Promoting teachers' professional development in mathematics education in Finland: examples of recent trends

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1) In-service teacher training in programming
2) In-service teacher training in mathematics education

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In-service teacher training in programming

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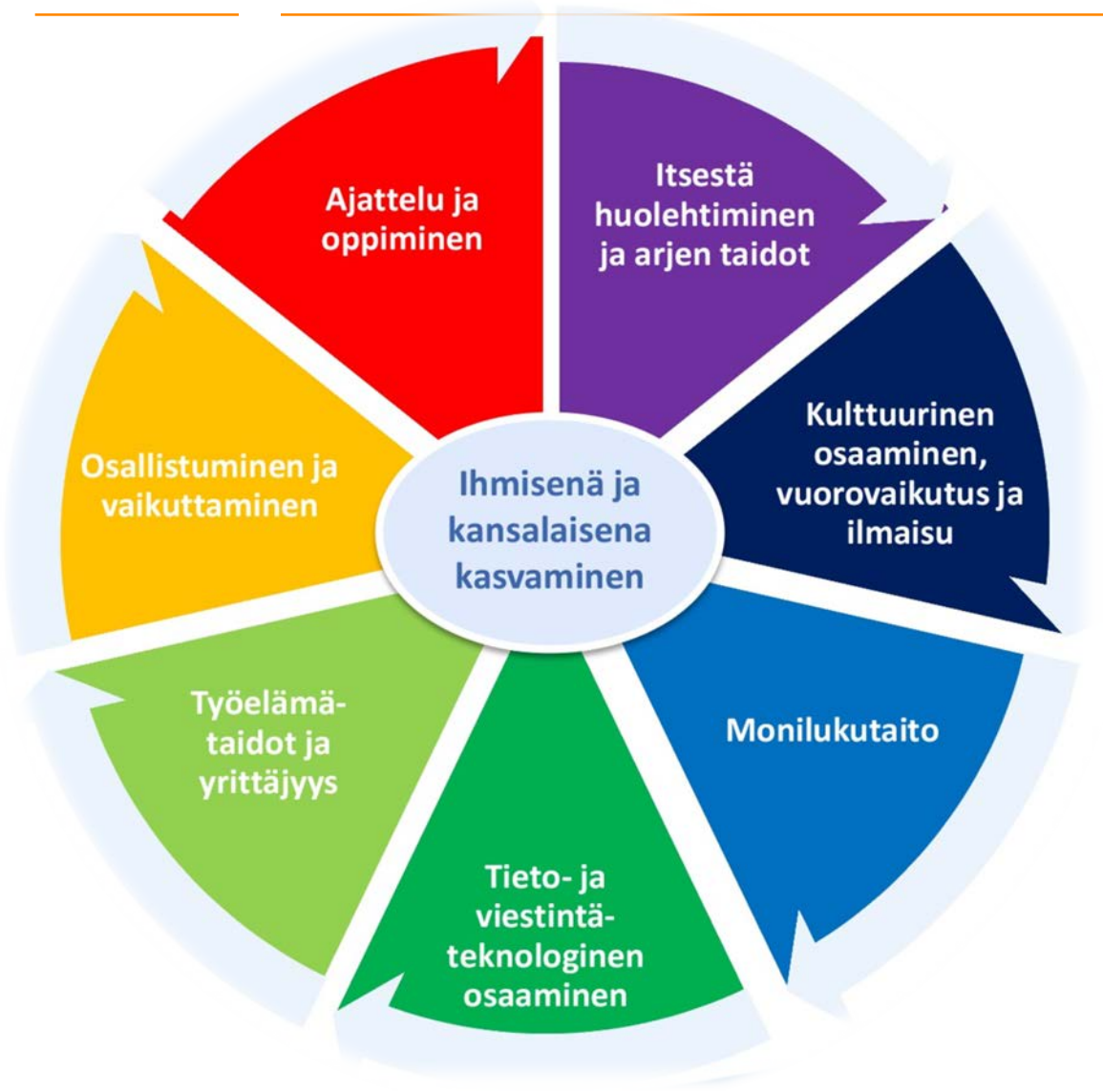

Programming is part of all subjects. The curriculum has 7 wide competence areas that overarch subject areas. One of them is ICT competences, and coding is positioned there

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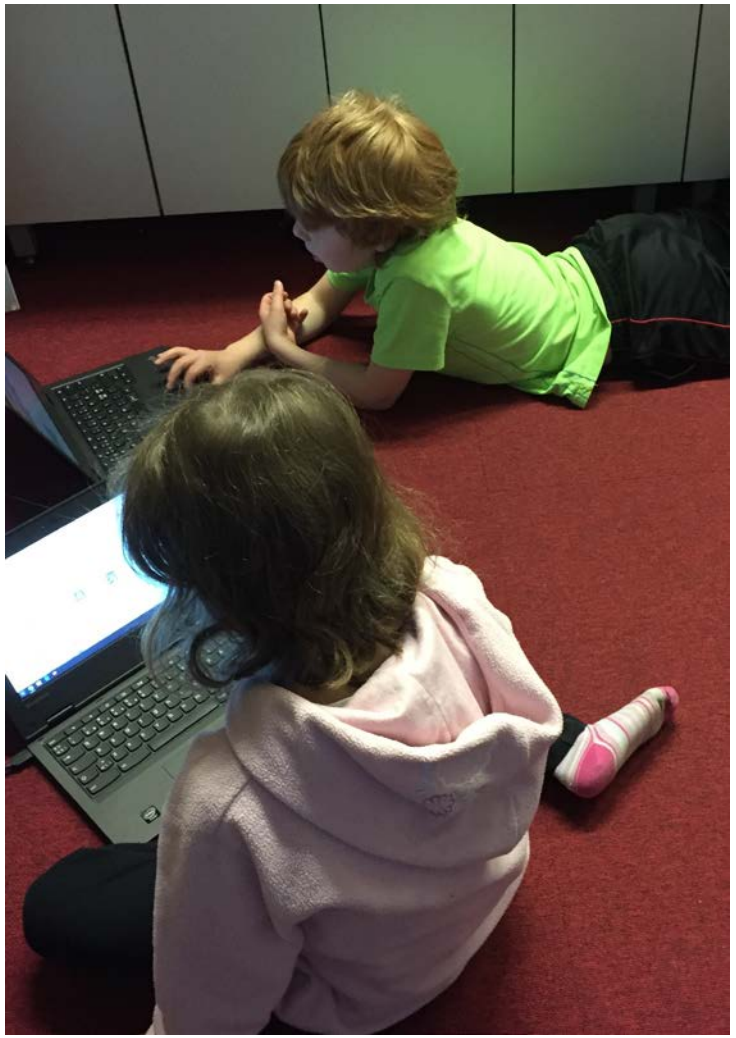

The new national curriculum framework for primary education in Finland:

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.

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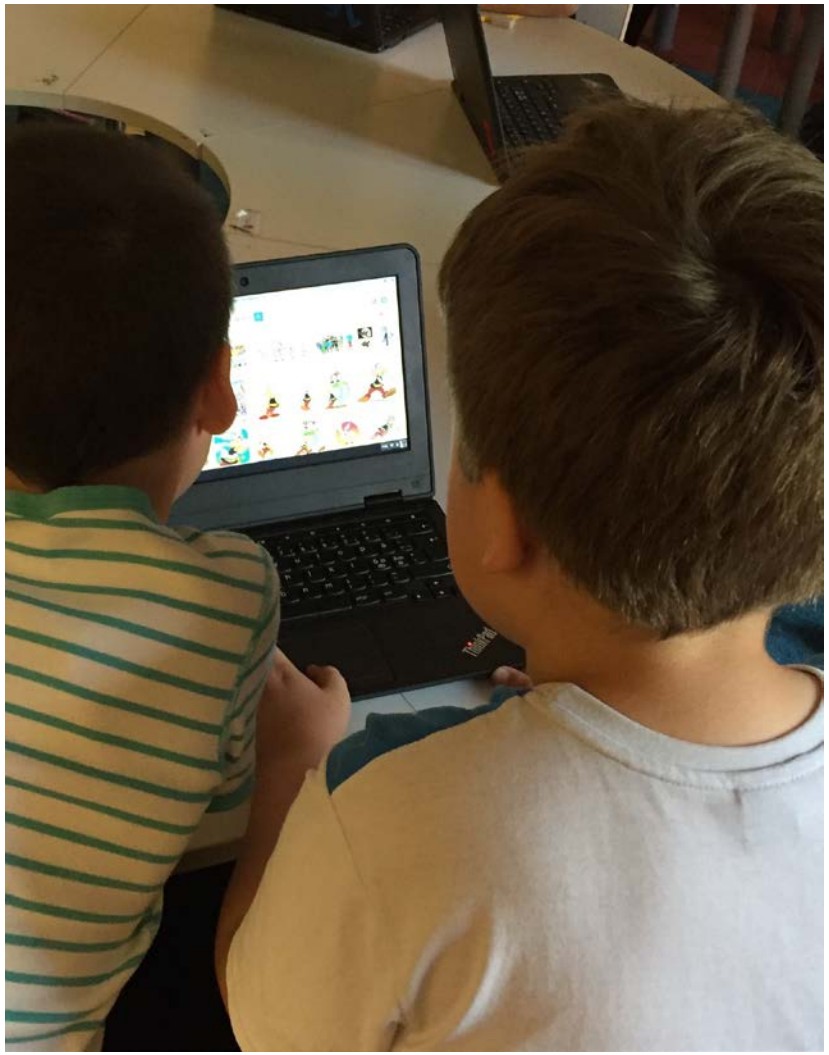

Some example requirements *(translations by Tarmo Toikkanen):*

ICT competences

grades 1-2: “Pupils receive and share experiences in working with digital media as well as age-suitable programming.” (OPS 2016, 101)

Igrades 3-6: “While experimenting with programming, pupils gain experiences on how the functioning of technology depends on human made decisions.” (OPS 2016, 157)

grades 7-9: “Programming is rehearsed as part of the studies of various subject areas.” (OPS 2016, 284).

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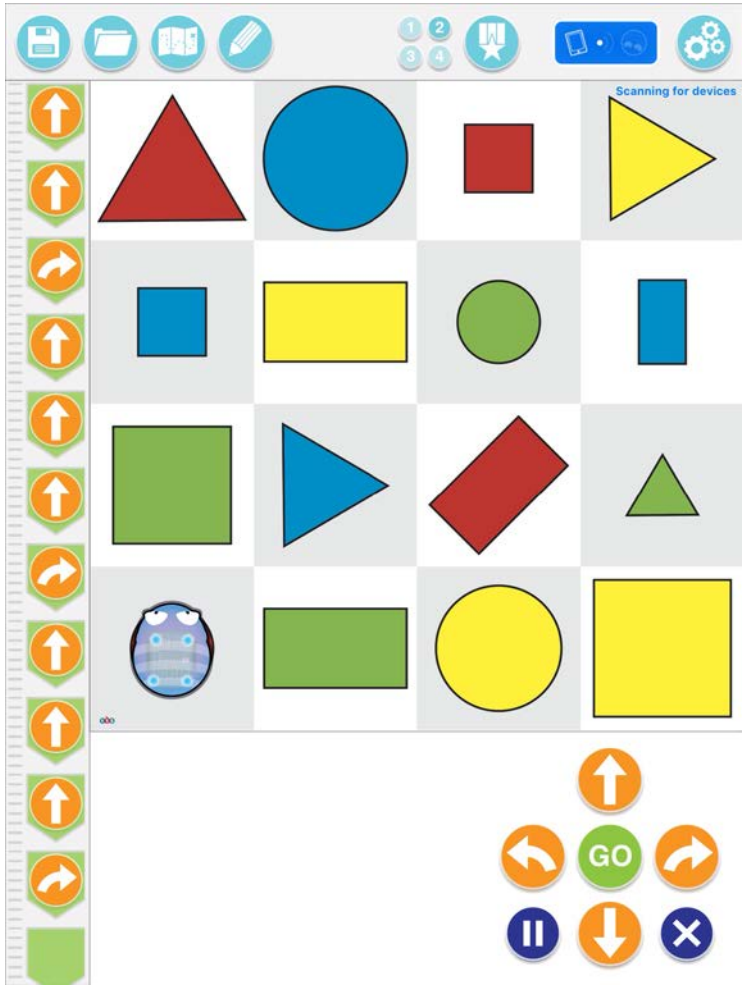

Mathematics

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)

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KOODIAAPINEN-MOOC

free-of-charge

tailored for Finnish primary school teachers.

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- theoretical sections on computational thinking
- pedagogical sections
- hands-on exercises
- four options: ScratchJr for K-2, Scratch for 3-6, Racket or Python for 7-9

two MOOCs last year: one in autumn 2015 and other this spring

a grassroots effort, mainly built by the efforts of volunteers

it-kouluttajat

Innokas!

Aalto-yliopisto
Taiteiden ja suunnittelun korkeakoulu

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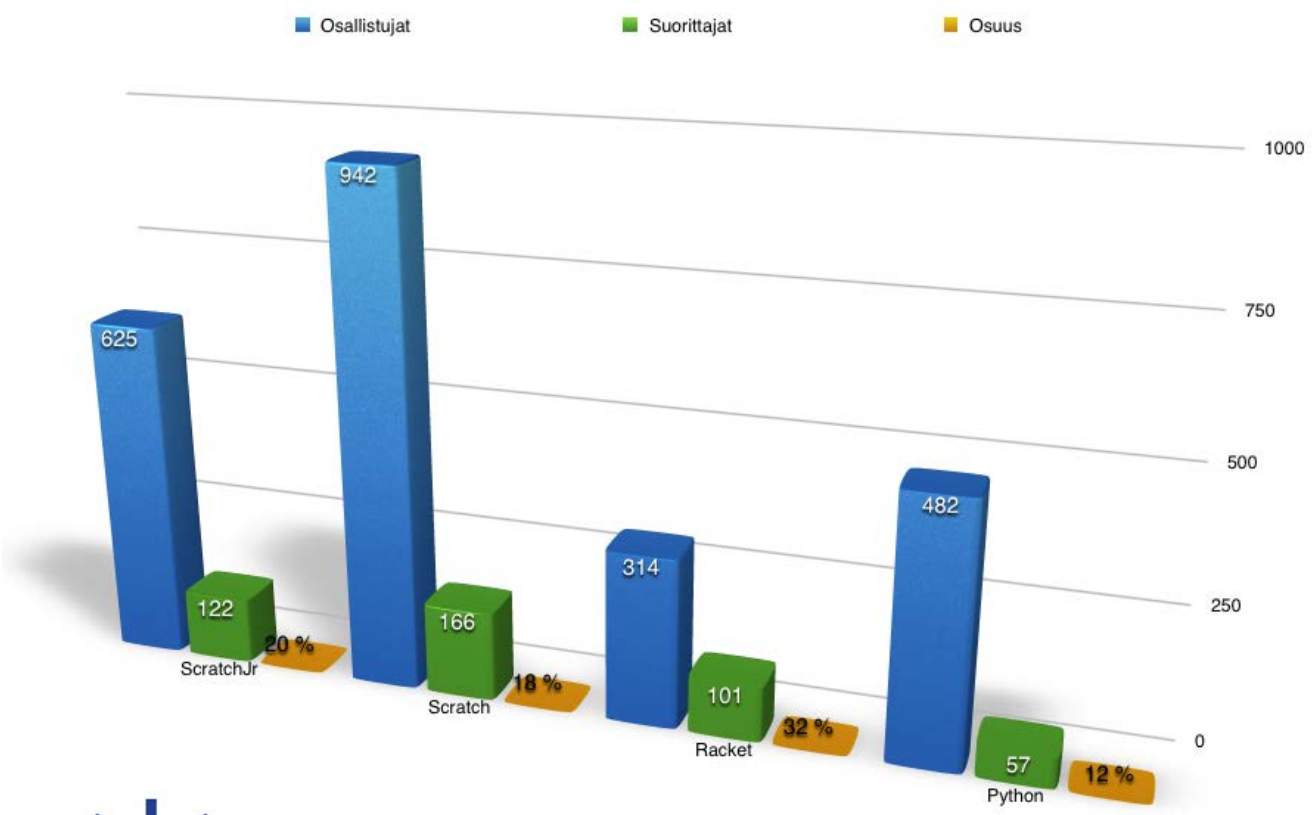
Code-ABC -MOOC last spring



- Nearby 1000 teachers have passed this course.
- The third MOOC begins 15.10.2016
- We use Aalto-University´s A+-platform, paddle und rubyric-platforms.
- We have got very satisfied feedback.

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Innokas-project

- Funded by the Finnish National Board of Education
- Coordinated by the Learning centre Innokas in the University of Helsinki and Koulumestarin koulu elementary school in Espoo
- Consists of a network of 60 schools where models that support innovative education, especially in information and communication technology, are developed.
- Methods of working include development work at the schools, clubs for children, national competitions in robotics for children, in-service teacher training etc.
- The main goal is to encourage and support children, teachers, and other actors in schools as well as collaboration partners in creativity and innovation, and in utilizing technology in versatile ways.
- Special focus of the Innokas project is on utilizing robotics in supporting teaching and learning.
- http://www.innokas.fi/about/

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In-service teacher training in programming in Lapland

- One-day courses of the national tour of Innokas project
- Short first-aid (1 h) workshops by LUMA-centre Lapland in different places
- One-day courses organized by the Regional State Administratvie Agencies
- Courses (mostly one-day) organized by the Unit of Continuing Education of the Faculty of Educational sciences in the University of Lapland and ordered by schools or municipalities.
- Team of innovative developers and teachers from the Innokas team in Lapland, the Lapland University of Applied Sciences and University of Lapland have been teaching the courses.

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In-service teacher training in Mathematics education in Finland in general

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Varga-Nemenyi assosiation and the movement of activity based teaching of mathematics

- A method for teaching mathematics to children developed by Hungarian Tamás Varga and Ester C. Neményi in the 60s and 70s became to be called Varga-Nemenyi method
- Important principles describing the method are that authentic experiences of children make ground for the construction of mathematical concepts, stepwise progression from the concrete to the abstract, rich use of manipulatives, emphasis on grounding conceptual thinking of children, emphasis of the use of language in learning and encouragment of children of not being afraid of doing mistakes, debating and being joyful when studying mathematics (Ikäheimo & Risku, 2000).

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- Varga-Nemenyi association in Finland aims in promoting teaching and learning of mathematics through the Hungarian Varga-Nemenyi method. They work to adapt the method to the present Finnish education (Webpage of theVarga-Nemenyi association, retrieved on the 31st of June 2016, http://varganemenyi.fi/koulutus/kurssikalenteri?page=1)
- Varga-Nemenyi association is active in organizing in-service teacher training courses (in August 2016, alone, they offer 8 courses in different cities in Finland)
- The movement has in general influenced Finnish teaching of mathematics. Nowadays, other instances, too, arrange courses for teachers in activity based mathematics (toiminnallinen matematiikka) without directly referring to the Varga-Nemenyi method.

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Math lands and MAOL

- Math lands in Finland (matikkamaat) are local pedagogical centers where teaching of mathematics is developed for students from the pre-shool to the upper secondary school. The ten math lands in the country work under the educational agency of a municipality or in a university.
- Math lands have manipulatives for students to work with or schools to borrow, they organize in-service teacher training courses in their region, they develop teaching materials etc. Each math land works in it’s own specific way.

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LUMA-centre Finland, LOGO

- There are 13 regional LUMA-centres, which are organizations in Finnish universities.
- The centres form a network, which is led according to a common startegy.
- The first center was established in 2003 in the University of Helsinki. Funding of the Ministry of Education and Culture increased the number of the centers significantly, and many centers were established in 2014 – 2016.
- A vision for LUMA is to guarantee high quality of competence in mathematics, science, tehcnology and information technology in Finland in the future.
- The most important mission of LUMA is to inspire 3 – 19 years old girls and boys to investigate topics in LUMA-subjects and encourage them to choose to study LUMA-subjects in their studies.

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- LUMA also aims at supporting future and present teachers' and counsellors' lifelong learning and research on teaching of LUMA-subjects.
- LUMA-centers try to unite different actors in the field to work for the common aim. They try to follow their slogans: Joy of comprehendig for all! and Together we are more!
- LUMA centers work in creative and innovative ways, keeping up-to-date. One example of that is the StarT-project.
- http://www.luma.fi/keskus/

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LUMA-Finland development project

- Program funded by the Ministry of Education and Culture in 2014 – 2019
- Part of the money the ministry gave for LUMA work is directed to wide and intensive development work, which supports the introduction of the new curriculum and teaching in line with that.
- The main goals of the program are to increase the motivation of 6 – 16 year old children and young people to study natural sciences, mathematics and information tehcnology and to develop working methods in schools more child centered, investigative and activity based ways. Also connections to everyday life and working life are emphasized for increasing the motivation.

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- The program is divided into three subprograms:

1) **Investivative/problem based learning of mathematics, technology for teaching and working life**,
2) Investigative learning in natural sciences and enviromental education, technology for teaching and working life and
3) Technology education, programming and robotics and information society.

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