

# LINKS, Learning from innovation and networking in STEM

Final conference

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# A short presentation of LINKS project

David Jasmin

Director of the Foundation *La main à la pâte*

# Why LINKS ?

The educational systems all over Europe are confronted with a major challenge: preparing the next generation for living in a more and more complex world:

- Evolutions of the 21<sup>st</sup> century raise new challenges for the teachers: changes that occur in our lives (globalisation, innovation, digitalisation...) should result in changes in the way children are educated as well.
- Besides, the society has new expectations towards school which has to support personal development of children in all its components: cognitive, physical, social and cultural.



# Objectives of the project

## General objective :

To contribute to the systemic development of STEM CPD policies and programmes at national and European levels

## Specific objective :

To develop a network focused on systemic change, in order to propose to main targets (CPD providers, local and national governments, employers, the scientific community and the European Commission) long-term strategies for innovative, effective and sustained support to STEM CPD



# Partners of the project

9 partners in 5 countries:

Austria:

Universität Alpen-Adria  
NaturErlebnisPark



Finland:

University of Helsinki  
University of Eastern Finland



France:

Fondation *La main à la pâte*  
Maison pour la science en Midi-Pyrénées  
Maison pour la science en Bretagne



Italy:

ANISN



United Kingdom:

STEM Learning



> These 5 national networks represent 120 local professional development providers that propose CPD to tens of thousands of teachers each year.



# Outputs of the project

1. A study –and its summary- that proposes a common framework for the professional development of STEM teachers and trainers, on the basis of the five networks' experience
2. 5 brochures that explore more in details 5 cross-cutting issues which have been identified as particularly critical for creating an environment conducive to the success and dissemination of professional development programmes
  - Working with the schools, coord. ANISN
  - Working with the scientific community, coord. *La main à la pâte*
  - Working with the employers, coord. University of Helsinki
  - Quality assurance and evidence-based impact, coord. STEM Learning
  - Building comprehensive alliances, coord. Alpen-Adria University



# Objectives of this conference

1. To share and discuss the results of the study and of the 5 working groups on cross-cutting issues
2. To collect ideas from the participants about additional issues that should be addressed as well in order to contribute to the promotion and enhancement of STEM professional development





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# Presentation of the study

Laurence Constantini

Fondation *La main à la pâte*

LEARNING FROM  
INNOVATION AND  
NETWORKING IN  
STEM (LINKS)

EXPERIENCES IN IMPLEMENTING EFFECTIVE

CONTINUOUS PROFESSIONAL DEVELOPMENT

FOR STEM TEACHERS IN FIVE EUROPEAN COUNTRIES







1

## 1. STEM Education in a Changing World



## **STEM education and sustainable development**

Addressing climate change, biodiversity... and their related technological challenges

## **STEM education and citizenship**

Strengthening scientific and critical thinking to understand the world around and make enlightened choices in the post-truth context

## **Challenges for STEM education**

## **STEM education and the economy**

Developing the knowledge and skills needed for a changing economy

## **STEM education and social inclusion**

Addressing gender and diversity issues for more equal access to STEM careers





2

**Main levers for effective  
and impactful professional  
development**



# 1. Content of professional development (PD)





## 2. CPD delivery (1)

Sustainable improvement requires long-term CPD investment

- Adopting IBSE requires deep professional changes regarding the attitude, and to consider student learning in a new light
- Helping teachers to change their practices in a sustainable way supposes to engage them in many new ways: working in collaboration with their colleagues, in a spirit of interdisciplinarity, but also working with their management, the parents and the scientific community
- The evolution of professional practices cannot be effective without going back and forth between moments of reflection outside the classroom and moments of implementation with students

That is why LINKS partners agree with the general recommendation of a total of 80 hours of professional development to achieve significant change



## 2. CPD delivery (2)

...But long-term CPD also requires specific dissemination strategies and activities to be accessible for all teachers

- Training of trainers is important to generate a multiplying effect and support teachers more effectively
- Distance learning & use of digital tools help to complement and deepen face-to-face professional development
- Turnkey resources and activities facilitate the implementation in the classroom
- Learning communities where teachers can work with their peers and other stakeholders

LINKS partners consider these strategies as complementary activities, of equal importance and which -as such- should be given equal consideration and support



### 3. CPD targets and CPD providers

#### Going beyond traditional boundaries in CPD

- ▶ **Common CPD for primary and secondary teachers**
  - Favouring interdegree sharing of good practices between teachers
  - Fostering local peer communities
  - Contributing to a smoother transition from primary to secondary school for students
- ▶ **Strong link between pre-service and in-service PD**
  - Promoting a professional development continuum that starts during pre-service studies and continues for the entire career
  - Benefiting from facing people with alternating background but similar interests

#### Involving new groups of educators in CPD

- ▶ **The possible role of students**
  - Science students provide useful content-orientated support targeted at primary teachers who are uncomfortable with science knowledge
  - Students in education can be mobilised to support teachers in the field, especially through specific small-scale projects to test innovative approaches
- ▶ **The growing role of scientists**
  - Promoting scientific subjects and careers, acting as role models for students
  - Providing scientific support during training or in the class
  - Contributing to the design and delivery of training sessions, pedagogical resources, etc.

#### Empowering STEM educators

- ▶ **Addressing educators as actors**
  - Forming communities of learning within peers
  - Fostering reflective-practitioners
- ▶ **Using knowledge for systemic change**
  - Modulating between top-down and bottom-up requirements
  - Identifying themselves as management from the middle and seek contact and exchange with scientists, local CPD providers, the industry and educational stakeholders



## 4. Conditions for successful CPD programmes





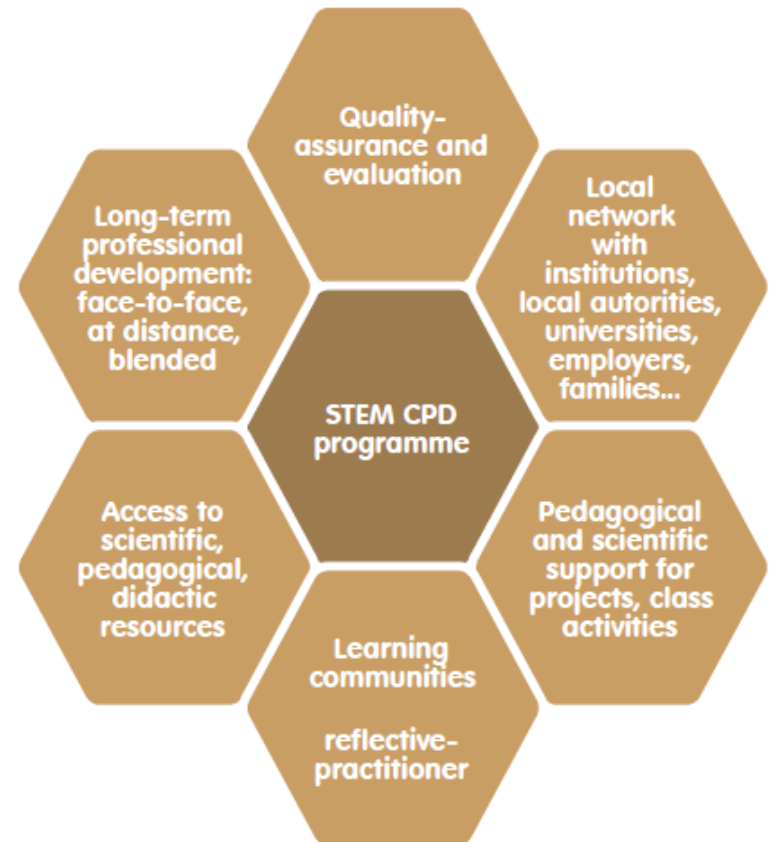


# **The future of STEM CPD: the vision of LINKS partners**



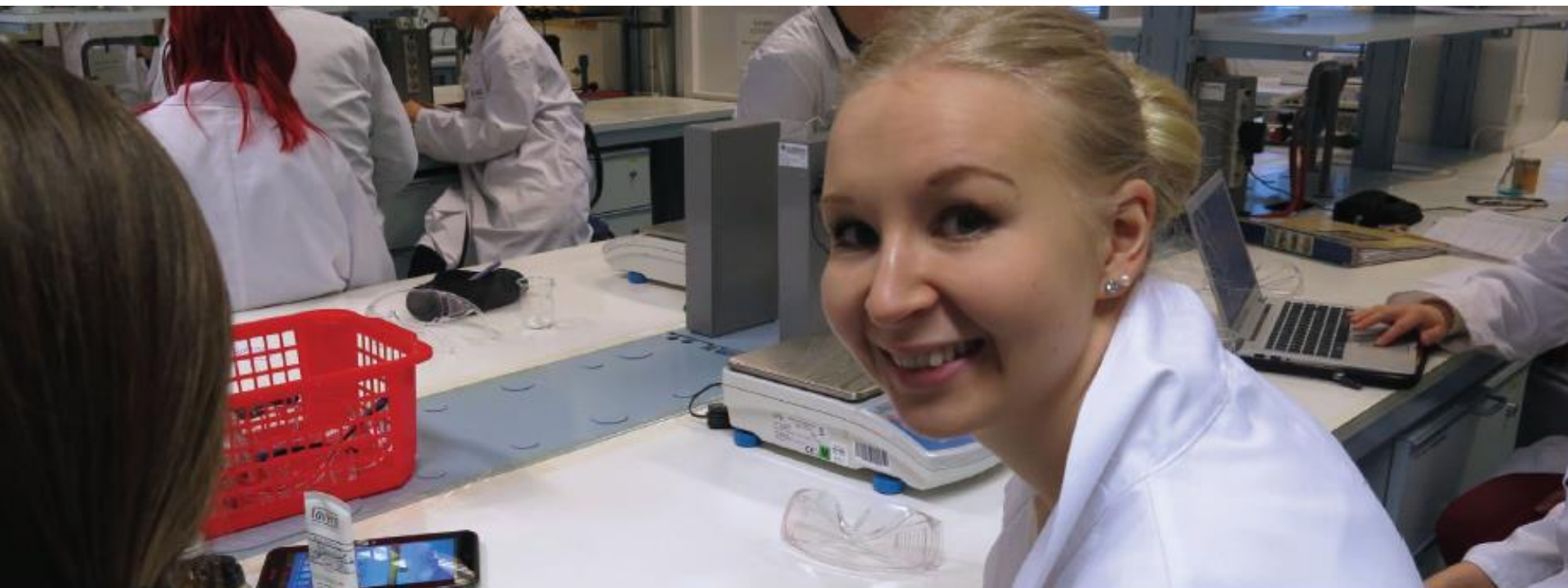
# The proposed strategy

- ▶ The capacity to provide consistent and comprehensive CPD programmes
- ▶ The capacity to progress from innovative pilot actions to larger-scale programmes
- ▶ The capacity to build links between the scientific and educational communities and institutions
- ▶ The capacity to remain close to local needs and dynamics and to enhance local results through networking



# The challenges

- ▶ The challenge of CPD for all teachers
- ▶ The challenge of sustainability





# Recommendations

- ▶ Educational authorities as well as the European Union should increase their recognition of the role of intermediary structures and their support to their work
- ▶ Educational authorities should lead the change towards a learning system
- ▶ Long-term ambitious policy for STEM CPD and STEM education should be adopted and maintained



# A field analysis in tune with international research

Recent research on professional development highlight trends that are similar to those identified by LINKS partners; 2 examples:

- Darling-Hammond, L., Hyler, M. E., Gardner, M. (2017). *Effective Teacher Professional Development*. Palo Alto, CA: Learning Policy Institute.

A report that reviews 35 methodologically rigorous studies and identifies seven widely shared features of effective professional development. Such professional development:

- Is content focused;
  - Incorporates active learning;
  - Supports collaboration;
  - Uses models of effective practice;
  - Provides coaching and expert support;
  - Offers feedback and reflection;
  - Is of sustained duration.
- *Teachers' professional development: Europe in international comparison*. A report from the EU and OECD that stresses the conditions for an effective PD implementation:
    - Importance of a continuum between pre-service, induction and in-service professional development;
    - Key role of local support programmes, promoting peer exchange for instance;
    - Importance of removing organisational barriers (time, place);
    - Proven need to review professional development offer in order to take into account a larger diversity of content, stakeholders, conditions...



# Documents available

Summary of the study available in 5 languages: ENG, FI, FR, GER, IT > paper and digital copies

<https://www.fondation-lamap.org/en/page/55552/main-expected-outputs-in-links>

> *Do not hesitate to ask for copies!*

Full study available in ENG > digital version only

[https://www.fondation-lamap.org/sites/default/files/upload/media/minisites/international/links\\_Final\\_Study.pdf](https://www.fondation-lamap.org/sites/default/files/upload/media/minisites/international/links_Final_Study.pdf)

**THANK YOU!**





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# *Working with the scientific community*

David Jasmin

Fondation *La main à la pâte*

Working  
with the  
scientific  
community



# The working group

## Coordinators:

Katia Allégraud & Frédéric Pérez, *La main à la pâte*

## Other members and authors:

Paola Bortolon, ANISN

Andrea Franz-Pittner, Austria

Gill Gunnill, UK

Risto Leinonen, Finland

- Online and physical meeting were organised to share ideas
- A national seminar in France also addressed this issue with external partners in December 2018 to confront ideas of the group





# The content of the guidance tool

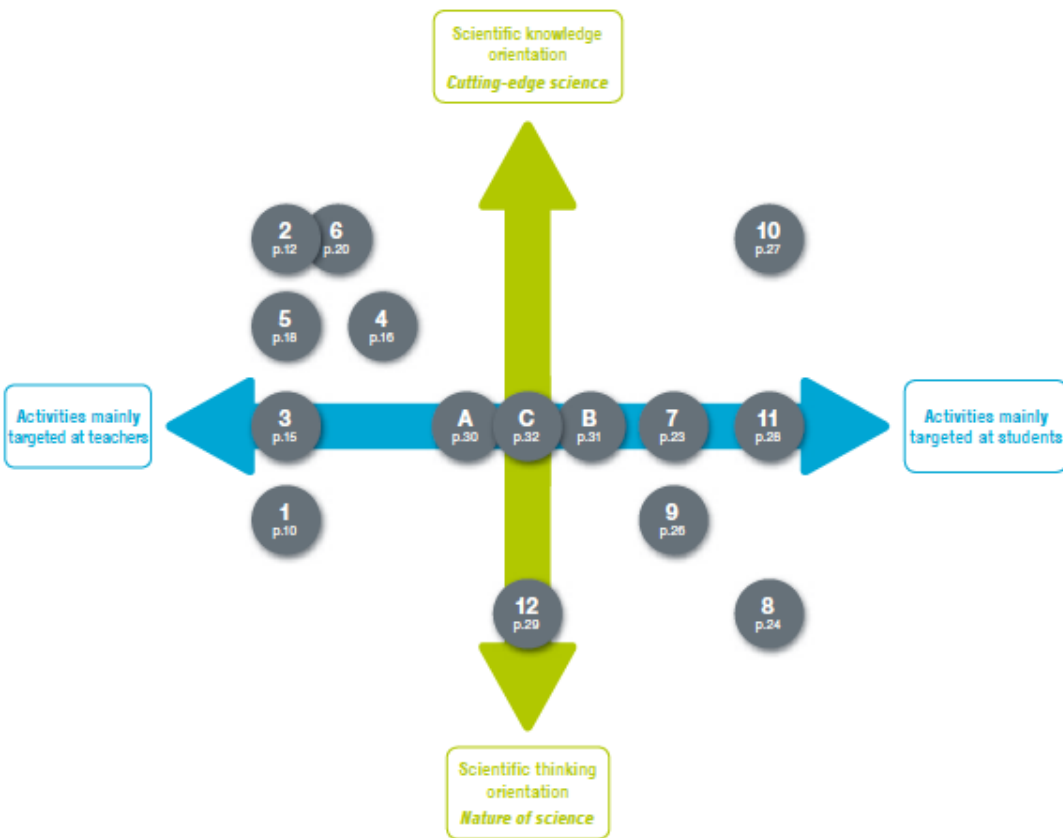
The objectives of this guidance tool are:

- to provide concrete examples of professional development activities that can be implemented through a collaboration between CPD stakeholders and the scientific community
- to show the mutual benefits for the teaching and scientific community of such collaboration

Thus, this brochure can help those who would like to develop this type of cooperation, by giving some ideas to start, but also by highlighting arguments that can be used to convince scientists to get involved



# Experiences in implementing professional development activities with the contribution of the scientific community



## 2.1 Twelve ideas to involve scientists in the professional development of teachers

- 1 Training teachers through hands-on sessions .....10
- 2 Preparing implementation in class: clarifying all the ideas related to a scientific concept .....12
- 3 Helping teachers with the appropriation of turnkey resources for the class .....15
- 4 Increasing scientific skills of teachers involving them in cutting-edge science protocols .....16
- 5 Placement for developing a better knowledge of the scientific professions .....18
- 6 Updating the knowledge of teachers on new scientific developments.....20
- 7 Building a network of STEM ambassadors.....23
- 8 Challenging students in their classroom by video .....24
- 9 Taking advantage of the presence of a scientist during an inquiry conducted in class by students .....26
- 10 Co-constructing a lecture with students.....27
- 11 Strengthening students' knowledge concerning science careers .....28
- 12 Involving students in a research work of the scientists .....29



# Benefits for the scientific community to participate in such actions

- Motivation to strengthen the link between science and society
  - Raising awareness of global issues (environment, new technologies...)
  - Informing about scientific careers to promote vocations in science and technology
- Personal intrinsic motivation
  - Civic engagement
  - Personal relationships
- Personal skills motivation
  - Developing one's communication skills
  - Stepping back on one's professional practice and teaching
  - Deepening one's understanding of scientific notions
- Interest for new research methods (participating sciences)



# A few testimonies

Testimonial: Laurent Chevalier, researcher at CEA and CERN (involved in *La main à la pâte* trainings about physics of matter) - France

*Outreach, that is to say «to make known» to the greatest number the scientific knowledge in a field, is one of the pillars of my work as a researcher. The society supports me to do research; part of my duties is to make intelligible the subjects on which I work.*

*I must be able to report on my work at all levels of society, from children to policy makers.*

*Moreover, at a time when the world is invaded by «fake news» the scientific approach is essential to promote at all levels of society. The analysis tools that I describe must allow the public to avoid any manipulation.*

Testimonial: Pasi Vahimaa, Professor in photonics in Department of Physics and Mathematics in University of Eastern Finland - Finland

*To promote scientific careers, it is important to show that we really do something that gives some benefit to people. Too often the presentations on science are about technical devices and results forgetting the benefits. Fortunately in optics, one can very easily spot our everyday life devices and say that this part here is why we learn optics. It can be virtual reality glasses used in the training of medical sciences. Here I can show that this is not possible without deep understanding of optics.*

Testimonial: Aldo Donizetti, professor in molecular biology researcher in the department of biology of the University of Naples Federico II - Italy

*The collaboration with high school teachers and their students in a didactic project strengthened my opinion that even behind a simple experiment, there is a great educational challenge. Each step of an experiment, although obvious to an expert scientist, offers the opportunity to stimulate the vision of the surrounding world through scientific reasoning. Sharing and helping to spread this vision increased my awareness of my role in society and the importance of being able to communicate my research at all levels.*

*Furthermore, the opportunity to share my passion for science and discovery with the community has refreshed my child's eyes that were the engine that drove me to my scientific path.»*





# Conclusion

→ The **involvement of scientists** in teachers' PD or directly intended for students **is effective...**

- Changes in teaching practices
- Improvement of scientific knowledge for both teachers and students
- Acquisition of new skills
- Better understanding of the nature of science

→ ... **When paying attention to some points:**

- True understanding of teachers' needs
- Close relation between cutting-edge subject and pedagogical knowledge



→ To guarantee success the role of CPD providers is crucial. They act as **intermediate bodies**, bridges between the scientific community and the teaching community:

- Helping scientists to make their knowledge meaningful to teachers and students
- Organising mutual training between the two communities
- Providing tools for cooperation
- Etc.



# Recommendations for a successful involvement of the scientific community

## The main challenge

- Current involvement of the scientific community is mainly based on good will and personal interest
- There is a risk that the reach of such cooperation remains limited
- **The development of more sustainable and larger programmes** requires more effort, especially
  - a continuous cooperation between CPD providers and major stakeholders and umbrella organisations in science and economy (science academies, employers' unions, universities, etc.)
  - adequate and secure funding to coordinate the activities, organise the training sessions





# Towards sustainable cooperation, some ideas

- Systematic inclusion of educational cooperation activities into research proposals (see the dedicated amount of the grants for outreach and/ or participative research)
- Specific grant programmes under the condition of cooperation between scientific institutions, schools and economic stakeholders
- Funding for intermediary structures that bridge the various organisations / communities
- And...



- Disseminating successful and effective experiences of cooperation already implemented like those described in our guidance tool!!

Thank you!

