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# Research and development policy of the LUMA Centre Finland

## 1. Introduction

At its meeting held on 11 November 2017, the board of the LUMA Centre Finland confirmed a proposal on the establishment of a national LUMA research programme. The proposal included the measure of drawing up a research and development policy. This policy can be utilised, for example, in partnership negotiations and enclosed in research funding applications.

The need for strengthening and systematising scientific research related to LUMA activities with significance to universities is clear, since it both supports the development of research-based learning and studying, and facilitates the consolidation of LUMA activities on the university level.

A joint policy is required for coordinating research and development conducted within the LUMA network. Research should constitute a continuum. In the long term, various research projects should form a harmonious whole, even if new research projects are targeted at unexplored areas. Local LUMA centres can focus their research activities as they see fit, but their individual research operations will together form a comprehensive whole that supports the national LUMA policy and development projects. The policy does not prevent LUMA Centres from carrying on with research related to the interests of their specialisations in mathematics, science and technology education.

This document was prepared by the network administration and was circulated for comments by LUMA Centres during spring 2018. At its meeting held on 4 June 2018, the network's board confirmed the policy and authorised the board's chair to finalise the document with minor specifications.



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## 2. LUMA Centre Finland bases its development of pedagogical innovations on research

**Developing pedagogical innovations with the help of scientific research for teaching in mathematics, science/environmental studies and technology** is a central purpose of the LUMA Centre Finland.

The LUMA Centre Finland is primarily an expert, research and development organisation that does not necessarily carry out all of the operating concepts, be they under development or completed, at least not permanently, but distributes them for unrestricted use by all interested parties.

In research and development, methods are used on a case-by-case basis.

The iterative methodology of [design-based research](#) is employed to a significant extent. In addition to new theoretical knowledge, it produces novel and useful solutions directly applicable to everyday life, such as learning environments, operating concepts, pedagogical approaches and materials. The theoretical research knowledge gained can be used to develop current and new practices.

Furthermore, the aim is to increasingly utilise learning analytics to enable research and development. It is important to try to understand through research how learning as well as educational environments and technology can be justifiably applied to pedagogy in various learning and teaching situations. Learning analytics can be used to understand how various sectors of information and communication technology can be used in learning and teaching the LUMA subjects, as well as related teacher education.

## 3. Non-formal learning environments as central environments and targets of research and development

Through multidisciplinary science and technology education conducted in several non-formal learning environments and related research, the LUMA Centre Finland is developing pedagogical innovations, such as new kinds of learning environments, operating concepts, approaches and materials. Research and development can be carried out in learning environments dedicated to science and technology education operated by universities and/or partners.



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Non-formal learning environments include the science and technology activities of children, youth and entire families, such as clubs, camps, parties and events, as well as the pursuit of hobbies at home. This may also partly encompass learning environments outside the classroom used as part of teaching, such as science and technology classrooms, museums, science centres and nature. The above learning environments can also be partly or entirely virtual.

The targets for learning and teaching in the learning environments are children and youth, as well as their guardians or entire families. The activities are also targeted at increasing the competence of teacher students or current teachers and supervisors. Research topics can also include the communality of various active parties and the role of agency as a supporter and facilitator of learning.

## **4. Focus areas to guide research and development**

Among the primary goals for science and technology education is the promotion of sustainable development.

Due to the nature of scientific and technological processes, research and development is focused on

- Studying science in a research-based and functional manner
- Studying phenomena in their entirety in a manner that brings together science and technology (as well as humanities and art)

Another central goal is to develop, on the basis of research, sensible methods for all science and technology education for

- Following the latest innovations in science/technology
- Taking advantage of modern technology

## **5. Organisation of research and development**

The local LUMA Centres conduct research and development according to their individual practices. Depending on the project, researchers and developers can represent various fields of science and units of their home university. Additionally, the parties active in the LUMA Centres serve naturally as coordinators of research and development. Researchers and developers can transfer between projects, representing various fields of science and units of their university.

Research and development can be conducted in both large-scale national and/or international projects and smaller projects, such as master's theses or doctoral dissertations.



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Often, the LUMA Centres conduct research and development related to science and technology education while studying formal school education or teacher education. For their part, the development needs arising from this research guide the research and development conducted by the LUMA Centre Finland.

It is natural for the administration of the LUMA Centre Finland to serve as the coordinating party for LUMA-related research and development projects carried out both by several universities together and with international partners.

## 6. Research and development through diverse cooperation

International cooperation with primarily academic parties will be strengthened. Cooperation with European researchers and science centres, already established to some extent, will be further advanced and consolidated.

The LUMA China Centre, established under Beijing Normal University, is a new significant international partner. China is a leader in the sensible utilisation of modern technology as support for science and technology education.

Systematic cooperation with international partners requires practices outlined in cooperation agreements, while the activities must support the research and development policy of the LUMA Centre Finland.

Measures to strengthen international research collaboration also include visits abroad to relevant research centres and hosting international scholars during their visits to Finland.

## 7. Completed innovations shared openly for all

The distribution of research and development results is of utmost importance to maximise their impact.

**Innovations** developed on the basis of research **will be distributed nationally and internationally** in cooperation with other parties, both directly and indirectly, to be applied to all (also formal) science and technology education and learning on different educational levels, even on a global scale.

The distribution channels include the **education of future and current teachers** at universities, events organised by universities and other parties, academic and popular multimedia **publications**, as well as



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international researcher exchange and **education export**. Innovations will spread to be used in both non-formal and formal learning environments.

Research results will be published for the academic community in the form of articles in domestic and international peer-reviewed open access publications, conference presentations and proceedings, as well as scholarly works (bachelor's, master's and licentiate theses, doctoral dissertations).

The LUMA Centre Finland has channels of its own, such as the International LUMAT Symposium and the peer-reviewed LUMAT online journal and the LUMAT-B online journal focused on conference and project proceedings, as well as the LUMA News section of the LUMA website.

The open distribution of research-based innovations also promotes the emergence of new business opportunities.