. 75–102). Kluwer Academic Publishers.
- [5] In Sweden, compulsory school starts at age six and lasts for 10 years. Students are streamed when they apply for non-compulsory upper secondary school. Traditionally, nearly all students attend upper secondary school. However, in recent years, a growing number of students (16 per cent in 2024, the highest in the EU) have been ineligible for national programmes. These students are referred to the individual programme to achieve passing grades for vocational or university preparatory programmes. In practice, many students drop out of the individual programme.
- [6] Jonsson, J. O., & Mood, C. 2023. *Karriärer och barriärer – en ESO-rapport om skolgång och etablering för unga med utländsk bakgrund* (SOU 2023:8).
- [7] SNAE, 2023.
- [8] Stinson, D W. 2004. Mathematics as “gate-keeper”(?): Three theoretical perspectives that aim toward empowering all children with a key to the gate. *The Mathematics Educator*, 14(1), 8–18.
- [9] Norén E. & Valero P. 2022. Att bilda goda, matematiska medborgare i Sverige. In P. Valero, L. B. Boistrup, E. Norén, & I. Christiansen, (Eds.), *Matematikundervisningens sociopolitiska utmaningar* (pp. 157–180). Stockholm University Press.
- [10] Alhasani, H. A., Källberg, P.S., Ryan, U. & Zaki, S. 2022. ‘Vi’ och ‘dom’ – Sociopolitiska dimensioner av matematikutbildning där olika språk och kulturer möts. In P. Valero, L. B. Boistrup, E. Norén, & I. Christiansen, (Eds.), *Matematikundervisningens sociopolitiska utmaningar* (pp. 299–321). Stockholm University Press
- [11] Ryan, U. & Källberg, P. S. 2024. Immigrant Students’ Experiences of (Re)producing School Mathematics in Home-School Transitions – epistemological positionings. *Research in Mathematics Education*, 1–20.
- [12] Alhasani et al. 2022.
- [13] Källberg, P. S. 2018. *Immigrant Students’ Opportunities to Learn Mathematics: In(ex)clusion In Mathematics Education*. (Doctoral thesis, The department of mathematics and science education,
- 18). Stockholm University, Department of Mathematics and Science Education.
- [14] Translanguaging pedagogy encompass the idea that all languages are of equal value. Therefore, the use of all languages that students have access to should be encouraged in the classroom in dynamic functional flows between interlocutors. See, for example, Chronaki, A., Planas, N., & Källberg, P. S. 2022. *Onto/Epistemic Violence and Dialogicality in Translanguaging Practices across Multilingual Mathematics Classrooms*. *Teachers College Record*, 124(5), 108–126
- [15] See Ryan & Källberg, 2024.

© 2024 Authors. This is an open access article distributed under the terms of the Creative Commons Attribution License (CC-BY 4.0), which permits the user to copy, distribute, and transmit the work provided that the original author(s) and source are credited.