

**OUR CENTRE:
15-YEAR-
ANNIVERSARY
IN 2018**

ENGAGING FUTURE MAKERS -KIDS AND YOUTH- IN STEM EDUCATON

Maija Aksela

Dr, Professor, Research director

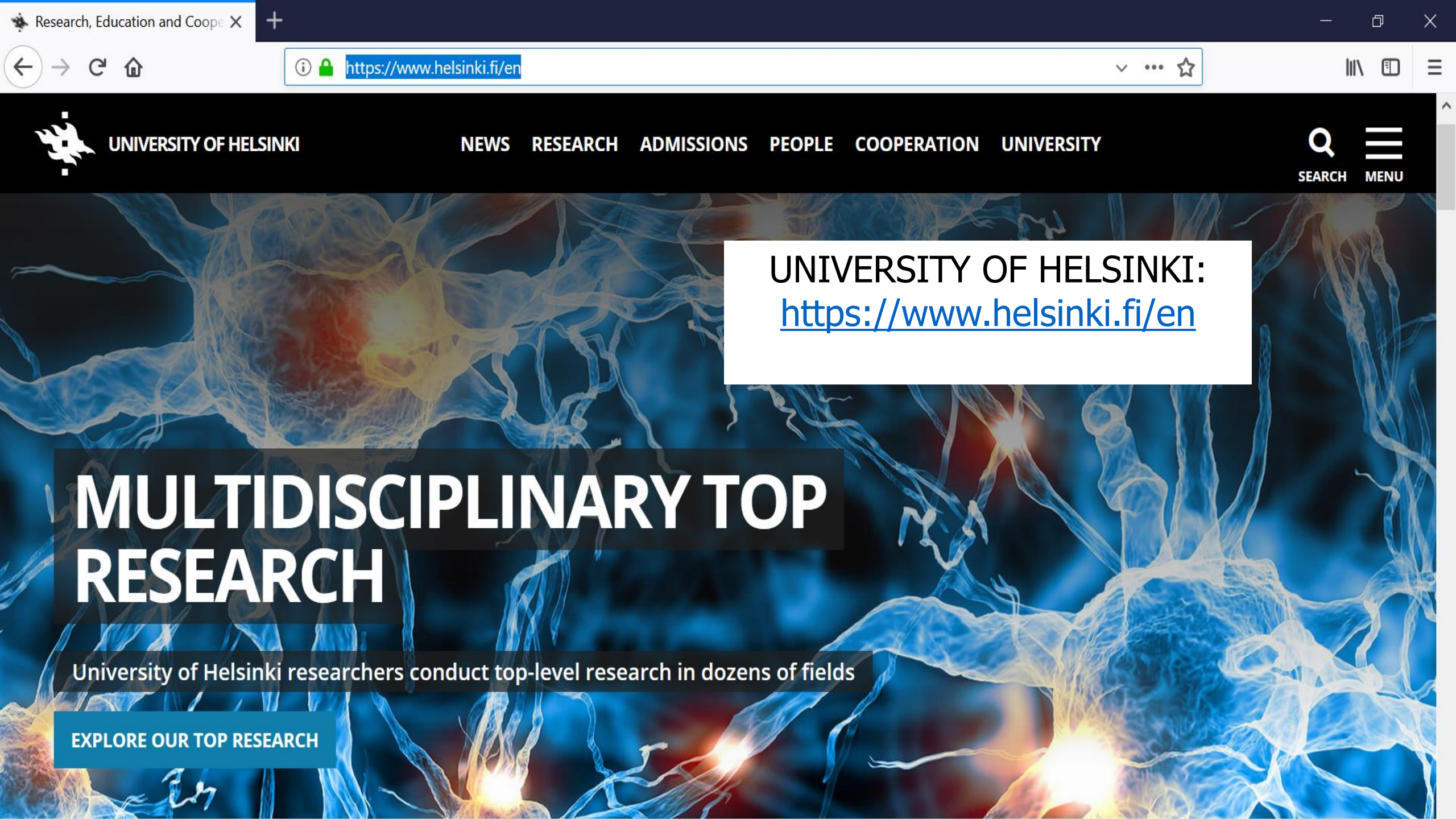
Director of Science Education Centre, University of Helsinki

Director of national LUMA Centre Finland

maija.aksela@helsinki.fi

A scenic autumn landscape featuring a man in a dark jacket and cap pushing a grey stroller on a gravel path. A black and white dog sits on the path in the foreground. To the left, a white wooden bench sits on a grassy area covered in fallen yellow leaves. Large trees with vibrant yellow foliage frame the scene, overlooking a calm lake under a blue sky with light clouds.

WARM A
WELCOME TO
VISIT US!

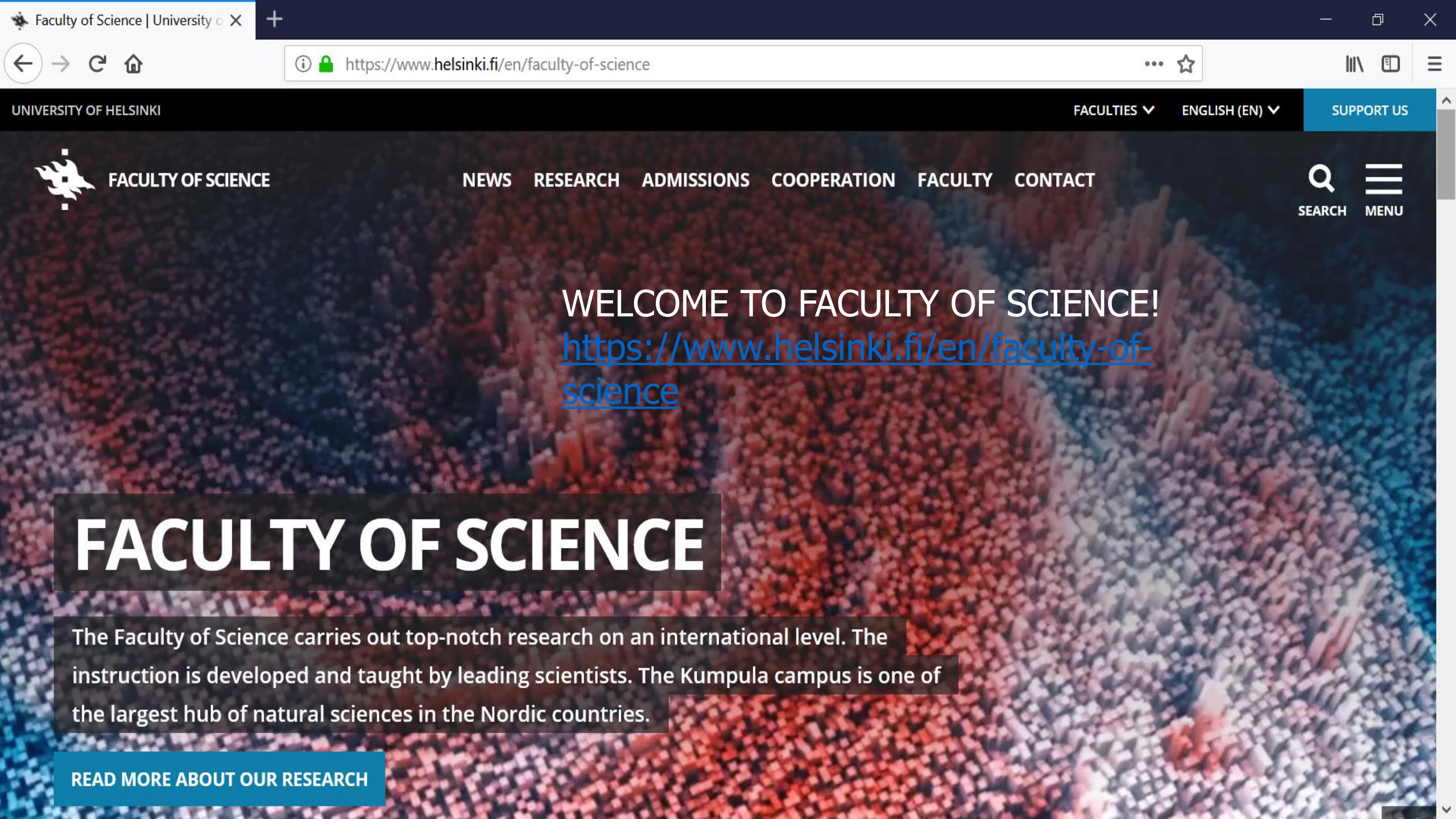


UNIVERSITY OF HELSINKI:
<https://www.helsinki.fi/en>

MULTIDISCIPLINARY TOP RESEARCH

University of Helsinki researchers conduct top-level research in dozens of fields

[EXPLORE OUR TOP RESEARCH](#)



FACULTY OF SCIENCE

NEWS RESEARCH ADMISSIONS COOPERATION FACULTY CONTACT

SEARCH MENU

WELCOME TO FACULTY OF SCIENCE!
<https://www.helsinki.fi/en/faculty-of-science>

FACULTY OF SCIENCE

The Faculty of Science carries out top-notch research on an international level. The instruction is developed and taught by leading scientists. The Kumpula campus is one of the largest hub of natural sciences in the Nordic countries.

READ MORE ABOUT OUR RESEARCH

Kids and youth –**future makers**- at the heart

New solutions and pedagogical innovations **collaboratively** through the newest **research**

Motto:
"Together
we are
more"

Maija Akselas' background info

- ❑ **Director of Science Education Centre, University of Helsinki**
 - ❑ **Director of national LUMA Centre Finland**
 - ❑ **50 % of working time in science education and 50 % in teacher education and its' research**
 - ❑ Over 35 years in science education
 - ❑ Over 350 publications in science education
 - ❑ **A member of Finnish UNESCO group**
-
- ❑ **Promoting education from 6 experiences:**
 - (i) researcher in science (at the beginning of career)
 - ❑ (ii) 6 years **math and science teacher at senior high school**
 - (iii) 23 years **teacher educator (math and science teacher program) and researcher** in University of Helsinki
 - (iv) about 30 years in-service training
 - (v) **16 years LUMA and science education work beside my job in teacher education**
 - (iv) mom for two children (adults) and happy grandmother

A photo: The oldest **LUMA lab**, ChemistryLab Gadolin –**research and development centre**- at the Faculty of Science, University of Helsinki since 2008.



**ENJOY OF ALL
SCIENCES**

FAMILY SCIENCE
EDUCATION

THE MAIN AIM OF OUR CENTRE :

To engage children and young people –both girls and boys- from age 3 to 19 in science at all levels AND teachers' in life-long professional development.

Education developed in partnership

"TOGETHER WE ARE MORE!" (LUMA MOTTO)

National
authorities

Local authorities

Teachers' union

Social partners

Parents

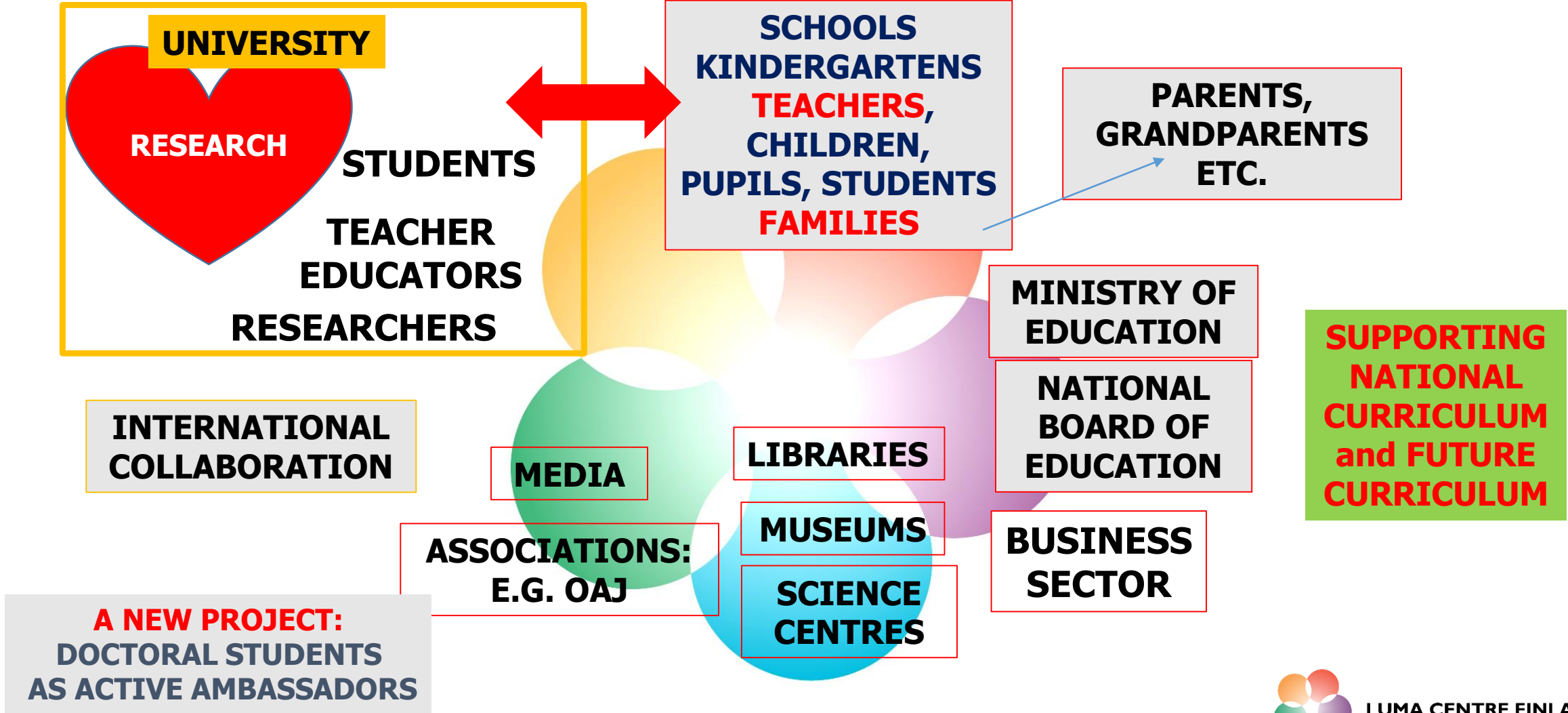
Pupils and students

Research
institutions

Relevant
stakeholders

This slide partly from National Board of
Education

OUR LUMA MODEL: **COLLABORATION IS A KEY FOR SUCCESS**



The background of the LUMA Centre

Year 2001: The **NEW** Unit of Chemistry Teacher Education Unit



KEMMA resource centre for supporting collaboration between the department of chemistry, schools and industry



Year **2003**: THE FIRST **LUMA CENTRE** AT UNIVERSITY OF HELSINKI

**LEARNING
THROUGH
SHARING!**

**TO PROMOTE
COLLABORATION
BETWEEN
UNIVERSITY,
SCHOOLS AND
INDUSTRY**

The background of the LUMA Centre

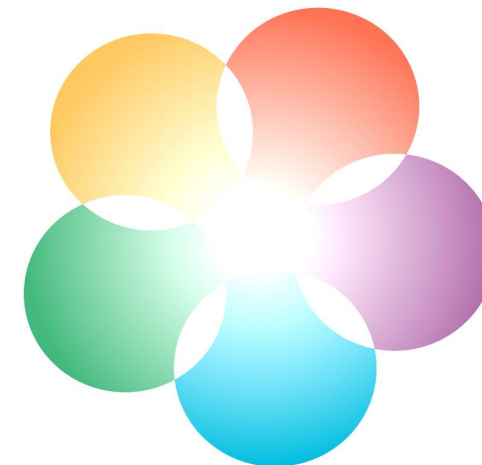
Years 2004-2013 12 other LUMA Centres into the 10 other universities



Year 2008: The first LUMA lab: **ChemistryLab Gadolin** to Dept. of Chemistry (later on other LUMA labs)



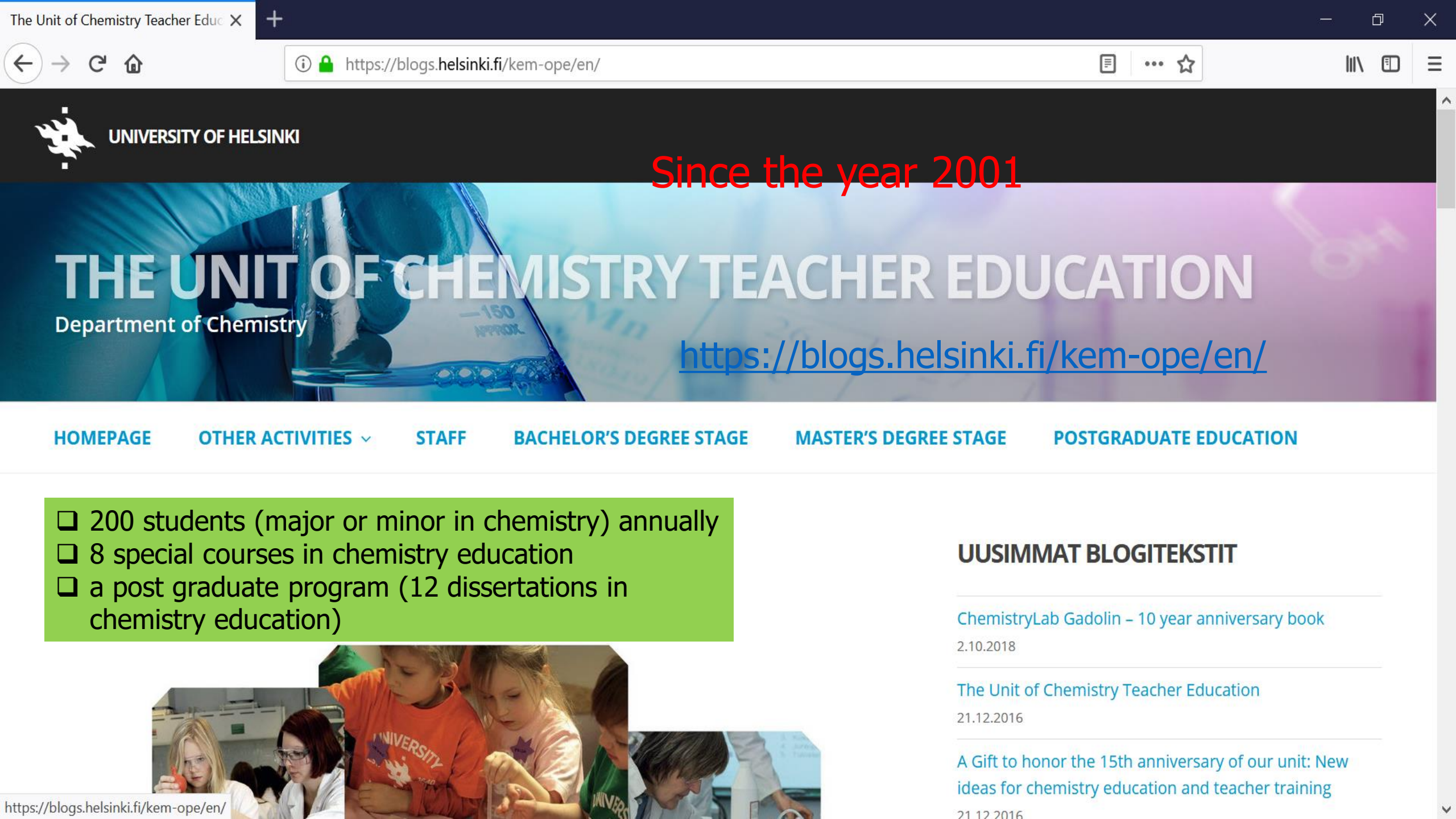
Year 2013-: National LUMA Centre Finland
<http://www.luma.fi>



Year 2017: LUMA China Centre, Peking, China

A NEW MODEL FOR PRE-SERVICE TEACHER TRAINING: STUDENT TEACHERS AS ACTIVE ROLE IN ALL LUMA ACTIVITIES





Since the year 2001

THE UNIT OF CHEMISTRY TEACHER EDUCATION

Department of Chemistry

<https://blogs.helsinki.fi/kem-ope/en/>

- [HOMEPAGE](#)
- [OTHER ACTIVITIES](#) ▾
- [STAFF](#)
- [BACHELOR'S DEGREE STAGE](#)
- [MASTER'S DEGREE STAGE](#)
- [POSTGRADUATE EDUCATION](#)

- ❑ 200 students (major or minor in chemistry) annually
- ❑ 8 special courses in chemistry education
- ❑ a post graduate program (12 dissertations in chemistry education)

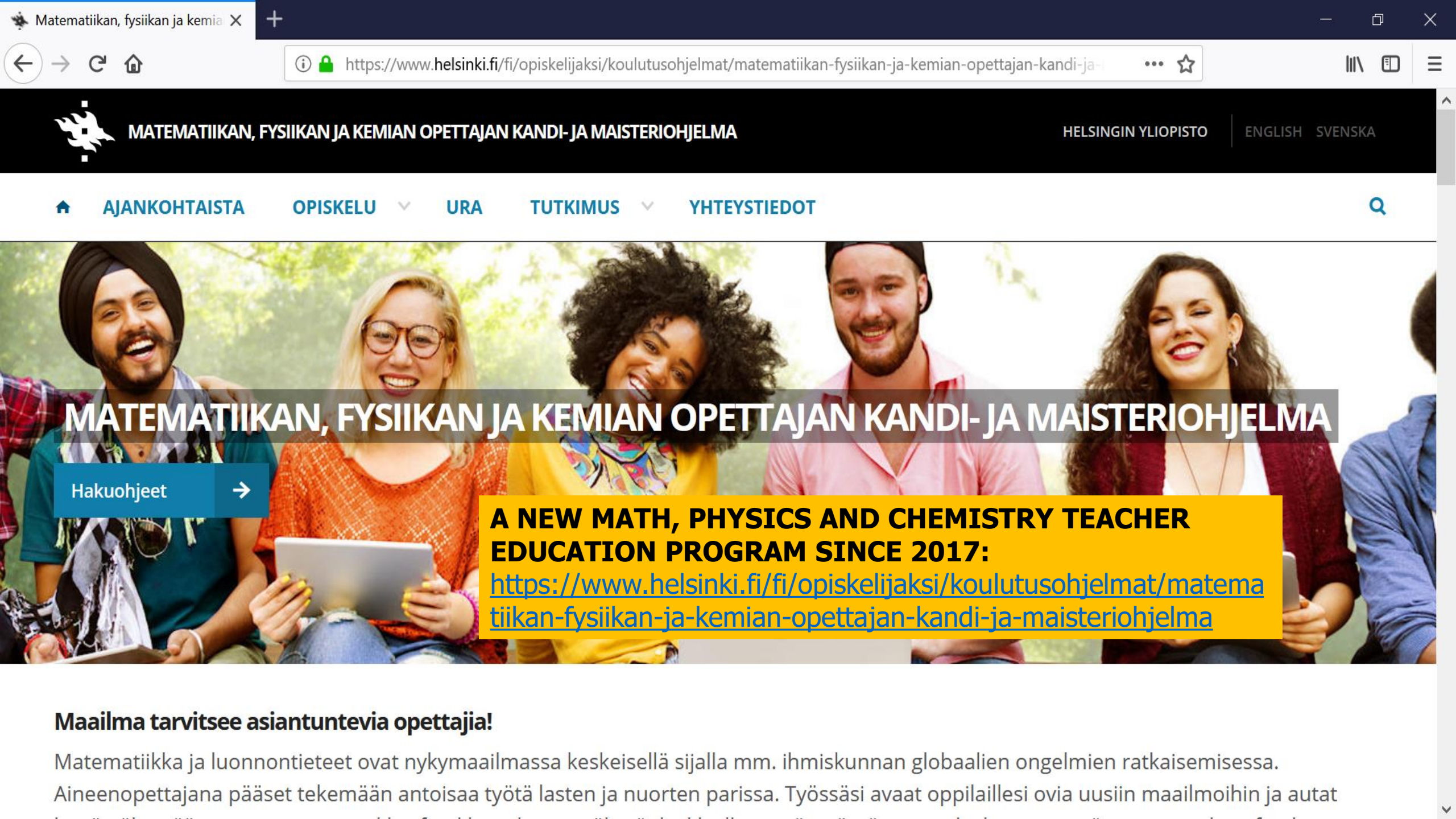
UUSIMMAT BLOGITEKSTIT

[ChemistryLab Gadolin - 10 year anniversary book](#)
2.10.2018

[The Unit of Chemistry Teacher Education](#)
21.12.2016

[A Gift to honor the 15th anniversary of our unit: New ideas for chemistry education and teacher training](#)
21.12.2016





MATEMATIIKAN, FYSIIKAN JA KEMIAN OPETTAJAN KANDI- JA MAISTERIOHJELMA

Hakuohjeet →

A NEW MATH, PHYSICS AND CHEMISTRY TEACHER EDUCATION PROGRAM SINCE 2017:
<https://www.helsinki.fi/fi/opiskelijaksi/koulutusohjelmat/matematiikan-fysiikan-ja-kemian-opettajan-kandi-ja-maisteriohjelman>

Maailma tarvitsee asiantuntevia opettajia!

Matematiikka ja luonnontieteet ovat nykymaailmassa keskeisellä sijalla mm. ihmiskunnan globaalien ongelmien ratkaisemisessa. Aineenopettajana pääset tekemään antoisaa työtä lasten ja nuorten parissa. Työssäsi avaat oppilaillesi ovia uusiin maailmoihin ja autat

CONTENTS OF **B.SC.PROGRAM** IN CHEMISTRY EDUCATION

Subject Studies (BSc level)

- MFK-201 ICT in Education II, 4 ECTS
- MFK-201E **Molecular Modelling**, 1 ECTS
- MFK-201F Report, 2 ECTS
- MFK-K202 Chemistry and Environment, 5 ECTS
- MFK-K203 **Essential Concepts and Phenomena in Chemistry Education**, 5 ECTS
- MFK-K204 **Inquiry-based Chemistry Education**, 5 ECTS
- MFK-K205 Sustainable Chemistry, 5 ECTS
- MFK-K206 **Nature of Chemistry**, 5 ECTS
- MFK-K299 Bachelor Thesis, 6 ECTS



CONTENTS OF **B.SC. PROGRAM** IN CHEMISTRY

General Studies (BSc level)

KEK401 Bachelor Thesis Seminar, 1 ECTS

MFK-402 Science Education, 5 ECTS

MFK-404 **Mathematics and Science in Society**, 5 ECTS

MFK-406 Vocational Portfolio, 5 ECTS

MFK-407 **Introduction to Mathematics, Physics and Chemistry Teaching**, 2 ECTS

MFK-408 ICT in Education I, 4 ECTS

CONTENTS OF **B.SC. PROGRAM** IN CHEMISTRY

General Studies (BSc level)

KEK401 Bachelor Thesis Seminar, 1 ECTS

MFK-402 Science Education, 5 ECTS

MFK-404 **Mathematics and Science in Society**, 5 ECTS

MFK-406 Vocational Portfolio, 5 ECTS

MFK-407 **Introduction to Mathematics, Physics and Chemistry Teaching**, 2 ECTS

MFK-408 ICT in Education I, 4 ECTS

CONTENTS OF **M.Sc. PROGRAM** IN CHEMISTRY

Advanced Studies (Master's level)

MFK-K301 **Research-based Chemistry Education, 5 ECTS**

MFK-K302 **Models and Visualisation in Chemistry Education, 5 ECTS**

MFK-K303 **Sustainable Development in Education, 5 ECTS**

MFK-K304 **Diversity in Chemistry education, 5 ECTS**

MFK-K399 **Master's Thesis, 30 ECTS**

MFK-398A **Research Methods in Education, 2 ECTS**

MFK-398B **Master's Thesis Seminar, 3 ECTS**

MFK-301 **Nature of Science, 5 ECTS**

MFK-411, **Practical Work in Chemical Science Education, 5 ECTS**



SUPPORTING TEACHERS' LIFE-LONG LEARNING

PRE-SERVICE TEACHER TRAINING

IN-SERVICE TEACHER TRAINING

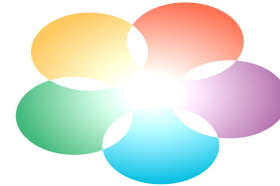
**INTEGRATING FORMAL, NON-FORMAL AND
INFORMAL LEARNING**



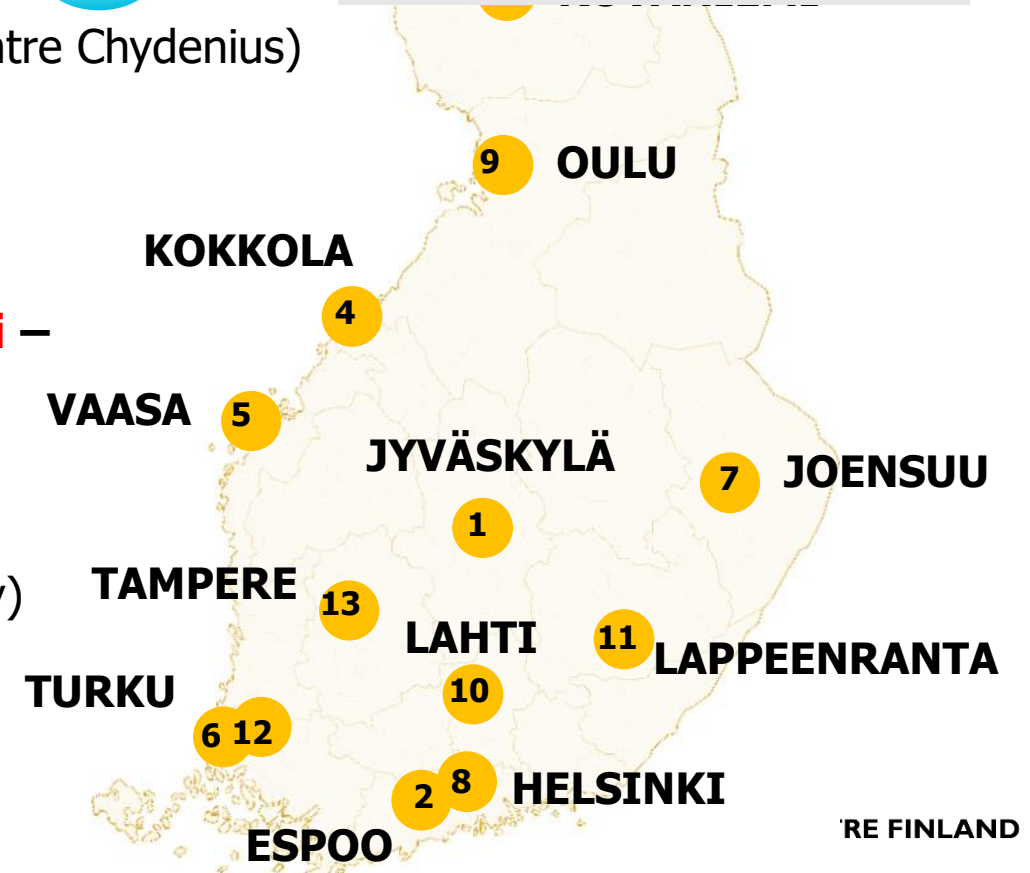
LUMA CENTRE FINLAND

for promoting math, science and technology education (since year 2013)

1. Central Finland LUMA Centre (University of Jyväskylä)
2. LUMA Centre Aalto (Aalto University)
3. LUMA Centre Lapland (University of Lapland)
4. LUMA Centre of Central Ostrobothnia (Kokkola University Centre Chydenius)
5. LUMA Centre of Ostrobothnia (University of Vaasa)
6. LUMA Centre of Southwestern Finland (University of Turku)
7. LUMA Centre of the University of Eastern Finland
8. **Science Education Centre at the University of Helsinki – COORDINATION**
9. LUMA Centre of the University of Oulu
10. LUMA Centre Päijät-Häme (Lahti University Campus)
11. LUMA Centre Saimaa (Lappeenranta University of Technology)
12. LUMA Centre Åbo Akademi (Åbo Akademi University)
13. Tampere LUMATE Centre (University of Tampere)



- ❑ OVER 1 MILLION PARTICIPANTS 2014-18
- ❑ 40 DIFFERENT FORMS OF ACTIVITIES
- ❑ ABOUT 100 "LUMA-WORKERS" (mostly beside of the job in teacher education)



LUMA MOTTO: TOGETHER WE ARE MORE!

RE FINLAND

LUMA CHINA CENTRE AT BNU OPENED IN 2017



北京师范大学与赫尔辛基大学“成立LUMA中国中心合作备忘录”及
“促进中芬联合学习创新研究院合作备忘录（双学位&学生交流行动计划）”
签约仪式

Signing Ceremony
Beijing Normal University & University of Helsinki
"Concerning the Establishment of LUMA China Centre"
"Agreement on Cooperation at the Sino-Finnish Joint Learning Innovation Institute"
"On Pilot Degree Program and Student Exchange Programs"



Director Yun Wang, LUMA China Centre,
Beijing Normal University



COLLABORATION WITH **SCIENTISTS AND OTHER SPECIALISTS** in universities and industry

❑ **Scientists** from different faculties of the **university** and **industry** are participating on collaboration (e.g. as roles models, supervisors of students thesis, writing publications...)

❑ **Future scientists** as role models are participating as part of their studies, too.

❑ The research-based new solutions and pedagogical innovations designed are based on **the main strategy fields in research of the university** (e.g. sustainability, digitalization, health and well-being...) supporting future curriculum.

**UNIVERSITY
OF HELSINKI:**

**15TH
ANNIVERSARY
OF OUR CENTRE
IN YEAR 2018**

A NEW BOOK:

COLLABORATIVE SCIENCE EDUCATION AT THE UNIVERSITY OF HELSINKI SINCE 2003

New Solutions and
Pedagogical Innovations
for Teaching from Early
Childhood Education
to Universities

**MAKERS OF THE FUTURE AT THE HEART:
COMPREHENSION AND JOY OF SUCCESS FOR
ALL!**

NOWADAYS
SCIENCE EDUCATION IS
PROMOTED AT THE
UNIVERSITY **IN DIFFERENT
FACULTIES AND
INSTITUTES.** THE
OPERATIONS ARE A PART OF
TEACHING, RESEARCH AND
SOCIETAL COLLABORATION.

E.G. ARTS, MEDICINE,
SCIENCE





Innohas!



KEMIAN TEOLLISUUS



OPETUSHALLITUS UTBILDNINGSTYRELSEN

Tilastokeskus



BMOL ry



UNIVERSITY OF EASTERN FINLAND



Tecnologiateollisuuden 100-vuotissäätiö



TEKNIIKAN AKATEEMISET

Tecnologiateollisuus



MUSTANKORKEA



LAPIN YLIOPISTO UNIVERSITY OF LAPLAND

Vaasan yliopisto UNIVERSITY OF VAASA

Opinkirjo

Tiedekeskus Tuorla



PROFESSORILIITTO PROFESSORFÖRBUNDET FINNISH UNION OF UNIVERSITY PROFESSORS



Turun yliopiston kasvitieteellinen puutarha



SUOMALAINEN TIEDEAKATEMIA FINNISH ACADEMY OF SCIENCE AND LETTERS

Saimaan MEDIAKESKUS

Metsä

OAJ

LYKE verkosto

PROFESSORILIITTO

LEARNING THROUGH STORIES

MAOL

STORMOSSEN

Kuntaliitto Kommunförbundet

LUMA-KESKUS SUOMI LUMA-CENTER FINLAND LUMA CENTRE FINLAND

THE GLOBE PROGRAM

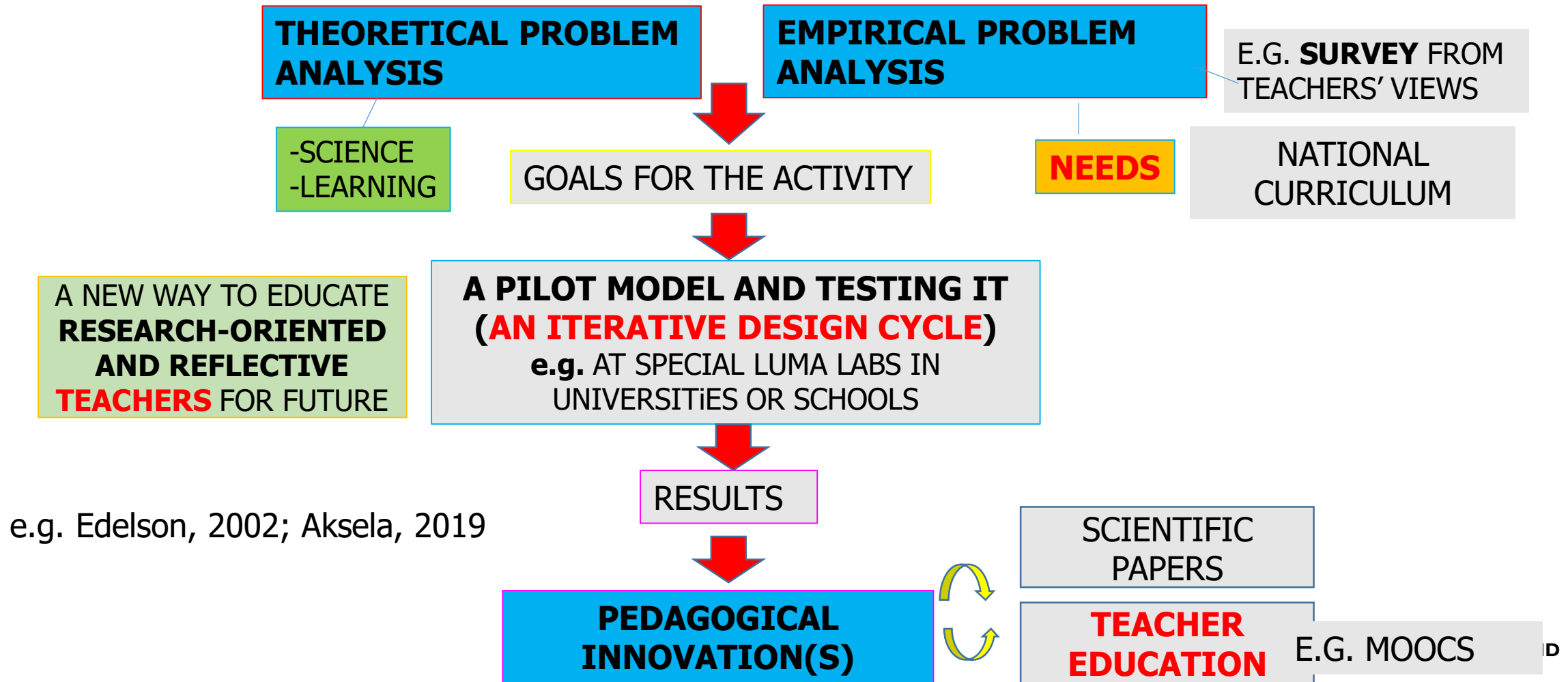
JYVÄSKYLÄN YLIOPISTO UNIVERSITY OF JYVÄSKYLÄ LASTEN JA NUORTEN YLIOPISTO



LAPPEENRANNAN TEKNILLISEN YLIOPISTON TUKISÄÄTIÖ

MAL ID

COLLABORATIVE **DESIGN-BASED RESEARCH** AS A TOOL FOR PEDAGOGICAL INNOVATIONS TOGETHER WITH TEACHERS



COLLABORATIVE **COURSES** FOR STUDENTS AT SENIOR HIGH SCHOOL LEVEL

- GLOBAL CHALLENGES**
- HEALTH AND WELL-BEING
- MATH AND COMPUTER SCIENCE
- CHEMISTRY AND BIOLOGY LABS

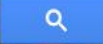
FUTURE TEACHERS AND DOCTORAL STUDENTS AS ACTIVE AMBASSADORS DURING THE COURSES





LUMA CENTRE FINLAND

Google Custom Search



NEW

New international course for high school students to develop solutions to global challenges

April 16, 2019



Upcoming Events

LINKS – Learning through innovation and networking STEM, Final Conference

June 3 @ 09:00 - 17:00

Helsinki

Finland

International LUMAT Symposium: Research and Practice in Math, Science and Technology Education 2019

June 5 - June 6

Jyväskylä

Finland

[View More...](#)

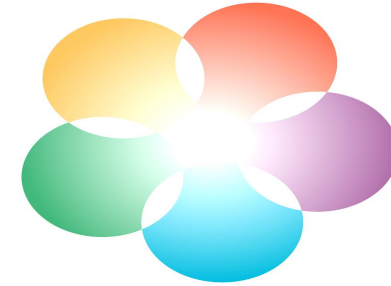


15 LUMA LABS IN FINLAND: 6 SCIENCE LABS AT UNIVERSITY OF HELSINKI



**math, biosciences, computer science,
chemistry, physics and geography**

FOUR ROLES OF THE SCIENCE LABS



- ❑ A **VISITING CENTRE** FOR SCHOOLS BY SUPPORTING CURRICULUM (**UNIVERSITY CLOSER TO FUTURE MAKERS**)
- ❑ A **RESEARCH AND DEVELOPMENT CENTRE FOR NEW PEDAGOGICAL INNOVATIONS** (e.g. thesis and publications)
- ❑ A **TRAINING CENTRE FOR FUTURE TEACHERS AND TEACHERS AT VARIOUS SCHOOL LEVELS**
- ❑ A **COLLABORATION CENTRE** WITH INDUSTRY, SCIENTISTS AND OTHER PARTNERS (E.G. MEDIA)



The oldest **SCIENCE LAB:** **CHEMISTRYLAB GADOLIN**

- Founded v. 2008
- Collaboration between
 - University of Helsinki
 - Finnish chemistry industry
 - Pedagogical institutions
- Coordinated by Centre for chemistry education (Kemmi)
- Over 50 000 and 2000 groups
- All school levels – free of charge
- Supporting Finnish national curriculum

- Study visits
 - Laboratory activities
 - Molecular modeling
 - **Scientist meetings**
 - Department and campus tours
- **Science clubs**
- **Science camps**

- **Birthday parties**
- Science fairs
- In-service training
- Pre-service training
- Material development
- Material lending
- Webinars
- **Academic research**

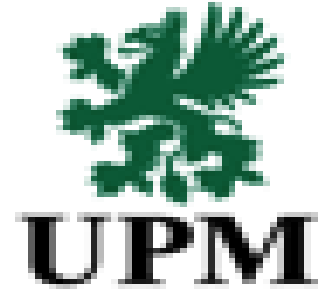
**AS A PART OF TEACHER
EDUCATION:
FUTURE TEACHERS
GUIDING GROUPS**





HELSINGIN YLIOPISTO

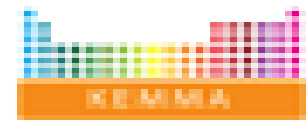
NESTE OIL



OPETUSHALLITUS
UTEIDNINGSTYRELSEN



LUMAKESKUS



kemira



Helsingin kaupunki
Opetusvirasto



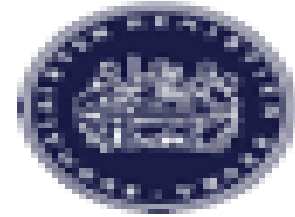
**COLLABORATION
WITH
BUSINESS**



A Member of
The Linde Group



BOREALIS



LUMATIikka

in-service training in math



**7 Collaborative
MOOCs for
teachers**

Funded by National
Board of Education

HOW TO ACTIVATE STUDENTS' THINKING?

- MATH AND ART
- MATH AND MOTION
- MATH AND PROJECT-BASED LEARNING etc.

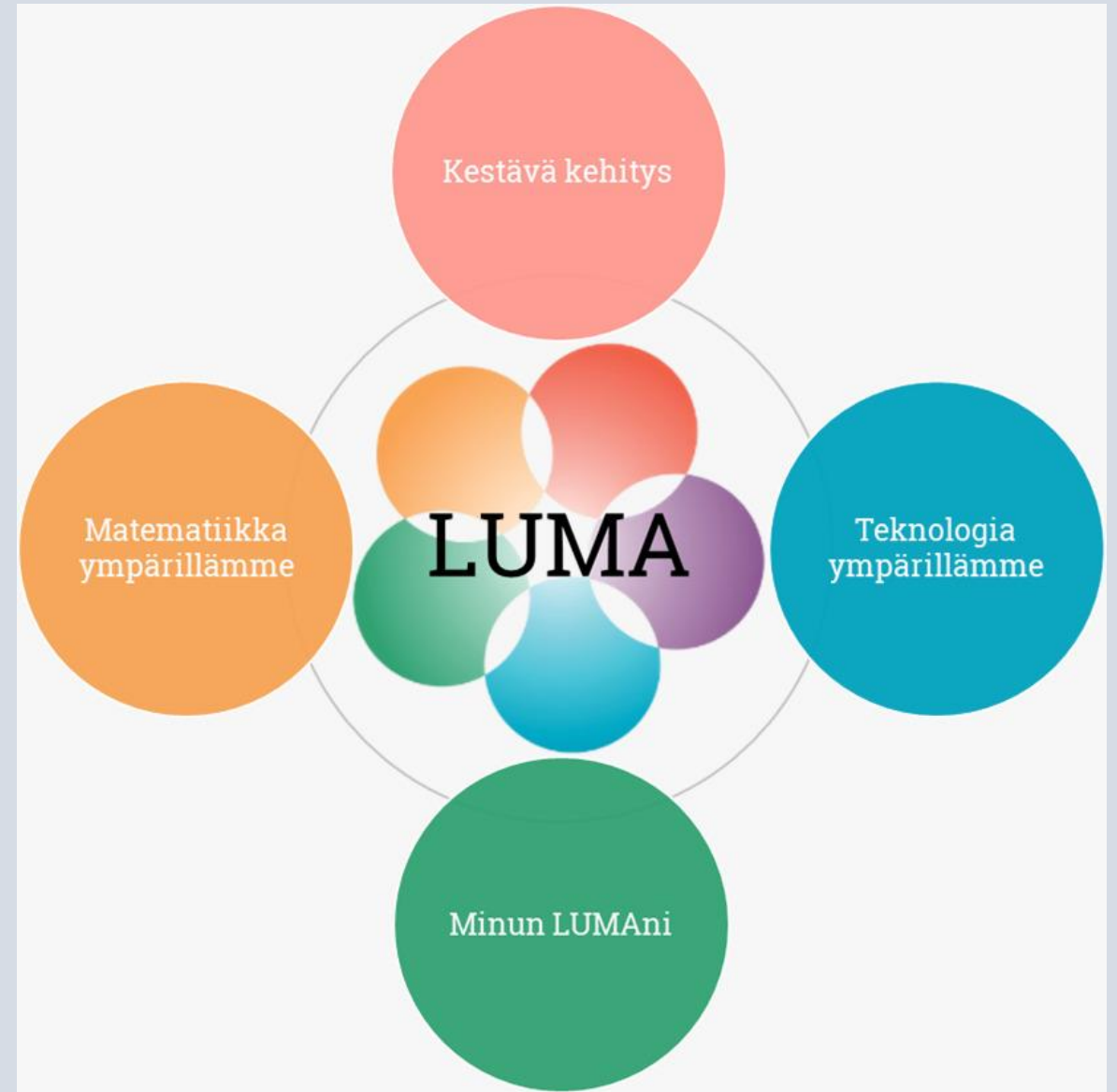


LUMA CENTRE FINLAND

Funded by Ministry of Education and Culture

LUMA2020 – DEVELOPMENT PROGRAM

2019-2020





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DEVELOPMENT PROJECTS AND **IN- SERVICE TRAINING** GOING ON



❑ THE
NEWEST
RESEARCH
USED

❑ **MATHEMATICS**

(e.g. creative problem solving; playful learning)

❑ **SCIENCE AND ENVIRONMENT**

(e.g. good questions, **JIPPO program**)

❑ **TECHNOLOGY EDUCATION**

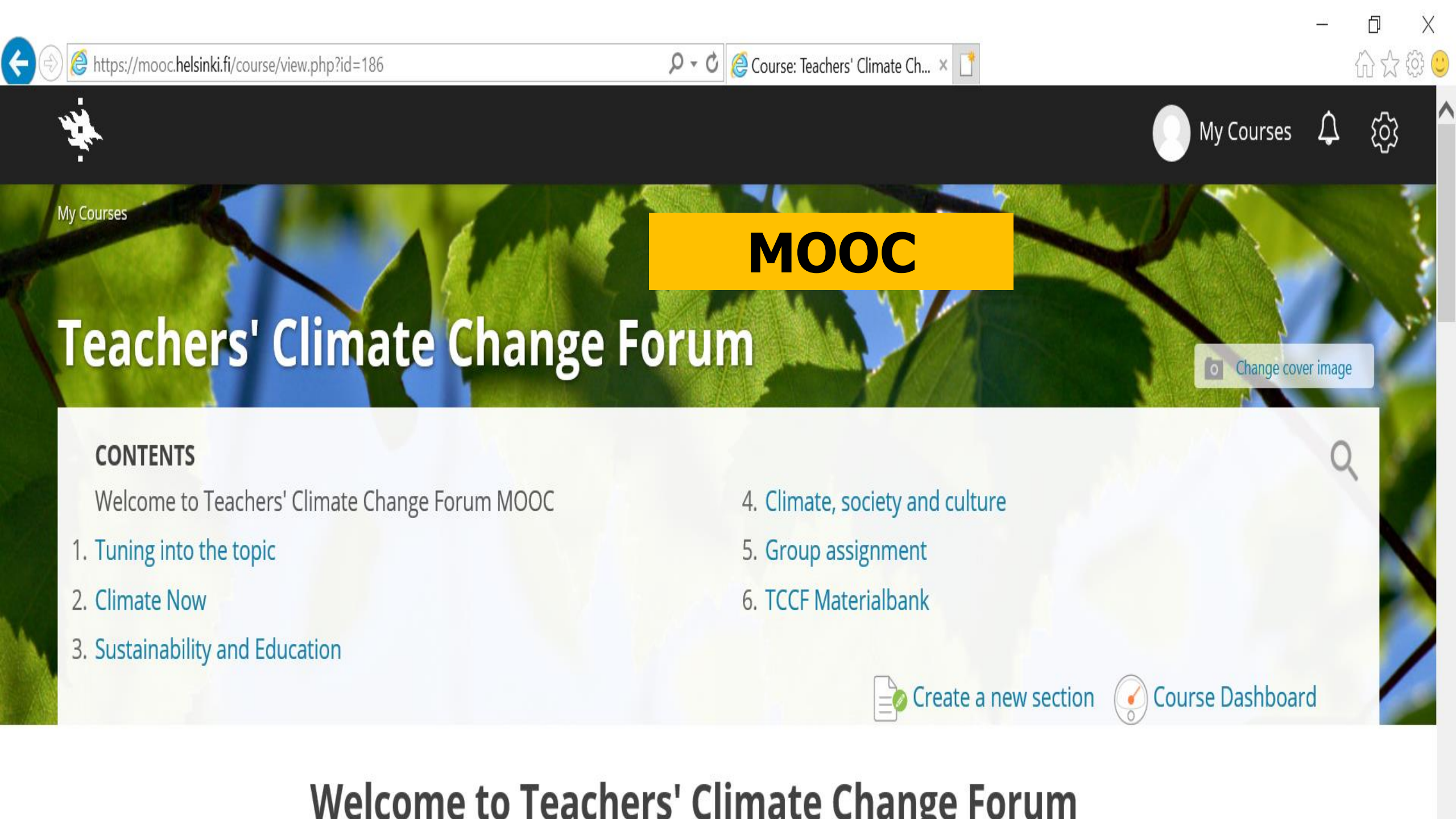
(e.g. programming, robotics)

**SUPPORTING
NEW
CURRICULUM
FRAMEWORK**

**13 MOOCS
FOR
TEACHERS**

**LUMA SUOMI PROGRAMME
FOR YEARS 2014-19**

(RESOURCES from the Ministry of Education and Culture)



My Courses

MOOC

Teachers' Climate Change Forum

Change cover image

CONTENTS

Welcome to Teachers' Climate Change Forum MOOC

- 1. Tuning into the topic
- 2. Climate Now
- 3. Sustainability and Education

- 4. Climate, society and culture
- 5. Group assignment
- 6. TCCF Materialbank

Create a new section

Course Dashboard

Welcome to Teachers' Climate Change Forum



Collaboration with Business

PRE-SERVICE AND IN-SERVICE EDUCATION TOGETHER

- ❑ It is carried out in collaboration with the industry and schools through the course called **Math and Science in Society** (LUMA)
- ❑ **Students, a company and a school (two teachers from the school) in each team**
- ❑ A project work with Industry Companies: designing a collaboration model for the school close to it

MOOC Course: How to make collaboration with companies?

Kousa, Aksela & Ferck-Savec, 2018

NEW: CHEMISTRY IN SOCIETY PROJECT: 30 TEACHERS, 8 COMPANIES AND UNIVERSITY

WELCOME ALL COUNTRIES!

www.start.luma.fi/en/

Learning through sharing

INTERNATIONAL PROJECT **StarT**

7 MAIN
THEMES

GLOBAL BEST
AWARD 2018: STEM
EUROPE



[A VIDEO](#)

**StarT Edugo
virtual clubs for
children and
youth**

OVER 40 COUNTRIES
PARTICIPATED

StarT: every child and youth can be a **star**
through **T**eamwork

LUMA CENTRE FINLAND



LUMA CENTRE FINLAND

Participate in our online courses:

1. Introduction to project-based learning through StarT

Entirely self-paced and free. An overlook on PBL and tips for carrying out StarT projects.



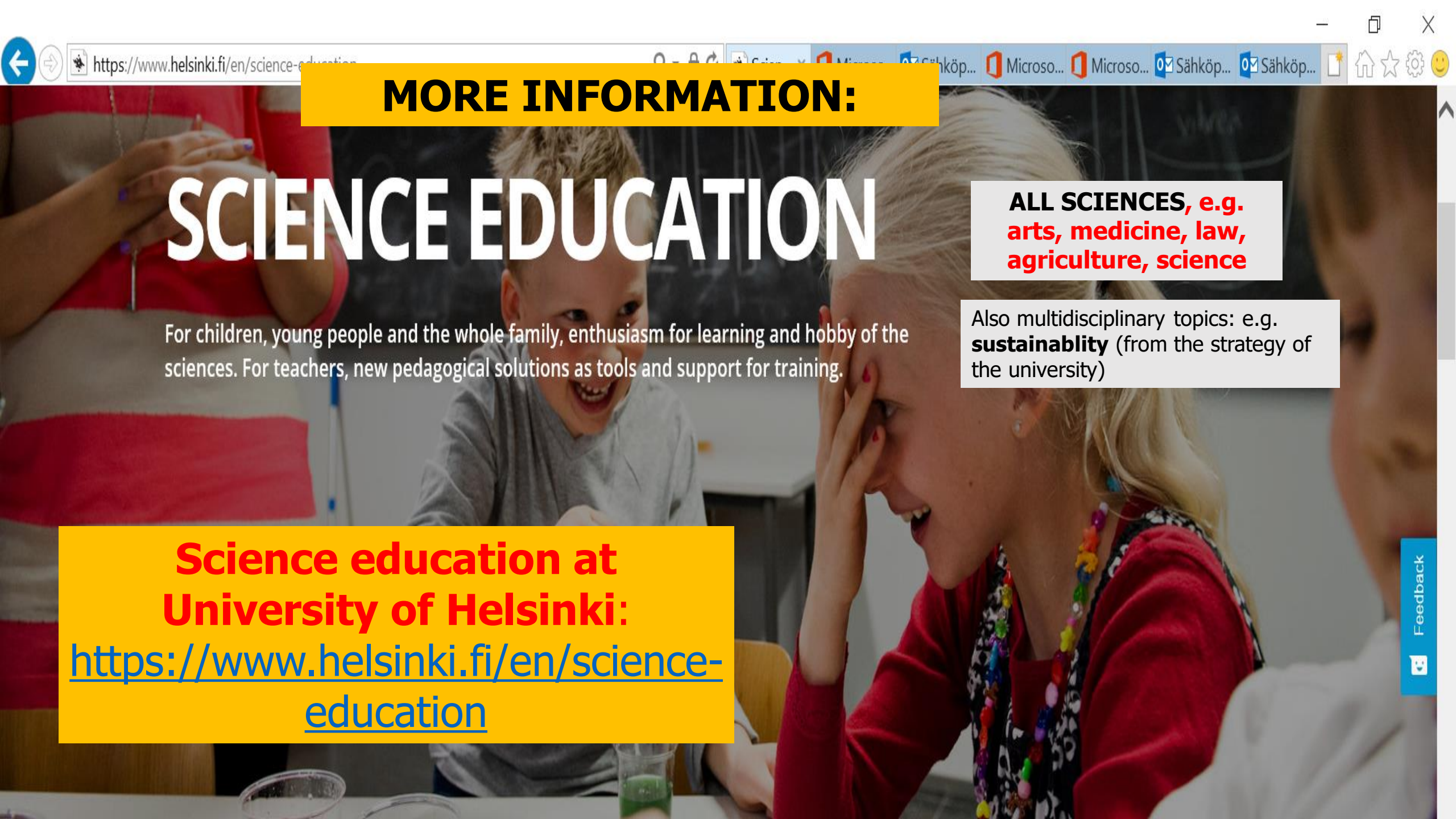
2. Project-based learning and the theory behind it – create your own project!

Begins in November. Participants will design or refine their own project-based unit during the course.

Register now!

<https://start.luma.fi/en/online-courses/>





MORE INFORMATION:

SCIENCE EDUCATION

For children, young people and the whole family, enthusiasm for learning and hobby of the sciences. For teachers, new pedagogical solutions as tools and support for training.

ALL SCIENCES, e.g. arts, medicine, law, agriculture, science

Also multidisciplinary topics: e.g. **sustainability** (from the strategy of the university)

Science education at University of Helsinki:

<https://www.helsinki.fi/en/science-education>



LUMA News

**National LUMA News:
Math, science and technology
education**

LUMA News is dedicated to mathematics, science and technology education news from Finland to all international audiences. The webzine highlights themes, innovations and research as well as interesting events within the field.

LUMA SANOMAT, www.luma.fi



Teachers' Climate Change Forum: Materials and new

Upcoming Events

**LINKS - Learning through innovation and networking
STEM, Final Conference**
June 3 @ 09:00 - 17:00
Helsinki
Finland

**International LUMAT Symposium: Research and Prac
in Math, Science and Technology Education 2019**
June 5 - June 6
Jyväskylä
Finland

[View More...](#)

StarT Competition



**THANK YOU FOR
YOUR ATTENTION!**

**LEARNING
THROUGH
SHARING!**

**TOGETHER WE
ARE MORE!**

FUTURE MAKERS

Maija.aksela@helsinki.fi