

Mathematics Teacher Development in Finland: Lessons Learned from a Joint U.S.-Finnish Workshop

Katie Hendrickson, Jenny Marshall, Janine Remillard, and John Staley



What do you think?

You've heard that Finland school children are typically ranked at the top of international tests. . .

- Why do you think this is?
- What factors in the school system or the general culture do you think contribute to this success?



Supporting Mathematics Teachers and Teaching in the US and Finland: A Bilateral Workshop*

Planned by the US National Commission on Mathematics Instruction (USNC/MI)

August 1-2, 2016 at the University of Helsinki

Participants: 16 mathematics educators and teachers from each country

4 sessions (presentation from each country, discussion)

- Overview of the system and challenges

- Teacher Education

- Professional Development

- Reflections and next steps

*Funded by National Science Foundation



Overview

1. Brief introduction to Finnish education system
2. Share critical features
 - Focus on equity
 - Local autonomy
 - Intensive teacher education
 - Professional development options
3. Questions/Discussion



Finland



Population
5.5 Million

similar to Minnesota,
22nd most populous state

Size
130,000 mi²

slightly larger than New Mexico,
5th largest state

Official Languages
**Finnish and
Swedish**

Finnish: 89%
Swedish: 5%

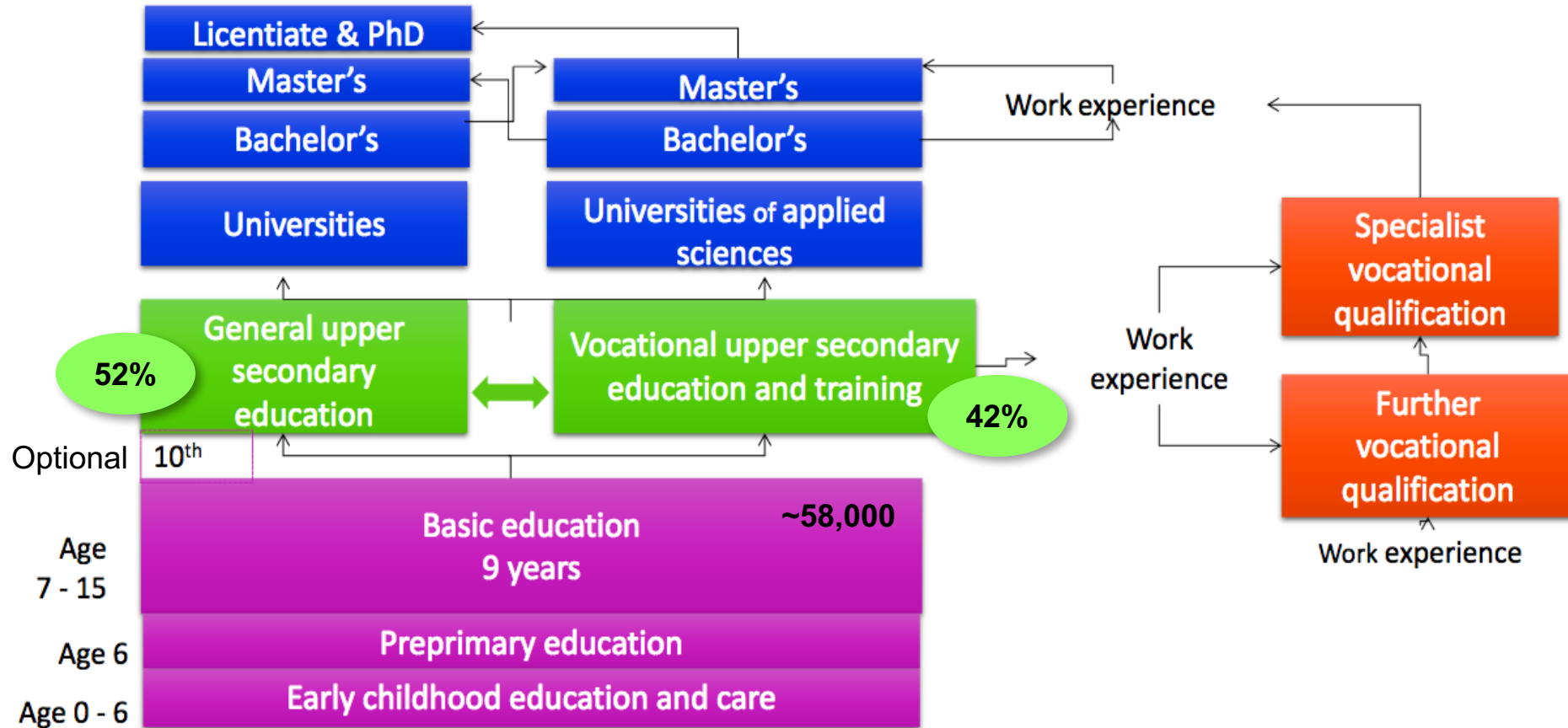
Finnish Education



FINNISH NATIONAL
AGENCY FOR EDUCATION

- Basic model for education put in place in the 1970s- originally a top down approach; revised in the 1990s to honor local input and control
- Compulsory education through grade 9
- Strong system of academic and vocational secondary schools
- An intensive approach to teacher selection and education
- Overseen by Finnish National Agency for Education (formerly the National Board of Education), which is under the Finnish Ministry of Education and Culture
 - Establishes educational policies
 - Sets national curriculum, revised ~ every 10 years

Educational Structure publically funded, “no dead ends”



Equitable Approach

Katie Hendrickson



Myth or Fact?

Most students in Finland attend a school that has **under 300 students.**

All students have a right to be **educated in one of two official languages:** Finnish or Swedish.

From the Finnish Constitution



Everyone has the right to basic education **free of charge**. The public authorities shall guarantee for everyone equal opportunity to receive other educational services in accordance with their ability and special needs, as well as the opportunity to develop themselves without being prevented by economic hardship.

Educational Equality is a *cornerstone* of the Finnish education system

- Public schools are free to all students, including things like books, transportation, and meals
- Free education at all levels (including pre-primary & higher ed)
- Everyone has the right to be educated in their mother tongue (Finnish, Swedish)
 - ➔ Speakers of other languages have the right to receive administrative services and some lessons in mother tongue
- Variance of performance between schools:
Finland: 8%; OCED average: 30% [PISA, 2015]

Finland has **no streaming, no selection,**
no magnet schools with a special curriculum
to draw students from wider areas.

Which Country?

Finland

Average class size

Primary: 19

Secondary: 20

School size

44% of schools have fewer than 100 students (12% of all students)

22% of schools have greater than 300 students (54% of all students)

United States

Average class size

Primary: 21

Secondary: 27

School size

Mean: 525

Myth or Fact: Revisited

Most students in Finland attend a school that has **under 300 students**.

FALSE

All students have a right to be **educated in one of two official languages**: Finnish or Swedish.

TRUE

Teachers' Autonomy

Jenny Marshall

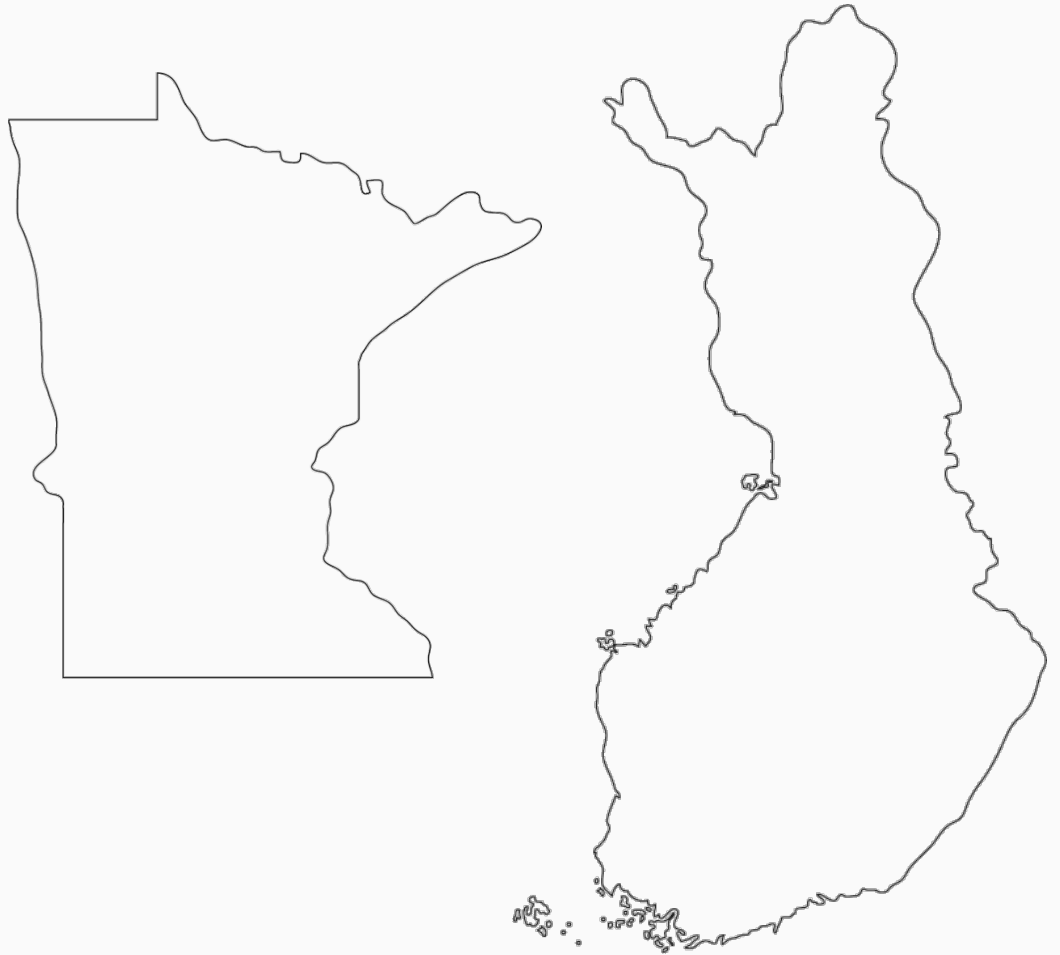


Myth or Fact?

The Finnish government uses **standardized testing** to ensure accountability across schools.

Finnish teachers get to **choose which textbook** they would like to teach from .

What are you
studying
to be?



The Teaching Profession



More important than salaries are such factors as **high social prestige**, **professional autonomy** in schools, and the **ethos of teaching as a service to society and the public good**.

Thus, young Finns see teaching as a career on par with other professions where people work independently and rely on scientific knowledge and skills that they gained through university studies.

– *Pasi Sahlberg*

Autonomy in Curriculum Design

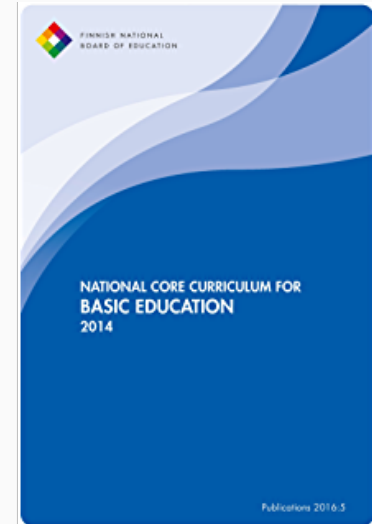
National Core Curriculum is created by
Finnish National Agency for Education

Minimum lesson
hours per subject

Objectives and
core contents for
different subjects

Special-needs
education and
pupil welfare

Principles of
assessment and good
learning environments



Autonomy in Curriculum Design

National Core Curriculum is created by
Finnish National Agency for Education



Local education authorities (teachers, principals, schools)
plan local curricula based on the National Curriculum

(take local needs and perspectives into consideration)



Autonomy in Curriculum Design

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Teachers choose learning materials



Autonomy in Curriculum Design: Recent Changes

Two recent changes in the National Core Curriculum:

- Computational thinking (i.e. coding)
- Multidisciplinary learning modules

Teachers view themselves as professionals and take on these new responsibilities with **competence, confidence, and creativity**.



Autonomy in Assessment

- **No school inspections or national exams** used for accountability
 - There is one national exam at the end of upper secondary school
 - Sample-based monitoring is used in the core subjects
- **Local authorities** develop assessments as they plan the curriculum to monitor quality assurance
- Assessment is used to **improve teaching and learning**
- **Culture of trust:** teachers are autonomous academic professionals

How autonomy plays out in school



→ Teachers spend *less* time in the classroom

	Finland	United States
Length of school year	190 days	175–180 days
Instructional time	600 hr / yr	900–1000 hr / yr
% of day that teachers are in the classroom	52–60% of the day	80–85% of the day

→ Some of their most important work is outside the classroom

- ◆ curriculum and assessment development
- ◆ experimenting and improving instruction

Myth or Fact: Revisited

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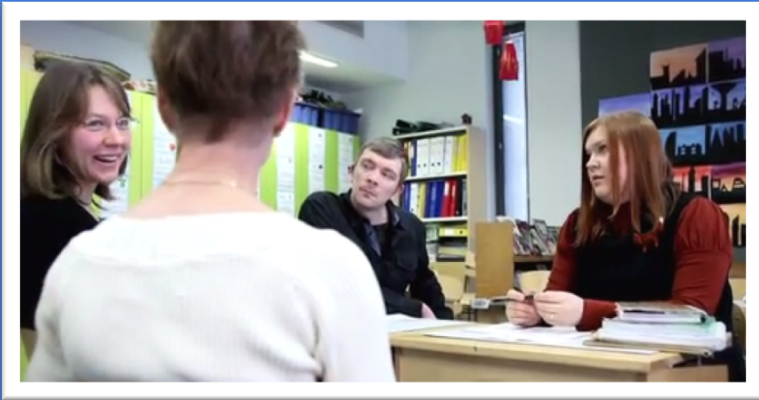
FALSE

Finnish teachers get to **choose which textbook** they would like to teach from.

TRUE

Teacher Education

Janine Remillard

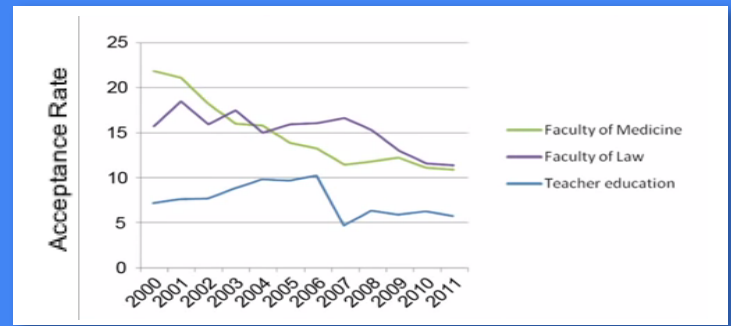


Myth or Fact?

Like the United States, Finland is experimenting with **alternative pathways** to preparing teachers.

It is **very difficult** to become a teacher in Finland.

Becoming a Teacher



Primary School Teacher

Teaches grades 1 to 6 (ages 7 to 13)

Typically qualified to teach all primary school subjects

Two-phase entrance process:

- 1) written exam on academic kn. (25% →)
- 2) Interview--social skills, view of profession (30% →)

Overall: ~8% acceptance rate

1564 applicants for 120 spots (2015)

Subject School Teacher

Typically teaches grades 7 to 12 (13 to 19 yrs)

Qualified to teach only in his/her major or minor subjects (typically two school subjects)

Major / minor replace written exam

Application process involves interview

Acceptance rate varies by subject area

~67% of mathematics applicants are selected

Overall: ~72% acceptance rate

605 applicants for 434 spots (2015)

University Curriculum Overview

Primary School Teacher

- 5 year program (3 BA + 2 MA)
- Major: Education
- Minors: typically 2 or 3 school subjects (Finnish, math, biology, geography, etc.)

Subject Teacher

- 5 year program (3 BA + 2 MA)
- Major: one school subject
- Minors: 1 or 2 additional subjects
- Additional Minor: pedagogical studies

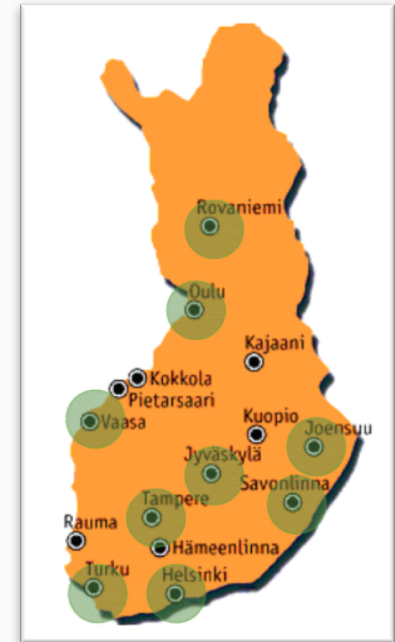
Unique Features

University-based design

- 9 universities are responsible for all teacher education
- Subject-specific pedagogical courses provided by some polytechnics
- Emphasis on research and theory applied to practice

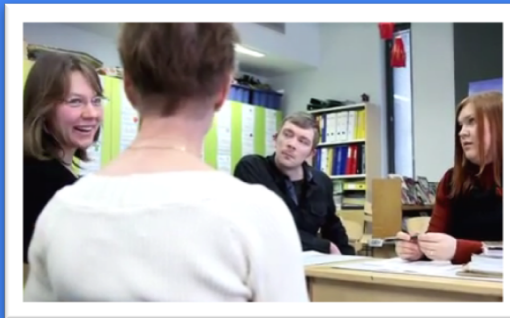
Strong connections to teacher-training schools

- 11 teacher training schools, associated with university teacher education programs, play central role
- Teachers are part of teacher education faculty
- Supervise and mentor student teachers
- Participate in research



Integrating Theory and Practice

*We teach what we research,
and research what we teach.*



Theoretical Aims

- Learn about research-based practices
- Learn to engage in systematic inquiry (master's thesis)
- Learn how children learn particular content
- Become aware of their practical theories and views on educational matters
- Mature as a pedagogical thinkers and decision makers
- Grow into the profession



Practical Experience and Support

- Extensive field experience in teacher-training school
- Collaborative planning (~6 weeks)
- Implement plans in classroom (2 weeks)
- Collaborative debriefing, feedback from
 - Peer student teachers
 - University-based supervisor
 - Classroom teacher
 - Self reflection

Myth or Fact: Revisited

Like the U.S., Finland is experimenting with **alternative pathways** to preparing teachers.

FALSE

Teacher education is systematic, extensive, and coherent

It is **very difficult** to become a teacher in Finland.

TRUE

Between 8 and 72% of applicants (depending on level and subject)

Professional Development

John Staley

Myth or Fact?

All professional development is provided by the Ministry of Education and Culture.

Teachers have great choice in the types of professional development.

Computational Thinking and Programming have been a part of the Finnish standards for the past 5 years.

Current Topics: Programming



The new national curriculum framework for primary education in Finland:

The curriculum does not use the word “code”. It talks about computational thinking (Finnish: algoritminen ajattelu) and programming.

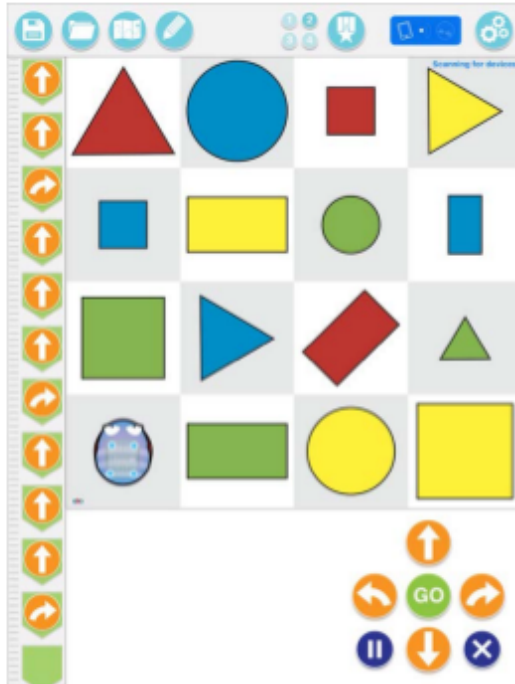
Programming is seen as a way to achieve computational thinking, but also to foster creative expression, increase motivation in general and interest in STEM, and to develop problem solving and logical thinking skills.

Coding is not a separate subject area.

Coding is not a specific course.

Coding is mandatory in both primary and lower secondary education.

Current Topics: Programming



Mathematics

2nd grade : “Familiarisation to the basics of programming starts by creating sequences of instructions that are also tested.” (OPS 2016, 129)

6th grade: “The pupil can code a working program using a visual programming environment.” (OPS 2016, 239)

9th grade: "The pupil can apply the principles of computational thinking and program simple programs." (OPS 2016, 379)

Current Topics:

Activity-based teaching of mathematics

Important principles describing the method

- authentic experiences so children make ground for the construction of mathematical concepts
 - rich use of manipulatives
 - stepwise progression from the concrete to the abstract
 - emphasis on grounding conceptual thinking of children
 - emphasis on the use of language in learning and encouragement of children of not being afraid of doing mistakes
 - debating and being joyful when studying mathematics
- (Ikäheimo & Risku, 2004)

In-service Teacher Training Formats & Providers

- One-day courses
- Short first-aid (1 h) workshops
- Online courses
- Courses purchased from universities
- Regional State Administrative Agencies
- Universities
- Associations
- Industry

In-service Teacher Training Formats & Providers

- **Math lands** in Finland (matikkamaat) are local pedagogical centers where teaching of mathematics is developed for students from the pre-school to the upper secondary school.
- **Commercial tool-specific courses** for subject teachers in the use of technology - tool-specific courses for mainly subject teachers to help teachers adapt new technology into their teaching of mathematics.
- **Matriculation examination courses** for teachers to learn the use of the particular programs and calculators used in the tests.

In-service Teacher Training Formats & Providers

The Finnish Association for Teachers of Mathematics, Physics, Chemistry and Informatics

MAOL - Annual conferences of MAOL are popular among subject teachers.

LUMA - centre Finland -organizations in Finnish universities – teachers and students

- *A vision for LUMA is to guarantee high quality of competence in mathematics, science, technology and information technology in Finland in the future.*
- The mathematics subprogram focuses on investigative/problem based learning of mathematics, use of technology for teaching and working life connections

Professional Development

“Many different organizations and people groups arrange in-service teacher training in Finland. It is often enthusiastic individuals or groups who organize and offer the courses....Also commercial companies participate in arranging courses.”

“It may be that in the future more of the money is directed to municipalities which then order teacher training according to their needs.... Teachers share ideas and opinions in the social media.”

Myth or Fact: Revisited

All professional development is provided by the Ministry of Education and Culture.

FALSE

Teachers have great choice in the types of professional development.

FALSE

Computational Thinking and Programming have been a part of the Finnish standards for the past 5 years.

FALSE

What is one take-away for you and your work?

You've heard that Finland school children are typically ranked at the top of international tests. . .

- Why do you think this is?
- What factors in the school system or the general culture do you think contribute to this success?





Thank you!

USNC/MI website: <http://sites.nationalacademies.org/PGA/biso/ICMI/>