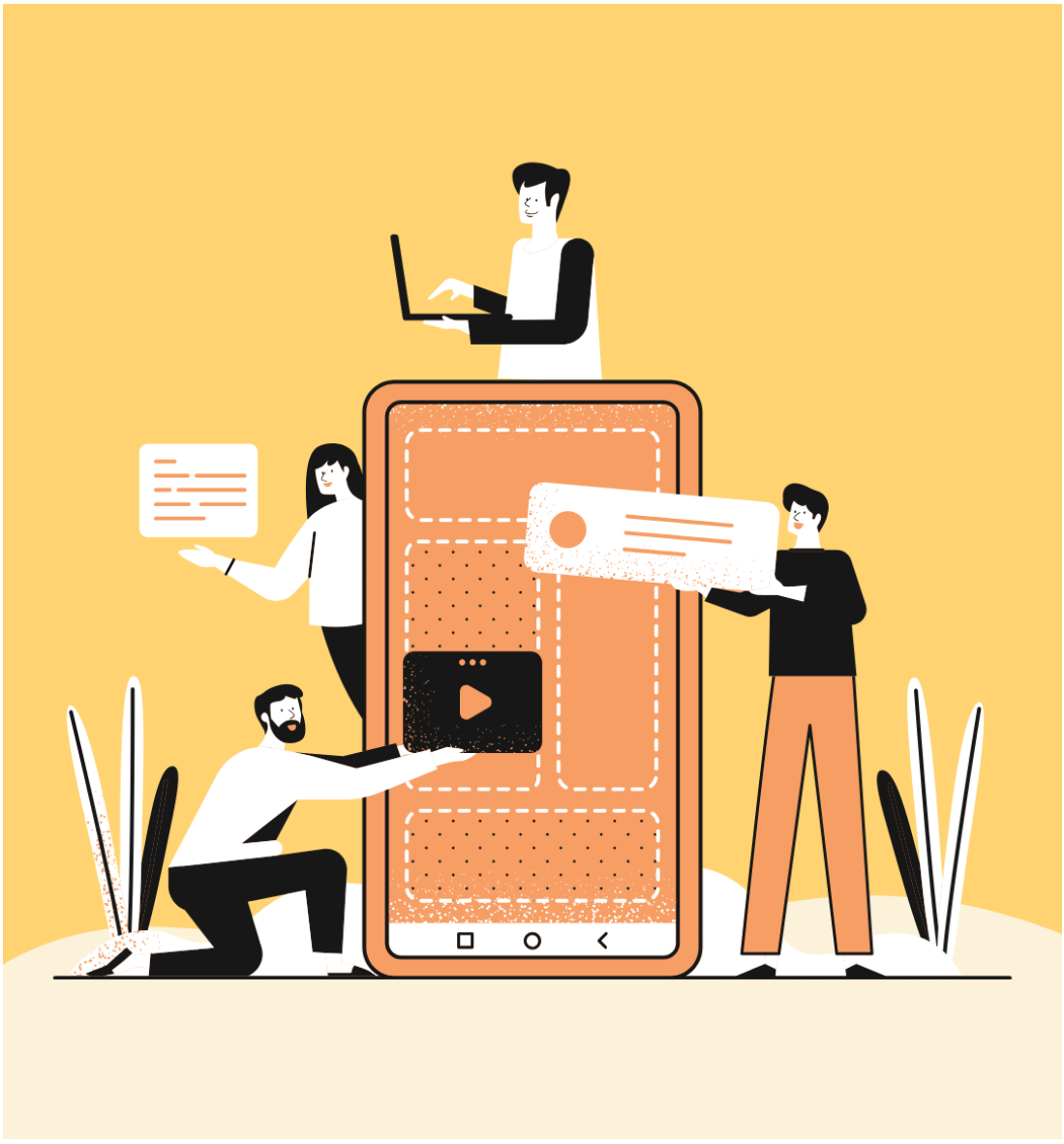
SciTeach Center Investigation Guides

May 2020

Resource Center

Brochure template adapted from www.canva.com and accompanying website images courtesy of www.pixabay.com.

In response to the COVID-19 crisis, the SciTeach team has developed several initiatives and activities to engage children in discovering science phenomena, including Investigation Guides for students and teachers. The Science Teacher Resource Center team welcomes feedback on the (re)usage of this material, which helps us monitor our initiatives' usefulness. The SciTeach team also appreciates receiving photos of science explorations with children, but please make sure to enclose a signed declaration of consent. All information and questions may be sent to **sciteach@uni.lu**.



SciTeach Center Investigation Guides

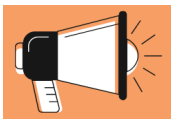
Developing pedagogical material for supporting primary science in A/B-weeks

The SciTeach Center team is developing pedagogical material for primary school *eveil aux sciences* teaching and learning that can be provided to students for the B-weeks. These activities can be integrated into the A-week lessons if teachers choose, or children can simply use them on their own during B-weeks.

CONCEPT

These observation-based investigations will be structured so that children can do them on their own with simple materials around the house, *maison relais*, or wherever they might be spending time in B-week. Thematic Investigation Guides will be downloadable so that students do not necessarily need to have access to the internet to complete the activities. In addition to Investigation Guides for students to use during week B, we are designing activities that teachers can integrate in week A with students working individually at their own desks if the teacher wishes to. These will serve to build upon and extend the students' B week science investigations and also provide a view on students' understandings. However, the week B activities can also "stand alone" as week B independent work for students if teachers prefer.

The goal of the Investigation Guides is to support students' purposeful observation of science phenomena in an informal (B week) setting. Objectives will include making observations, asking questions, designing investigations, documenting discoveries, and finding solutions.



GOAL

STRUCTURE

SciTeach Center Investigation Guides will be series of investigations that students can do on their own, with guiding questions, documentation, and extension possibilities. Potential topics include weather, plants, water, and other types of themes that can be done with simple observation prompts and with material readily available in a home. Topics and activities in the Investigation Guides will be competency-based and connected to the Luxembourg *plan d'etudes*, and both teacher as well as student materials are structured to allow for flexibility and a range of science understandings.

Each of these topic-based-guides will also include options for children to document their week B discoveries, such as posters, labor journale, photos, apps, and also include resources for the teacher for week A if they choose, including discussion prompts, demonstration activities, interdisciplinary connections, suggestions for other resources, and management tips.

DOCUMENTATION

EXTENSIONS AND ADAPTATIONS

Each Investigation Guide will have prompts and ideas for further extension, both for students as well as for teachers. Interdisciplinary connections will be included, as will suggestions for scaling activities up or down based on students' interest, abilities, and the time available to the teacher.

Investigation Guide

Overall Main Goal

When a child takes part in a science experiment or undertakes an investigation, s/he engages in the practices of science, meaning that the search for evidence is the focus and the path is built on the steps of doing science itself.

As a teacher, try to pay attention to the process of the investigation and how the student gets involved. The results may vary and every conclusion will likely be grounded in life experiences; therefore, students will express their ideas and conclusions in different ways and at differing depths. Try to allow the process of investigation to emerge from students' interests and curiosities, as time goes by, you can introduce words and concepts as they come up during experiences in the class.

This form of learning is called "inquiry-based learning" and it places the focus on the learners. Lessons are structured based on the interests, needs and questions of the students, and are oriented towards their everyday experiences and competencies. Children become active co-creators of the lessons. Discussions give rise to new questions, which can be explored, manipulated, observed and recorded, leading to answers and learning outcomes. The learners develop their own questions and demonstrate and verbalize their understandings in relation to their engagement in science processes. Students' questions result in an exploratory phase, during which they seek information and/or themselves try things actively and make careful observations. New findings and results are communicated and shared with others, questions can be answered and new questions arise. This is followed by reflection, to support students in reflecting on the investigation, documenting, and working toward making conclusions. Possibly students will develop alternative approaches to addressing their questions, and return again to the exploration phase. New questions and opportunities to investigate and observe emerge, and the cycle of inquiry can begin again. This form of teaching is supported by a learning environment structured around collaboration and student involvement. Authentic dialogue that builds upon students' interests and contexts can support the process of investigation and wondering and lead to construction of new understandings. This process is promoted by building upon students' curiosity, and this can be fostered by a mind-set that includes an openness to new ideas. Inquiry-based approaches thus build upon students' curiosity, and support the development of their creativity and critical thinking skills.

Topics

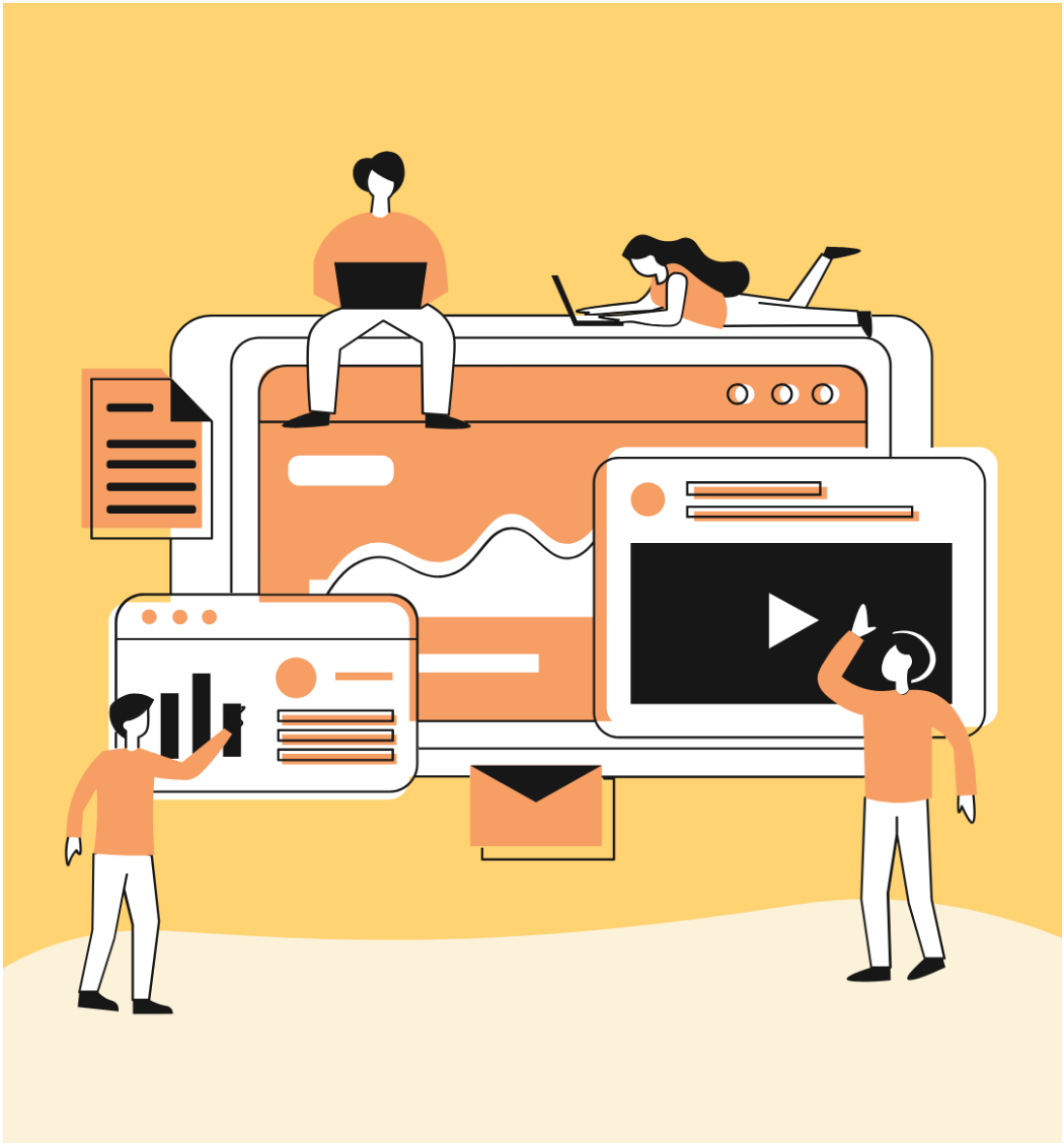
Each topic comes with a teacher guide and student activities (handouts).

TEACHER	CONNECTIVE DESCRIPTION	STUDENT
Equipment	List of what the student will need.	**You will need**
Instructions	Step-by-step of the experiment.	**What to do**

→ Optional parts may appear in students' journals, such as "Tips", "If you want to take one step forward", "If you want to test your investigation, make a control experiment".

Teacher Guide will include pre- and post- investigation suggestions on how to tackle the activity in the classroom before and after the student has undertaken the investigation. The guide will also as much as possible include information on:

Objective	List of the goal(s) the experiment is intended to meet.
In-Depth and Transdisciplinary approach	• Connection to other experiments and looking at the initiative as a continuum; • Connection to other subject contents.
Extra activities and links	Other online and printable activities, videos and useful links.



The Levels of Competence

Science and Interdisciplinarity

Discovery of the world with all senses, discovery of science, natural and human sciences

COMPETENCES	LEVEL	DESCRIPTION	SUMMARY
Exploring phenomena	L2 (Cycle 3)	The pupil observes a living being, a plant or an object and he describes its main features.	**OBSERVATION**
	L3 (Cycle 3)	The pupil asks at least one question about an issue.	**INQUIRY**
	L4 (Cycle 3)	The pupil formulates at least one hypothesis relating to a specific problem (e.g. within the scope of the observation of changes in the weather).	**PREDICTION**
	L5 (Cycle 3)	The pupil makes an observation over a longer period of time (e.g. to follow the development of a plant) and he draws at least one conclusion from his survey.	**OBSERVATION, RESULTS AND CONCLUSION**
Gathering and use of specific information	L2 (Cycle 3)	The pupil compares two plants or animals according to given criteria.	**COMPARISON**
	L4 (Cycle 3)	The pupil gives a concrete description of the evolution of an animal or of a plant (…).	**DESCRIPTION**
Rendering critical judgment	L5 (Cycle 3)	The pupil discusses the consequences of human action, referring to a precise example from his region.	**ARGUMENTATION**
Establishing interrelations	L2 (Cycle 3)	The pupil establishes the interrelation between the features of different plants or animals and their natural environment or their way of life.	**COMPARISON AND INTERRELATION**
	L3 (Cycle 3)	The pupil classifies animal and plant species as well as well-known technical devices, and he determines their common characteristics.	**CLASSIFICATION**
Interaction through the use of different means of communication	L2 (Cycle 3)	In collaboration with his classmates, the pupil relates what happened during one given day for instance, and he illustrates the story with drawings, photos and short texts.	**NARRATIVE AND EXPRESSION**
	L3 (Cycle 3)	The pupil participates in group work and he contributes to the creation of a series of drawings or photos including short explanatory texts dealing with a specific subject.	**(within the limits)**
	L4 (Cycle 3)	The pupil knows how to present in a simple way an element of his own environment and its specificities (e.g. in the context of the elaboration of an elementary tourist guide).	**PRESENTATION**
	L6 (Cycle 4)	In the context of the presentation of a specific topic, the pupil uses the most common technical and scientific terms in his oral and written expression.	

Source: The Levels of Competence

→ Due to the nature of the competences "**Exploring phenomena**", "**Gathering and use of specific information**" and "**Establishing interrelations**", they emerge as core competences related to science inquiry-based learning process and should be explored as much as possible.
→ The different levels of the competence "**Drawing up, development and implementation of a project**" can be explored in all activities as far as classroom development.

Interdisciplinarity

→ These are some competences on other areas that share goals with science and/or their contents can take role in the science investigation. As content distribution/order may vary, we present these just as some examples.

AREA	SPECIFICATION	COMPETENCES	LEVELS
LANGUAGE	Oral production	**Addressing na audiance**	4-5
	Written production	**Writing different types of texts** (description/ sequencing/comparison/conclusions/…)	All
MATHEMATICS	Space and Shapes	**Orientation in plane and space**	5
	Numbers and operations	**Correct presentation and communication of numbers and operations**	5-7
VISUAL ARTS		Imagination and creation of two- and three-dimensional works	5
		Use of basic techniques	4-5

Source: The Levels of Competence

Other Tools and Resources

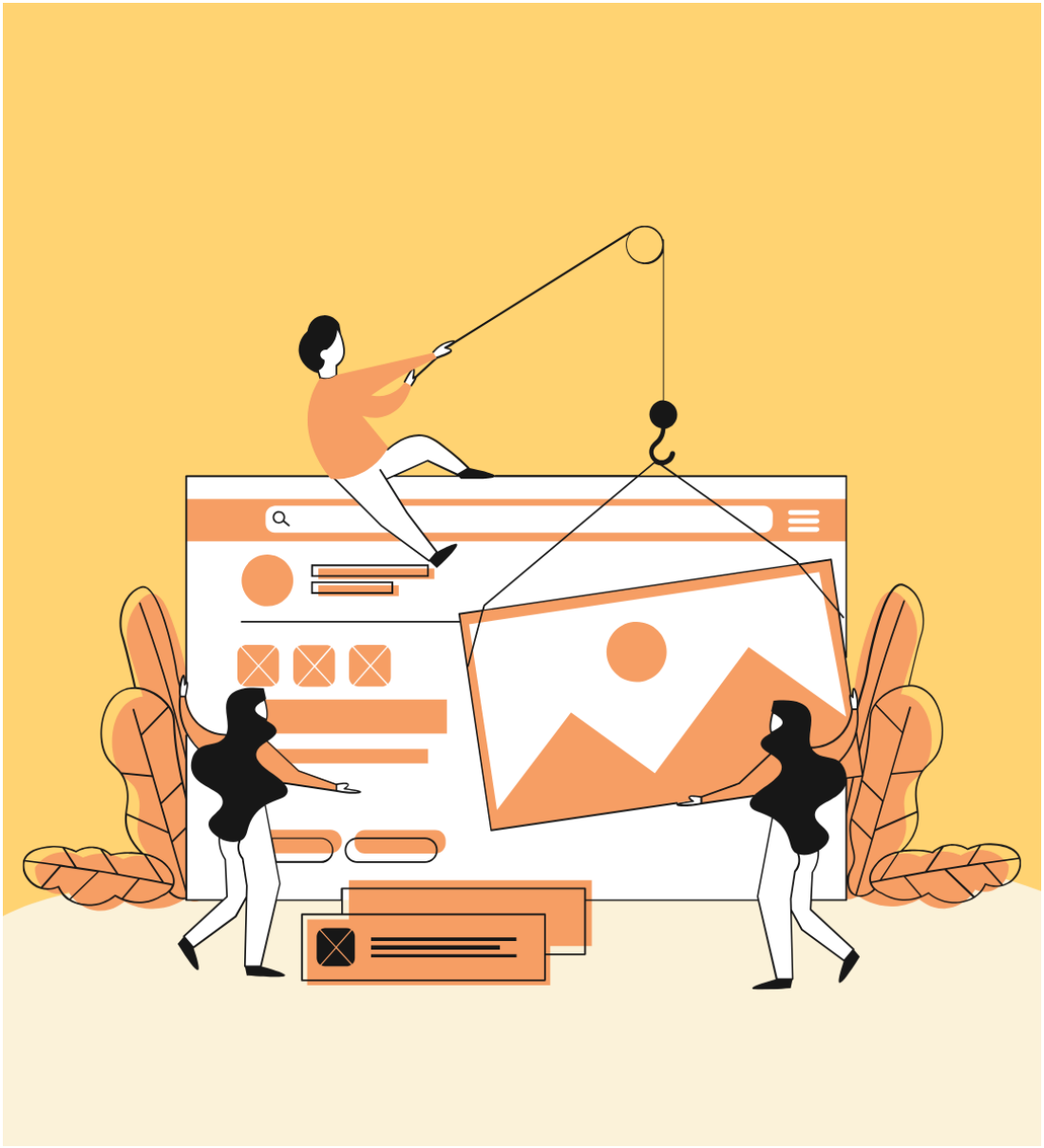
→ There are several tools and resources available online for free. Check some of our suggestions and keep track of our posts for new resource references.

- App: Science Journal by Google
  This app can be downloaded for free and allows to keep a written and photographic record of an investigation/experiment. To gather your students' information, the best way is to create a Google account for your classroom and all your students can log in and save their work individually. All data will be also available in Google Drive.

- Platform: Poly by Google (http://poly.google.com/)
  It's a platform to explore 3D environment. You can search for a topic or create one and ask your student to explore it. This is compatible with Expeditions by Google (360 scenes and Augmented reality).

- Science.lu (https://science.lu/de/experimentieren)
  This website is an initiative of the Fonds National de la Recherche (FNR), which offers a variety of resources for science discovery, including short videos of experiments and ideas for teaching.

- Exploratorium (https://www.exploratorium.edu)
  This is the website of the "a public learning laboratory exploring the world through science, art, and human perception". Here, you will find a vast collection of online experiences.

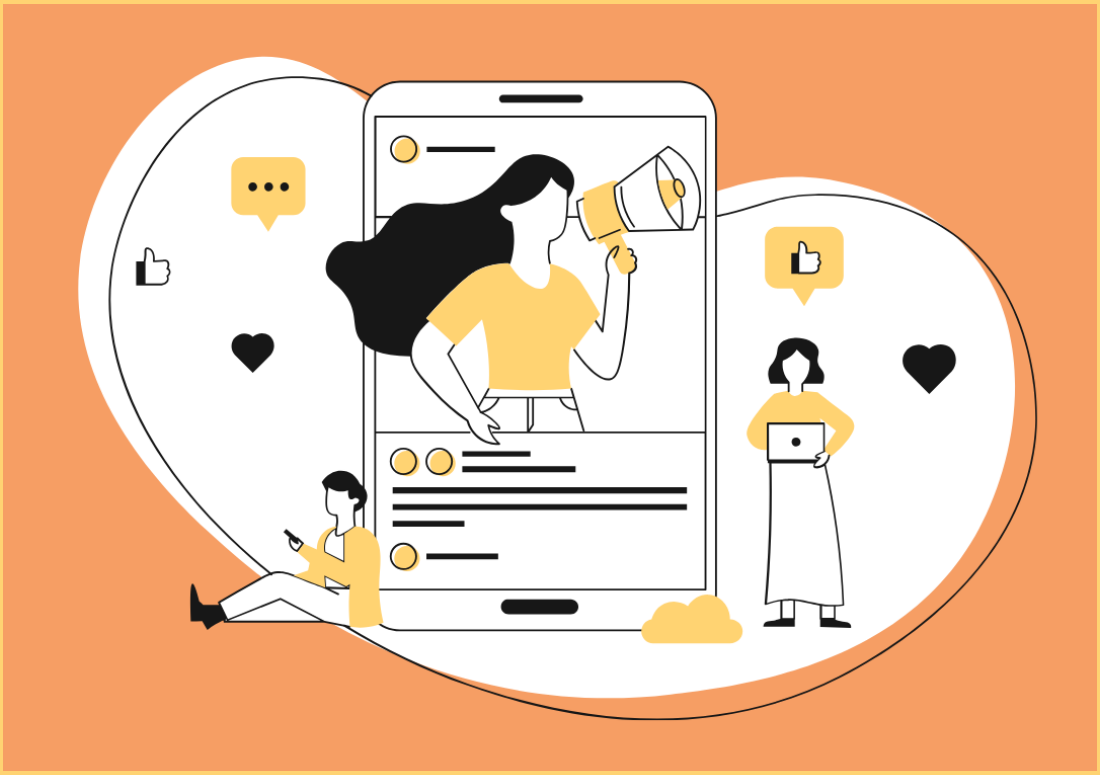


Science Teacher Resource Center

University of Luxembourg

SciTeach Center Team

- Christina Siry (Professor of Learning and Instruction)
- Kerstin te Heesen (Post-doctoral Researcher)
- Sara Wilmes (Research Scientist)
- Maiza Trigo (Doctoral Researcher)
- Nora Kneip (Primary School Teacher)
- Thierry Frentz (Science Teacher in Primary School)
- Rene Schneider (Technical Support)
- Sandra Sabelus (Admin Support – maternity cover)
- Maria Ounik (Admin Support – maternity leave)
- Sabela Monteira (External Consultant)



Science Teacher Resource Center
sciteach@uni.lu
www.facebook.com/sciteachcenter

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