

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

HOW TO ENGAGE CHILDREN AND YOUTH WITH SCIENCE?
**NEW SOLUTIONS AND PEDAGOGICAL INNOVATIONS
FOR SCIENCE EDUCATION**
FROM EARLY CHILDHOOD EDUCATION INTO UNIVERSITIES

Maija Aksela

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Director of national LUMA Centre Finland

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CONTAINS OF MY TALK



1) OUR MODEL TO PROMOTE SCIENCE EDUCATION

2) SOME EXAMPLES OF THE ACTIVITIES:

- LUMA SUOMI AND LUMATIKKA PROGRAM FOR TEACHERS
- FAMILY SCIENCE EDUCATION
- COLLABORATIVE COURSES FOR HIGH SCHOOL STUDENTS
- SCIENCE LABS AS A LEARNING ENVIRONMENT
- DOCTORAL STUDENTS AS ACTIVE AMBASSADORS IN SCIENCE EDUCATION
- CLIMATE CHANGE EDUCATION
- INTERNATIONAL StarT PROGRAM

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

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

Motto: "Together we are more"

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

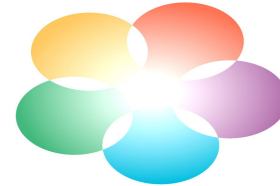
Maija Akselas' background info

- ❑ **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**
 - ❑ 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 snior high school**
 - (iii) 22 years **teacher educator (math and science teacher program) and researcher** in University of Helsinki
 - (iv) about 30 years in-service training
 - (v) **15 years LUMA and science education work beside my job in teacher education**
 - (iv) mom of two children (adults)

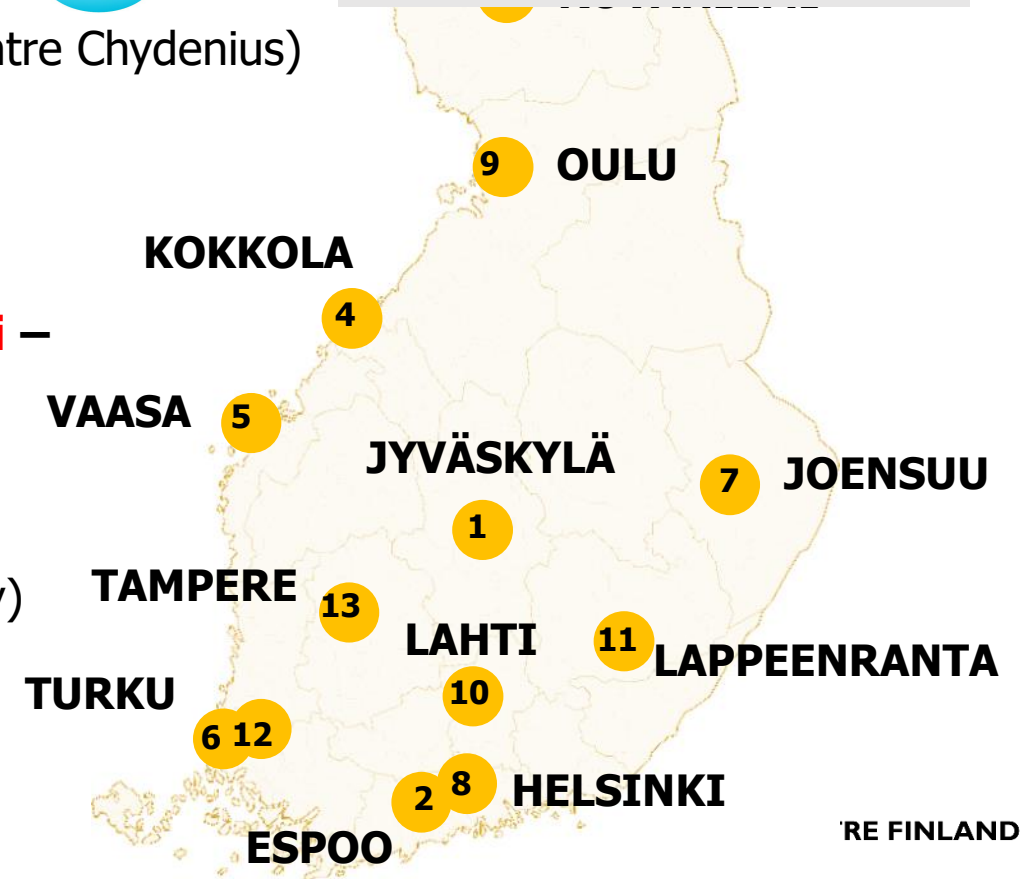
LUMA CENTRE FINLAND

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 CENTRE CHINA

THE SIGNING CEREMONY ON 10TH OF OCTOBER, 2017, BEIJING NORMAL UNIVERSITY

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 Promoting the Degree Program and Student Exchange Programs"



Director Maija Aksela, LUMA Centre Finland,
University of Helsinki

Director Yun Wang, LUMA China Centre, BNU

**UNIVERSITY
OF HELSINKI:**

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

A NEW BOOK:

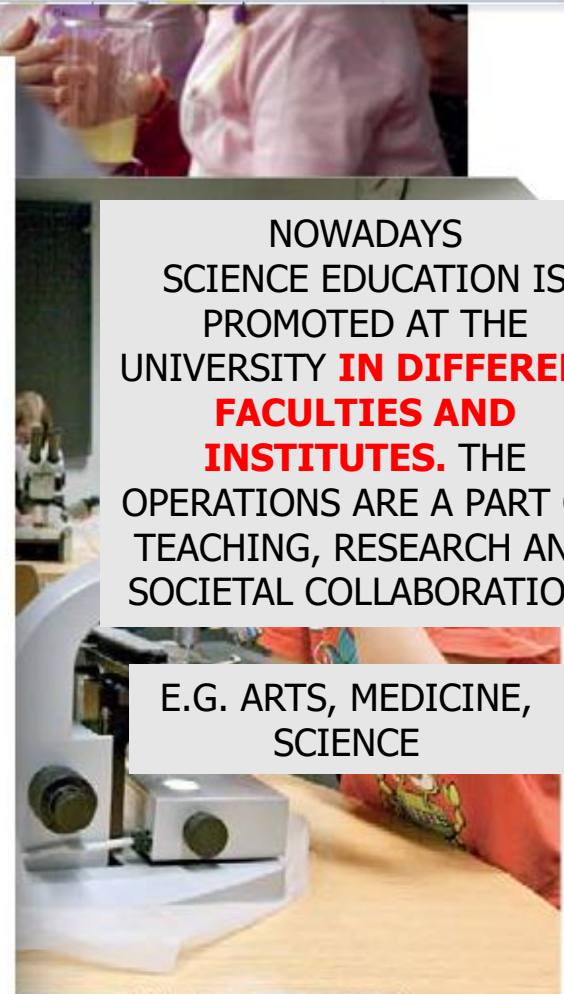
COLLABORATIVE SCIENCE EDUCATION AT THE UNIVERSITY OF HELSINKI SINCE 2003

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

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

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





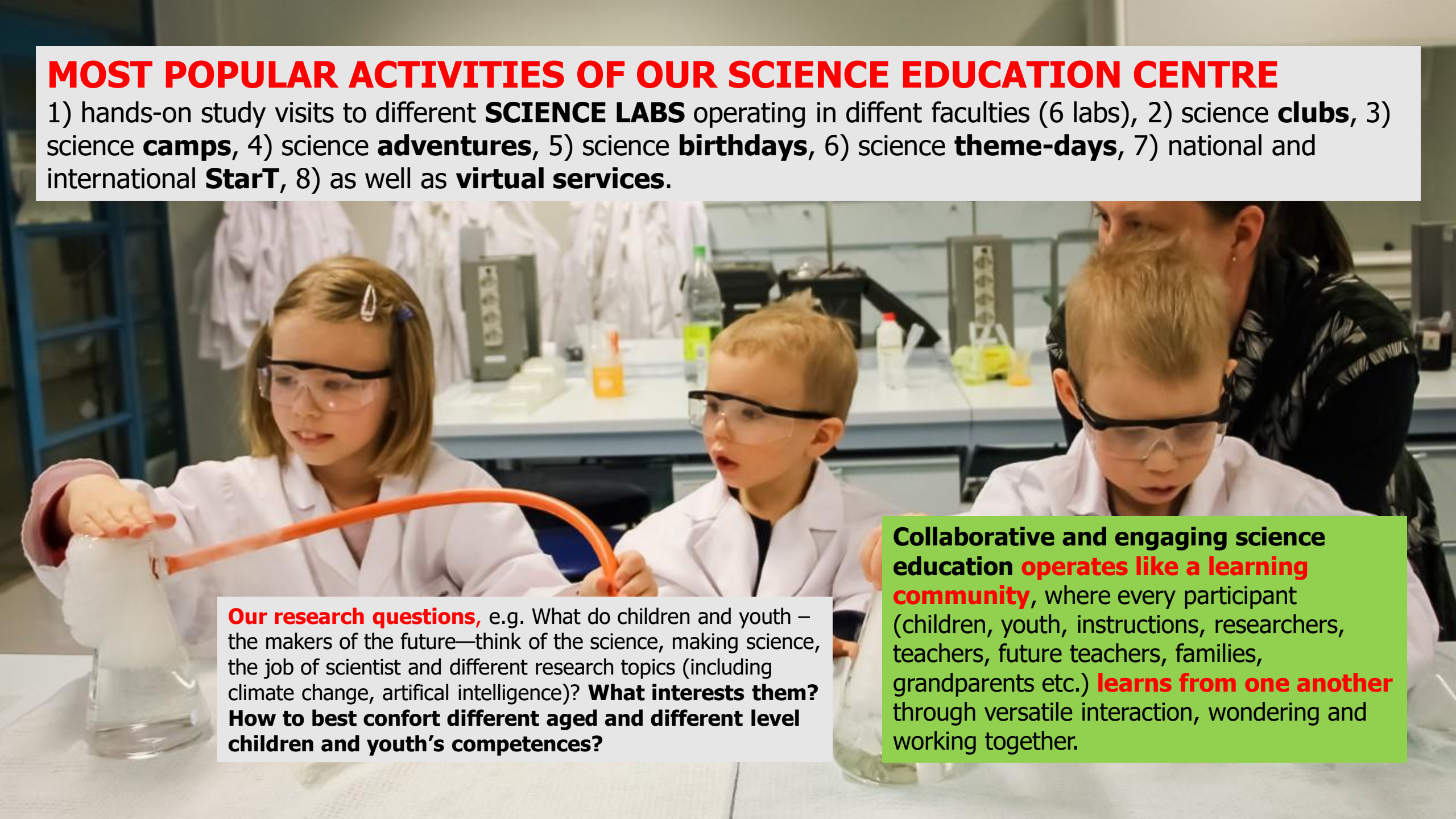
SCIENCE EDUCATION IS DEFINED AS THE STRENGTHENING OF SCIENTIFIC KNOWHOW AS IT COVERS **ALL FIELDS OF SCIENCE** (MINISTRY OF EDUCATION AND CULTURE, 2014).

THE AIMS OF SCIENCE EDUCATION

- 1) **TO INSPIRE CHILDREN AND YOUTH –MAKERS OF FUTURE –TOWARDS STUDYING SCIENCE**, ALSO TOGETHER WITH THEIR CLOSE RELATIVES AND VARIOUS COLLABORATIVE PARTNERS. **BOTH GIRLS AND BOYS**
- 2) **TO SUPPORT CURRENT AND FUTURE TEACHERS’** IMPORTANT **LIFE-LONG LEARNING** FROM EARLY CHILDHOOD EDUCATION TO UNIVERSITIES
- 3) **TO DEVELOP NEW SOLUTIONS AND PEDAGOGICAL INNOVATIONS** INTO EDUCATION, **COLLABORATIVELY AND BASED ON RESEARCH.**

MOST POPULAR ACTIVITIES OF OUR SCIENCE EDUCATION CENTRE

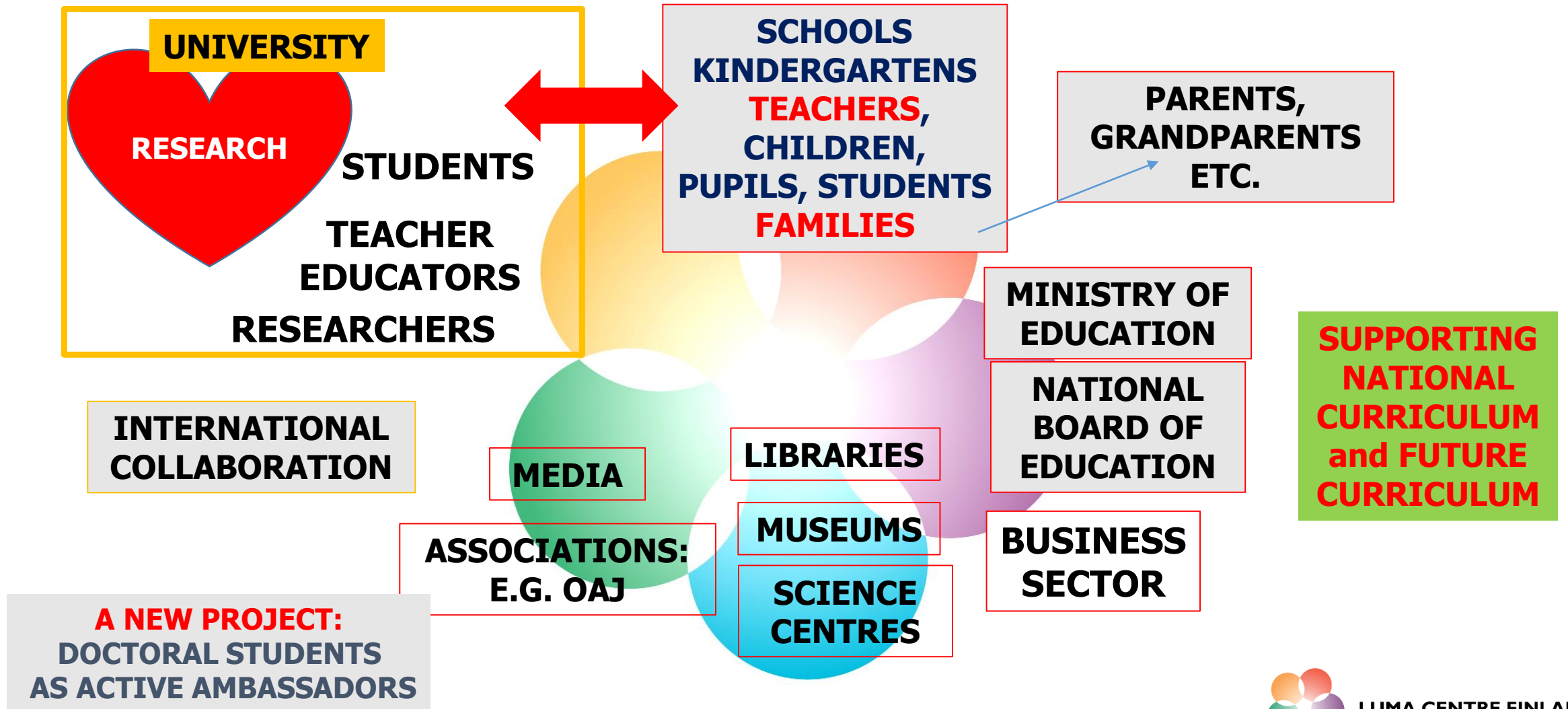
1) hands-on study visits to different **SCIENCE LABS** operating in different faculties (6 labs), 2) science **clubs**, 3) science **camp**s, 4) science **adventures**, 5) science **birthdays**, 6) science **theme-days**, 7) national and international **StarT**, 8) as well as **virtual services**.

A photograph of three children in a science laboratory. They are wearing white lab coats and safety goggles. The child on the left is a girl with blonde hair, holding a long orange tube over a flask. The child in the middle is a boy with blonde hair, looking on. The child on the right is a boy with blonde hair, looking down at a flask. A woman in a black jacket is partially visible behind them, observing the experiment. The background shows lab equipment and white lab coats hanging on a rack.

Our research questions, e.g. What do children and youth – the makers of the future—think of the science, making science, the job of scientist and different research topics (including climate change, artificial intelligence)? **What interests them? How to best confront different aged and different level children and youth's competences?**

Collaborative and engaging science education operates like a learning community, where every participant (children, youth, instructors, researchers, teachers, future teachers, families, grandparents etc.) **learns from one another** through versatile interaction, wondering and working together.

THE FINNISH MODEL: **COLLABORATION IS A KEY FOR SUCCESS**



Basic education curriculum reform

Core ideas

Active learner

**Sustainable way
of living**

**Integrative
teaching**

**School as a learning
community**

**Comprehensive
education**

SUPPORTING TEACHERS' **LIFE-LONG LEARNING**

EG.
ACTIVITIES
AS A PART OF
SPECIAL
COURSES FOR
FUTURE
TEACHERS IN
MATH AND
SCIENCE
EDUCATION
IN FACULTY OF
SCIENCE &
THESIS DONE

PRE-SERVICE TEACHER TRAINING

IN-SERVICE TEACHER TRAINING

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





37

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)



LUMA CENTRE FINLAND

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.



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FAMILY SCIENCE EDUCATION

FROM EARLY CHILDHOOD

HOW CAN **PARENTS AND OTHER CLOSE PEOPLE** PROMOTE THE COMPETENCES AND INTERESTS OF CHILDREN, BOTH **GIRLS AND BOYS**?

- SCIENCE CAMPS AND CLUBS (VIRTUAL)
- BIRTHDAY PARTIES
- SCIENCE THEME-DAYS

A RESEARCH AND DEVELOPMENT PROJECT:
SCIENCE CAMPS WITH **GRANDPARENTS** IN
SUMMER 2019



LUMAT

INTERNATIONAL JOURNAL ON MATH,
SCIENCE AND TECHNOLOGY EDUCATION

Register Login

A research and development project (started year 2013):
Science clubs for 3 to 6 years old kids and their parents.

Home / Archives / Vol 7 No 1 (2019): General Issue / General Issue: Research Articles

Science at home: parents' need for support to implement video-based online science club with young children

Make a Submission

Jenni Vartiainen

Department of Education, University of Helsinki, Finland

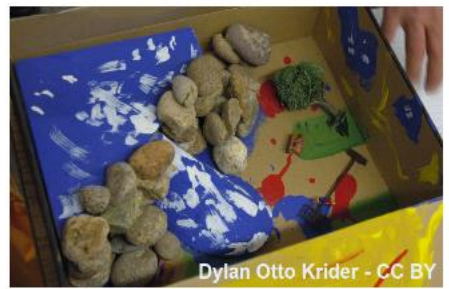
 <https://orcid.org/0000-0003-2846-511X>

Maija Aksela

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 <https://orcid.org/0000-0002-9552-248X>

DOI: <https://doi.org/10.31129/LUMAT.7.1.349>



Information

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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



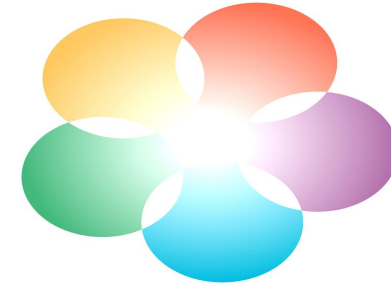


6 SCIENCE LABS AT UNIVERSITY OF HELSINKI

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)



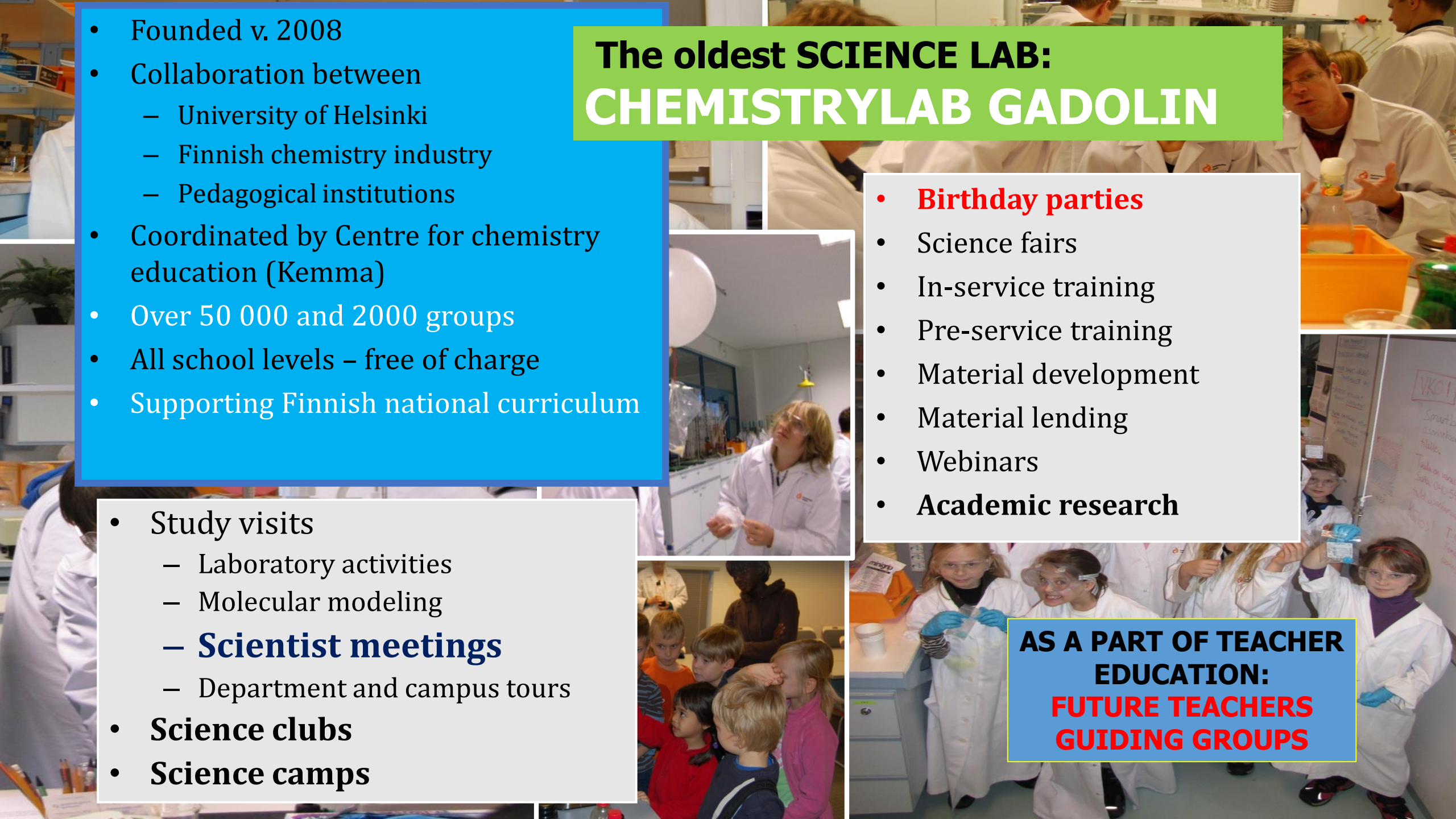
The oldest **SCIENCE LAB:** **CHEMISTRYLAB GADOLIN**

- 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**

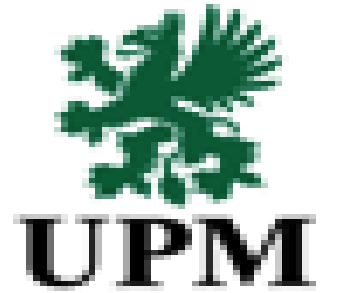
**AS A PART OF TEACHER
EDUCATION:
FUTURE TEACHERS
GUIDING GROUPS**





HELSINGIN YLIOPISTO

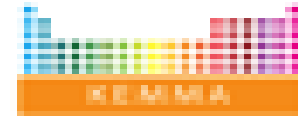
NESTE OIL



OPETUSHALLITUS
UTEIDNINGSTYRELSEN



LUMAKESKUS



kemira



Helsingin kaupunki
Opetusvirasto



COLLABORATION
WITH
BUSINESS



Metrohm
Nordic



A Member of
The Linde Group

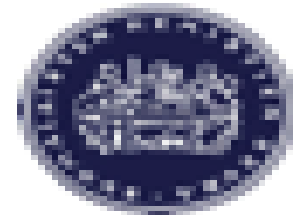


BOREALIS



SUOMEN BIOTEOLLISUUS
FINNISH BIOINDUSTRIES

Thermo
SCIENTIFIC





**COLLABORATIVE
SCIENCE EDUCATION
AT THE UNIVERSITY OF
HELSINKI**

**CHEMISTRYLAB GADOLIN
– A SCIENCE LAB AS AN
INSPIRING ENVIRONMENT
FOR **LEARNING,
DEVELOPMENT AND
RESEARCH SINCE 2008****

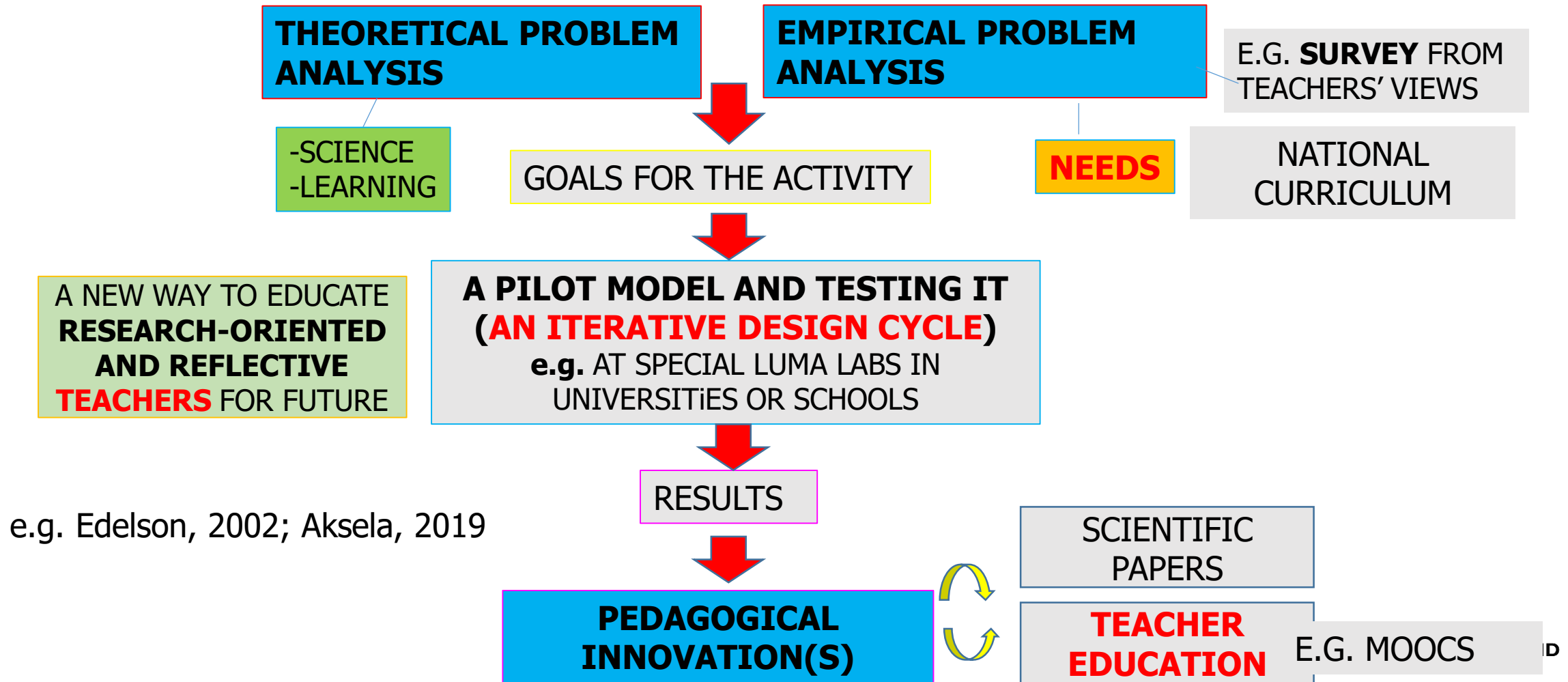
**CHEMISTRYLAB GADOLIN AS
AN EXAMPLE OF **NON-FORMAL
LEARNING ENVIRONMENT** AT THE
UNIVERSITY**

**NEW SOLUTIONS AND PEDAGOGICAL
INNOVATIONS FOR CHEMISTRY EDUCATION
THROUGH RESEARCH**

SEE MORE: <https://www.helsinki.fi/en/science-education/chemistrylab-gadolin>



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



CLIMATE CHANGE EDUCATION PROGRAM:

STUDENTS' QUESTIONS AND ACTIONS

- What **type of questions** do students ask about sustainable development (e.g. climate change)?
- What **type of actions** do students take to make the world a better place?
- What **type of expectations** do students have for non-formal education with a context of sustainable development?
- How can **students' needs and expectations** be met through non-formal education?

e.g. Tolppanen & Aksela, 2018



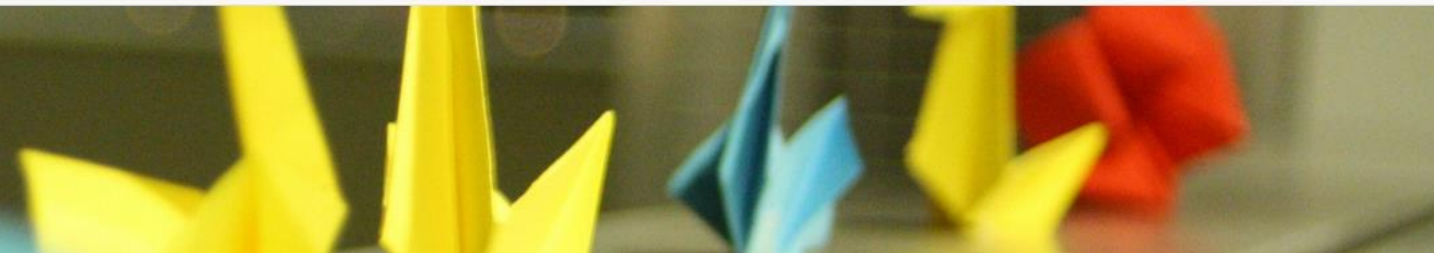
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THE RESEARCH RESULTS APPLIED TO

**INTERNATIONAL MOOCs and
VIRTUAL CONFERENCES:**

- A COURSE "SUSTAINABILITY ENERGY" **FOR YOUTH** AROUND THE WORLD
- A COURSE **FOR TEACHERS** (SAME TOPIC IN THE EDUCATION CONTEXT)
- GLOBAL TEACHER'S CLIMATE CHANGE FORUM 2016 & 2019**





See more from [LUMA](#) News

Teachers' Climate Change Forum: Materials and new knowledge for climate education from the new online course

January 21, 2019



Upcoming Events

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

June 5 - June 6

Jyväskylä
Finland

[View More...](#)

StarT Competition



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

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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>

NEW



The next blog: How to promote math education?

SCIENCE EDUCATION / NEWS /

A new blog on science education, "Makers of the future at the heart", has been started

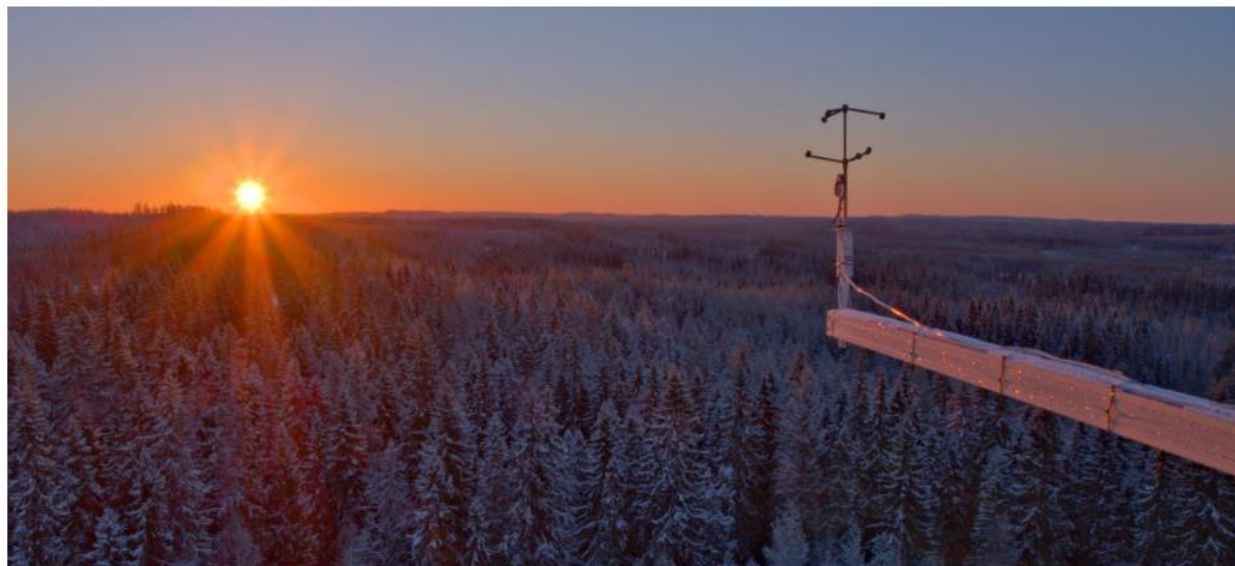
Feedback



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.



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!**

KIDS & YOUTH

TOGETHER WE ARE MORE!

Maija.aksela@helsinki.fi