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Published in:
Building on the Past to Prepare for the Future

DOI:
10.37626/GA9783959872188.0
10.37626/GA9783959872188.0.083

Published: 01/08/2022

Document Version
Final published version

Document License
Unknown

Trends in Mathematics Education in Finland

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Abstract
Since PISA 2000 there has been a huge international interest towards education in Finland. Are there particular explanations to the PISA-success, a philosophers' stone, to be found? Is it possible to export innovative components found in Finnish schools to other countries and what exactly are these components? Is it about accessibility? Can the successful components be noticed and described? And why has the Finnish PISA-results in mathematics dropped lately? Questions like these have been asked over the years. In the paper I discuss trends in the Finnish public schooling that I find to be of particular importance and highlight changes in the curriculum and trends in mathematics education generally. I connect my arguments to research findings as well as to anecdotal stories.

PISA, public schooling, and teacher education in Finland

Starting from the OECD's Programme for International Student Assessment (PISA) in 2000, Finland has been viewed as a successful country in education, a viewpoint both strengthened and questioned by the results from the following six rounds of PISA (2003, 2006, 2009, 2012, 2015, 2018) (Table 1).

Table 1. The ranks of the Finnish scores in the seven completed PISA rounds. There was no statistical difference between the score points for ranks in 2018.

	2000	2003	2006	2009	2012	2015	2018
Reading literacy	1	1	2	3	6	4	3–9
Mathematical literacy	4	2	2	6	12	13	12–18
Scientific literacy	3	1	1	2	5	5	6–10
Participating systems	32	41	57	65	65	73	79

Over the years the increasing number of participating countries and economies signifies that this multinational assessment of how well education systems prepare students for real-life situations has become an important instrument for educational authorities, researchers, and debaters throughout the world. The Finnish 15-year-old students' success on all three content domains of each of the four first PISA rounds have prompted Finnish academics to offer systemic explanations typically linked to the structural qualities of Finnish schooling and teacher education (cf. e.g. Niemi, Toom and

Röj-Lindberg, Ann-Sofi (2022). Trends in Mathematics Education in Finland, in Morska, Janina & Rogerson, Alan (Eds) *Building on the Past to Prepare for the Future, Proceedings of the 16th International Conference of The Mathematics Education for the Future Project,* King's College, Cambridge, Aug 8-13, 2022 (pp. xxx-xxx). Münster: WTM. htpps://doi.org/10.37626/ GAxxxxxxxxxxxxx.x.xx.

Kallionemi, 2012). Many outsiders have turned to Finland to look for possible explanations for the Finnish results (cf. e.g. Andrews, Ryve, Hemmi & Sayers, 2014; Chung, 2105; Taylor, 2013). Some with an intention to transfer Finnish educational innovations to classrooms in other countries, some ponder over the drop in Finnish scores especially in 2012, and some point to the impossibility of transferring educational innovations between countries as well as to the danger of inaccurate reporting by cultural outsiders due to incomplete understanding of the culturally embedded issues underpinning education in a particular country.

The case of Finland does undeniably indicate that it is possible to develop national educational systems with quality teaching and learning, as well as equity and equality for students. On the other hand, as Säljö and Cestari (2019) write with reference to classroom research, it is an "unsurprising fact that the instructional patterns and normative assumptions differ between countries given how different countries are in other respects" (Säljö & Cestari, 2019, p. 21). This is reflected in a story told in Chung's study (2015) where a Finnish professor in education stated that "Russian visitors think the Finnish schools have no discipline and the students are ill-behaved, while the Swedish 'PISA tourists' believe that Finnish schools have strict discipline and well-behaved students" (Chung, 2015, p. 10). When we are aware of such issues of cultural relativity it becomes clear that possible innovative components found in Finnish schools might not have the similar efficacy in schools in another cultural context (Andrews, 2010; Clarke, 2013). Our theorizing is never culturally neutral. Different cultures value different types of educational, including mathematical, performance (Clarke, 2013).

There is a long tradition of public schooling in Finland (Niemi, Toom & Kallioniemi, 2012). In 1921 a law was passed which required access to general compulsory education. But a National Core Curriculum for *all* students is a fairly new invention. Before implementation of the 1968 Basic Education Act, which stated that all children from the age of 7 should attend the same comprehensive school for their first nine years of education, Finland had two parallel education systems which placed children on different educational routes at an early age. However, with the introduction of comprehensive schools in the 1970s all children became entitled to quality basic education, regardless of where they live or socio-economic background. This principle has guided school development ever since, promoting between school equality and equality related to family background. Nevertheless, some worrying indications of growing inequality between students and schools in Finland have appeared lately. The results from the 2019 Trends in International Mathematics and Science Study (TIMSS) showed increasing difference between students' early literacy and numeric skills. The skills level has declined especially for those students who have the weakest learning resources at home (see Vettenranta, Hiltunen, Kotila, et. al, 2020). The latest national assessment of learning outcomes in mathematics in the 9th grade show that differences in average achievement levels between schools seem to increase furtively (Metsämuuronen & Nousiainen, 2021).

There are only a few private schools including religious schools in Finland, and all are required to follow the National Core Curriculum. There are no compulsory national tests in basic education. There are some national tests available in mathematics, English and Swedish, but those are voluntary, and teachers can choose if they want to use those or not. In Finland teacher education support teachers' role to work as high-quality professionals. Since more than three decades primary school teachers and secondary school teachers in Finnish comprehensive schools must have Master-degrees, in pedagogy (primary school teachers) or in subjects (secondary school teachers). The popularity of the profession is high, which means that hardly any shortage of teachers exists in Finland. Teacher training within teacher education is arranged through university practice schools, where teacher educators and mentors supervise the students. Society's trust in teachers is high, albeit not necessarily reflected in the teacher salaries, and students generally have a high respect for their teachers.

Comprehensive school is well-equipped, provide free school meals for all, invests substantially in special educational needs support, and is so well regarded that despite the right to choose alternatives parents continue to choose their local school. Unlike the other Nordic countries, people in Finland remain positive about education policy irrespective of the politics of the party in power. Chung (2015) cites the Finnish subject teachers Jouko and Kjell. Jouko thinks that "Finnish society respects and values teachers more [than in Scandinavia]. It is not financial, but it is status. Teachers and doctors are respected [in the same way]". Kjell thinks that compared to its neighbour country Sweden the students in Finland have better study skills and go further and deeper in subjects (Chung, 2015, p. 9). Schools also instil a work ethic in their students. In Finland, students try their best in school, even if they do not necessarily enjoy it (see e.g. Röj-Lindberg, 2017).

Trends and changes in mathematics education

The main goal of Finnish educational policy from the 1980s was to increase the autonomy of the municipalities and individual schools. In the curriculum reforms in the 1980s, 1990s and 2000s higher standards were set for all students, access to successful learning for all students became the focus point of education and local authorities received autonomy to organize schools, education processes and funding.

With the National Core Curriculum reform in 1985, under the slogan "a school for all", the practice of streaming students was abandoned in lower secondary school, hence also in mathematics. Now there was only one math program in the compulsory phase of education and the mathematics teachers had to adjust their teaching to the learning of individual students in heterogeneous groups. This was a demanding task for mathematics teachers as they were educated during times of two parallel education systems.

In line with the new curricular guidelines in 1994 school-based shared decision-making became a central part of formulating local curricula. One important aim was to reform traditional classroom practices by moving to a

more student-centred curriculum, learning how to learn and think, and to increase the possibilities of the schools and teachers to innovate. These expectations of the curriculum implicated teachers to restructure their practice and represented a radical departure from established practice, not necessarily welcomed by all. The old curriculum from 1985 was encapsulated in detailed regulations that told teachers what to do. Also, in some schools the enthusiasm about innovations and progress was hampered due to the recession in the 1990s resulting in larger classes and less time and support for in-service training and collaborative work with colleagues. The mathematics teachers I worked with in an action research process for several years in the middle and late 1990s, welcomed the new freedom to innovate offered by the curricular guidelines. They found themselves trapped in the patterns of the traditional classroom routines and saw a clear need for more active students, as also proposed by the 1994 curricular guidelines. "How do you think here?" became a common question in their classrooms (Röj-Lindberg, 2013), basically reflecting a constructivist perspective on learning, as well as two pedagogical practices shown to facilitate students' mathematical competence: to build instruction on students' mathematical thinking and to encourage the development of mathematical language (see Anthony & Walshaw, 2009). The teachers in my study expected the restructured practice to afford them new and better tools for addressing the academic and motivational heterogeneity in the student groups and they told me about the nice sense of success they had experienced because of giving students more time to think and devoting more time to mathematical discussions in whole class.

A common ground and a shared reason for them to be involved in the restructuring process was the view that their traditional approach to mathematics teaching was insufficient. They described the traditional approach as "too theoretical" and with far "too little realistic mathematics" and far too much "bumping around with rules", "too little time to think" and with "too much reliance on conventional tests". The learning content should, the teachers argued, include more than mathematics. It should also include norms related to how a student is expected to act in the mathematics classroom both socially and mathematically.

The following comprehensive curriculum reforms in 2004 and 2014 were more centralized. Compared to 1994 - a text comprising only approx. 100 pages - they were detailed and brought with them an increased emphasis on development of teaching through ongoing evaluation and interdisciplinary pedagogy. The 2004 National Core Curriculum tried to narrow down differences in local implementation of the guidelines, and national criteria for student assessment was introduced for the first time. Both the 2004 curriculum reform and the subsequent 2014 curriculum reform were perhaps partially reflections of the evaluation of the 1994 curriculum reform (see Norris, et. al, 1996) which was critical of how the 1994 reform had worked out in practice. The team of evaluators saw much traditional whole class teaching in Finnish comprehensive schools and "not much evidence of, for example, student-centred learning or independent learning" (Norris, et. al, 1996, p. 85) and they

suggested much more involvement and sustained contributions of researchers and others who could support innovations in schools.

In the 2.5–year long curriculum design process ending in a new core curriculum 2014 hundreds of professionals were involved. This curriculum became effective in August 2016. The basis of the curriculum is still national, municipalities do their own alignments and schools decide on the details. Every school interprets the curriculum in their own way (see examples in e.g., Lähdemäki, 2019). The local curriculums are binding for the teachers but there are no sanctions or other forms of punishment if schools or teachers do not adhere to it. Contrary to interpretations of outsiders (e.g., Garner, 2015), the approach to teaching and learning is still very clearly subject-based. The 500-page document consists of values, objectives, and general principles that number around 100 pages. The rest of the document covers the subject syllabi for each of the close to 20 subjects included in it. From the point of view of a subject teacher the biggest change that the new curriculum brought with it is perhaps that the overall goal for basic education now focuses on the learning of transversal competencies. According to the curriculum, each student must have a project-based learning module at least once a year. What this means more concretely is to be defined by individual municipalities, schools and through teacher collaboration. There are not much research results yet on how this curriculum has played out in comprehensive schools. There are however some indications that the Finnish mathematics classroom practice continues its traditional route like that exemplified by Norris and his colleagues (Norris, et. al,1996).

Final comments

I argue that there are no *particular* explanations neither to the PISA-success, nor to the declining trend that seems to be the fact since 2012. Those researchers may be right that assume high attainment by Finnish students with respect to PISA to be more linked to cultural values in the Finnish society than to *specific* mathematics teaching practices (e.g., Andrews, Ryve, Hemmi & Sayers, 2014; Simola, 2015). One such cultural value is the expectation that students discuss their mathematical learning at home and do homework. Also, findings from research on Finnish teacher students show most students had not only received help with mathematics from their parents but also that the family encouraged positive attitudes towards the subject.

Finland's mathematics educators themselves are not really surprised by the declining rankings. Mathematics in grades 7-9 is taught only three or four times a week, for a total of 135-180 minutes per week (a schoolyear is 38 weeks long). This is not a lot compared for instance to a high-ranking country like South-Korea, a country with an otherwise quite similar collective mindset to that of Finland (Simola, 2015). Also, the decline in scores since PISA2012 might show the possible effect of increased immigration in Finland. While immigrants in Finland traditionally perform well in PISA an increasingly diverse population in Finland has brought new challenges for teachers and the education system.

References

Andrews, P. (2010). The importance of acknowledging the cultural dimension in mathematics teaching & learning research. *Acta Didactica Napocensia*, 3(2).

Andrews, P., Ryve, A., Hemmi, K., & Sayers, J. (2014). PISA, TIMSS and Finnish mathematics teaching: an enigma in search of an explanation. *Educational Studies in Mathematics*, 87, 7–26.

Anthony, G., & Walshaw, M. (2009). Characteristics of effective teaching of mathematics: A view from the west. Journal of Mathematics *Education*, 2(2), 47–164.

Clarke, D. (2013). Contingent conceptions of accomplished practice: the cultural specificity of discourse in and about the mathematics classroom. *ZDM Mathematics Education*, 45, 21–33. Doi: 10.1007/s11858-012-0452-8

Garner, R (3 mars 2015). Finland schools: subjects scrapped and replaced with 'topics' as country reforms its education system. *The Independent*. https://www.independent.co.uk/news/world/europe/finland-schools-subjects-are-out-and-topics-are-country-reforms-its-education-system-10123911.html

Lähdemäki, J. (2018). Case study: the Finnish national curriculum 2016 – a co-created national education policy. In J. Cook (Ed.), *Sustainability, human well-being, and the future of education* (pp. 397–422). Palgrave Macmillan.

Metsämuuronen, J., & Nousiainen, S. (2021). *Mathematics in the shadow of covid-19 pandemic– Achievement in mathematics at the end of 9th grade in spring 2021*. Finnish Education Evaluation Centre (FINEEC).

Niemi, H., Toom, A., & Kallionemi, A. (Eds.) (2012). *Miracle of education: the principles and practices of teaching and learning in Finnish schools*. Sense Publishers.

Norris, N., Aspland, R., MacDonald, B., Schostak, J., & Zamorski, B. (1996). *An independent evaluation of comprehensive curriculum reform in Finland*. National Board of Education.

Röj-Lindberg, A-S. (2013). Finnish mathematics teachers talk about restructuring practice. *Networks. An On-line Journal for Teacher Research*, 15, 1–17.

Röj-Lindberg, A-S. (2017). *Skolmatematisk praktik i förändring – en fallstudie. (School mathematics in the process of change – a case study).* Doctoral thesis. Åbo Akademi University.

Simola, H. (2015). *The Finnish Education Mystery: Historical and sociological essays on schooling in Finland*. Routledge.

Säljö, R., & Cestari, M. L. (2019). Researching classrooms in search of learning: Theoretical and methodological considerations. In C. Kilhamn & R. Säljö (Eds.), *Encountering algebra. A comparative study of classrooms in Finland, Norway, Sweden, and the USA* (pp. 13–21). Springer.

Taylor, A. (Dec 3, 2013). Finland used to have the best education system in the world – what happened? https://www.businessinsider.com/why-finland-fell-in-the-pisa-rankings-2013-12?r=US&IR=T

Vettenranta, J., Hiltunen, J. Kotila, J., et. al (2020). *Tulevaisuuden avaintaidot puntarissa. (Rethinking future key-knowledge).* Koulutuksen tutkimuslaitos.