

The Digital Learning Lab

New ways of learning in the 21st century

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Didactics, Design, Digital – The Digital Learning Lab

Digitisation means a higher quality of life and more opportunities for education and participation. The digitisation revolutionises learning and teaching in the future.

How education can succeed in times of digitisation was the central question experts discussed at the National IT Summit in Saarbrücken in November 2016. This publication shows in an exemplary way how new learning and teaching can look like in the future.

The Digital Learning Lab is a space for developing, applying and testing approaches in digital education practice. It addresses core questions relevant to the future:



- Technical equipment, didactics and interior design – What characterises the future learning locations?
- Education in the cloud – Experts from all around the globe come into the classroom – How can interconnection work in school and beyond?
- How do pupils learn in the most effective way if the technical infrastructure and the didactic framework are given?

New ways of learning in the future

At the National IT Summit, the 21st Century Competence Center introduced the concepts and ideas of the Digital Learning Lab. Moreover, it demonstrated its application with pupils and educators, thus showing what will distinguish learning and teaching in the future.

Under the motto “Learning with and from children”, the traditional classroom turns into an educationally well-designed and digitally connected learning location where social learning and interaction between pupils and educators are central.

SMART SCHOOL

Digitalisierung macht Schule



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„Education in the 21st century needs to face the challenge that we learn new things throughout our entire life. Pupils need to develop the skills to become active in the digital world as makers and co-creators.“

Thomas Schmidt, Board fjs e. V.

A world of codes and algorithms

As of now, “digital” is everywhere: programming codes pervade, shape and change each aspect of our everyday life. Quite naturally, we are using things that have only been made possible by written computer codes. That can be something very ordinary, like online shopping, booking a train ticket, a selfie with the smartphone or writing, sending and reading messages.

But also things that up until now we could not imagine become part of our everyday life: Self-driving vehicles and flying devices will be on the mass market soon, for example.

The Internet of Things connects billions of devices around the globe. “Friendly robots” support caregivers in health services. We communicate with chat bots without noticing it. We generate individual movement profiles with GPS data from our smartphones or cars. Big Data influence our lives. We measure and document our body functions and thereby expose our data – knowingly and unknowingly.

In the light of those developments, the digitisation confronts education in the 21st century with major transformations. The 21st Century Competence Center takes up on this challenge and aims at identifying ways to actively shape the digital world.

Digitally connected learning locations: Opportunities for education

Our ideas of politics, society, commerce and the way we communicate and deal with each other are currently subject to radical change. Just as rapidly as digitisation is changing every aspect of our lives, new opportunities for education are arising. We need to identify those and seize them just in time.

The contents and ways of learning will change dramatically if knowledge becomes more and more available as common property on a global scale. Educational institutions of the future are required to create a space for new teaching and learning scenarios as well as to actively design this process. Because future education will not only be more digital, but also more individually accompanied by educators and more connected within and outside educational institutions.

For an active life in the digital future, the young generation needs key skills especially in the fields of communication, collaboration, critical thinking and creativity. New technologies, digitisation and the increasing worldwide interconnectedness provide further possibilities to strengthen 21st century skills.

Learning locations of the future are inspiring environments that allow learning with good didactic concepts and independent of space and time. Besides the necessary acquisition of knowledge, pupils will learn in a more action-oriented way, i. e. by developing models and simulating problems that draw on and further extend their actual living environment and experiences.



Learning new things: Communication, collaboration, critical thinking and creativity are key skills to developing ideas and solutions to problems together.

A turtle turns into a robot and ...

Children are born into the digital world and grow up surrounded by digital technologies and devices. Microprocessors are all around us, however, we neither notice nor do we have a clue as to how these digital helpers actually work; may it be the electronic egg timer, the motion detector, the video surveillance or a special smart home device for light control.

Nowadays, digital devices, social media and virtual game environments are just as common to children and teenagers as the telephone, broadcast or TV were to older generations.

However, most children and teenagers only know the digital world as users and consumers. Learning a coding language gives pupils a first glimpse behind the scenes of the digital world. Knowing how to code opens up the chance to understand and actively shape the digital world. Children can start coding as early as primary school age. With the didactic concept of the Digital Learning Lab, the children can apply and deepen the learned basics. First, they navigate a virtual turtle and an analog drawing robot and eventually, they will be able to approach more complex problems and develop solutions with other devices, e. g. a microcomputer.

... a star lights up education in the 21st century

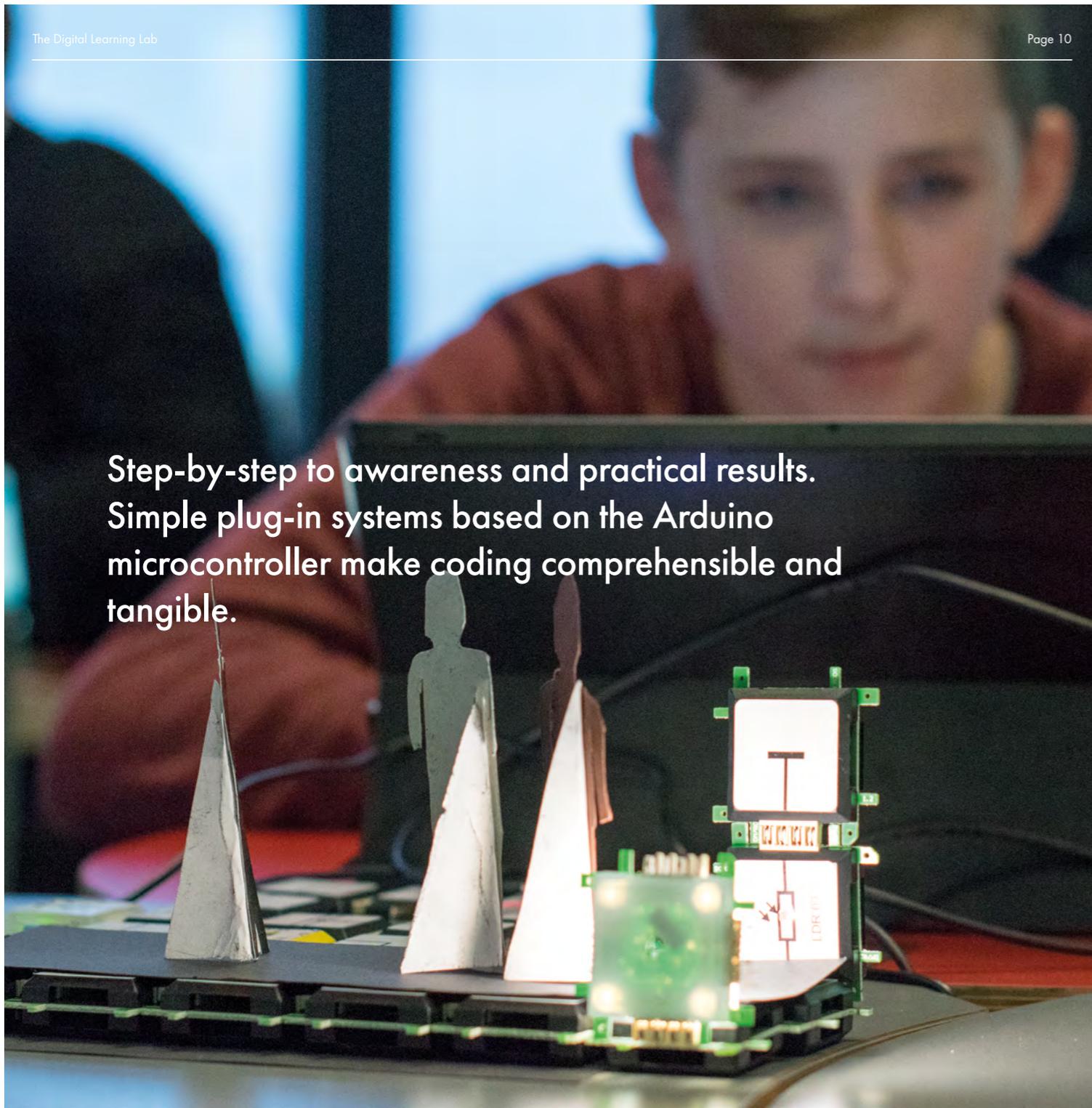
Over 40 years ago, Seymour Papert and his colleagues at the Massachusetts Institute of Technology (MIT) developed Logo, an educationally-oriented, functional coding language for children. It provides the basis for a child's first coding steps in the Digital Learning Lab.

Logo is well-suited for getting to know the principles of coding step-by-step. Logo's characteristic feature is its so-called "turtle graphic": With simple coding instructions, the user can move one or more virtual turtles over the screen. The virtual turtle translates the instruction and code lines into movements and thereby draws lines, forms and patterns.

With our didactic concept, children learn in an action-oriented way: First, they play the turtle themselves and follow instructions given by classmates. Only when they have fully grasped the principle, they start coding on the computer. At this, children learn in small groups and support each other.

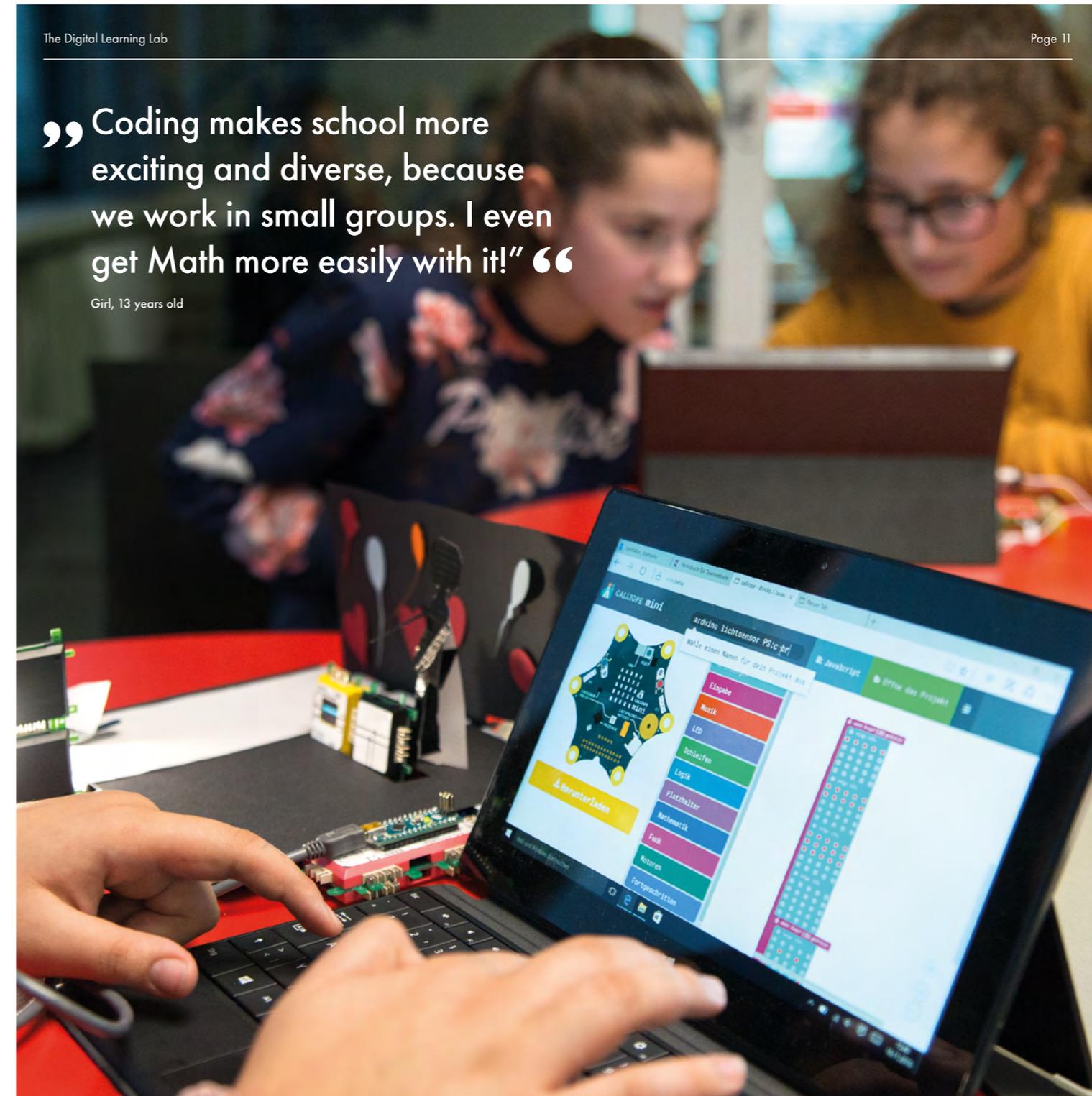
With electronic components and microcontrollers like the Arduino or the star-shaped Calliope mini, the pupils develop their own ideas to real models, at which they can pick up on and simulate scenarios from everyday life. Simple plug-in systems make coding comprehensible and tangible.

Step-by-step to awareness and practical results. Simple plug-in systems based on the Arduino microcontroller make coding comprehensible and tangible.



„Coding makes school more exciting and diverse, because we work in small groups. I even get Math more easily with it!“

Girl, 13 years old

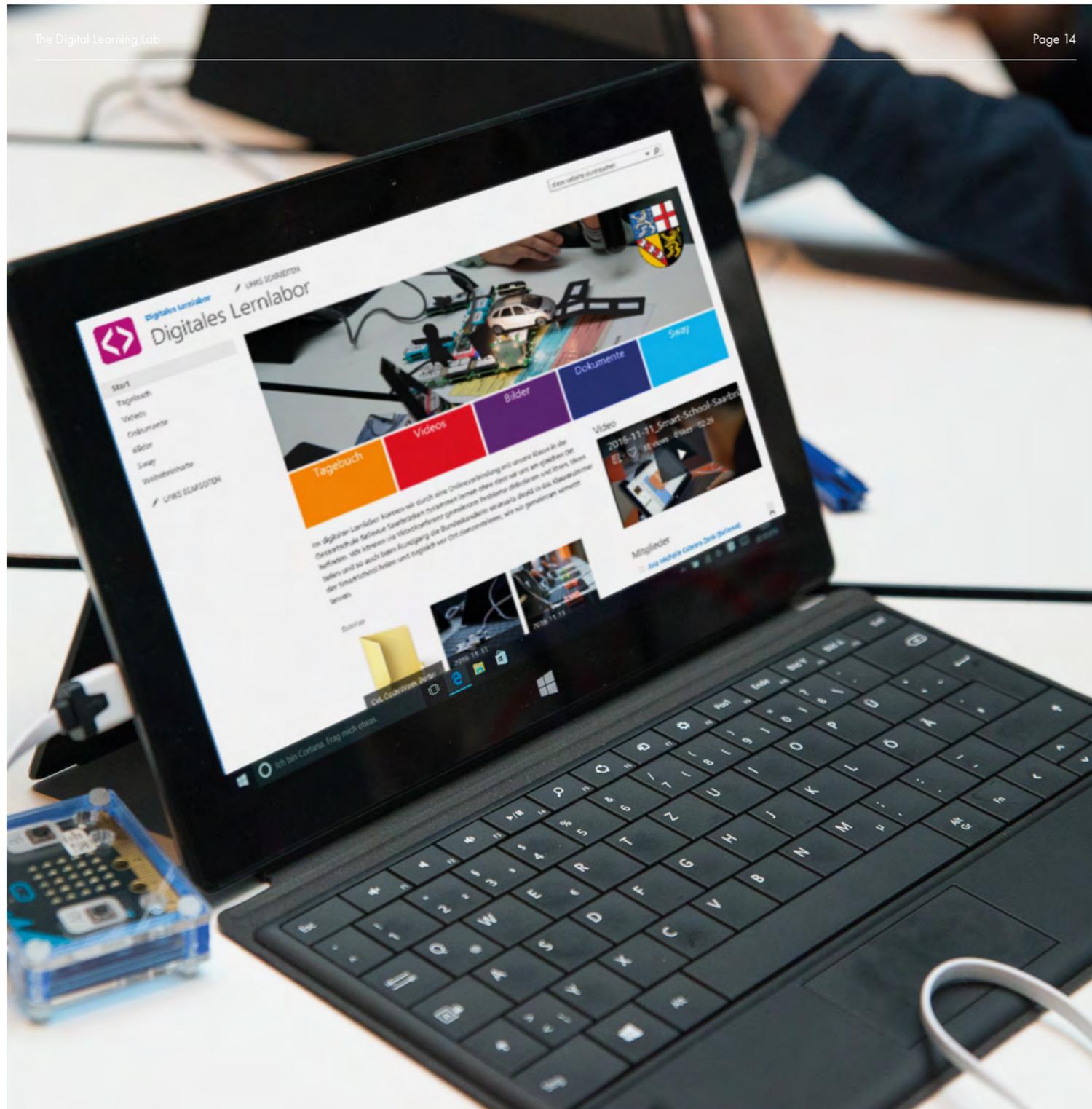




Live video talk: Pupils at the Bellevue School inform German chancellor Angela Merkel about their projects in the Digital Learning Lab.

The vision: connected learning in the cloud

The Digital Learning Lab makes all resources for lesson planning available, individually and at all times. Educators and pupils can communicate via Skype video, both internally and with external partners, at any time of the day.



The Digital Learning Lab learning platform as a door opener

With the implementation of a learning platform as a central component of the Digital Learning Lab, pupils can connect to peers, apprentices, college students, experts and teachers – world-wide and interdisciplinary. They can discuss their ideas and questions and can thus directly exchange and share experiences and information live and in real-time.

The online learning environment opens doors to the world and encourages children to connect, (net) work and digitally document their learning results. Educators can structure tasks, organise their lesson plans as well as communicate with parents and colleagues. Hence, the learning platform both contributes to an open classroom and is an extension of the faculty room.

Always on

In the Digital Learning Lab, pupils learn online-based. With a permanent online connection over mobile devices (e. g. tablets or computers), they can work from different places without a loss of communication. In Skype conferences, they can develop ideas, share resources, discuss problems and work out solutions together. Further, the platform provides open-access materials (OER), individual checklists and digital textbooks. Results can be collected and presented as pictures, videos, texts and animations, which again offers new ways of interaction between connected users. Thus, pupils are appreciated for their work. The learning space opens up – parents can participate and the connection between school and leisure time enables flexible learning.

Pupils of the Bellevue School in Saarbrücken introduced their ideas for a safe way to school and their model of a programmed traffic control system to German chancellor Angela Merkel and minister Johanna Wanka – both out of their classroom and live on site at the National IT Summit.



A delegation with representatives of federal and state government, companies and civil society is visiting the Digital Learning Lab of the Bellevue School in Saarbrücken.





Coding in school? Of course!

In the Digital Learning Lab, lessons are always set in the context of current issues and challenges and revolve around topics and trends of the future. This also comprises the self-independent gathering of experiences, which helps children and teenagers recognise and comprehend complex relations step-by-step. At this, learning is regarded as a holistic process. Children learn in a social group and engage actively with haptic experience and their own movement around the room. Furthermore, they step into the digital world and both apply and develop the acquired knowledge on the computer. They tinker and handicraft models with paper, scissors and glue stick.

Specifically developed learning scenarios show how coding can be incorporated into lessons in a practical and interdisciplinary way. They can alternatively be implemented as coding groups in the afternoon or be offered at all-day leisure institutions.

Eventually microcomputers like the Arduino and the Calliope mini are employed. They make it possible to develop more complex tasks and to simulate concrete problems.



School turns into a maker space

In the Saarbrücken Smartschool, no pupil has any reservations when it comes to working with electronic components. On the contrary: The star-shaped single-board computer Calliope mini arouses curiosity and motivates everyone to deal with questions and challenges from everyday life and to develop solutions.

For example, the pupils in Saarbrücken dealt with the traffic situation in front of a school. They wanted to develop a sign that reacts to an approaching vehicle by displaying a warning text such as "Watch out! Drive slowly!"

The pupils approached this challenge with a model of a light barrier. Whenever a vehicle is passing the light barrier, the warning text is displayed. At the National IT Summit, the pupils presented their model and were able to demonstrate that they can also quickly change the source code of the sign: They live-programmed a personal welcome note to German chancellor Angela Merkel.

Informatics is everywhere

Coding is obviously fun for the children because they can develop and test their own ideas while quickly reaching concrete results. If it gets too tricky, the boys and girls help each other until they have found their own solution to the problem.

With the example of the programmable street sign, many other related topics can be discussed. Usually the pupils come up with their own questions, for example about Big Data: "How are traffic data collected and evaluated to optimise traffic flow or save energy?" Or about data security: "Can traffic signs be hacked to jam the traffic of an entire city?"

For educators, coding offers additional suggestions and options for modern teaching in various disciplines; from Math, English, General Studies or Arts in primary school to Natural Sciences and Technology and even Philosophy and Ethics in secondary school.

Coding can draw upon many aspects of the learning and living environment. Thus, it is not only an enrichment for the learning in school, but also for the non-formal education context, in the open youth work and family education. The concept of the Digital Learning Lab is transferable as it considers different approaches from the perspectives of contents and didactic methodology.



At a glance: The Digital Learning Lab

- is a variable concept for modern and contemporary learning.
- creates open learning spaces for children and teenagers with digital extensions.
- consistently involves the cloud as a "digital learning space".
- puts a special focus on learning and applying coding skills.
- puts technology into service of pedagogy.
- can be implemented throughout the entire educational system, in all school forms and extracurricular contexts.
- supports the application of Open Educational Resources (OER).
- draws upon the respective curricula's contents.
- supports a competence- and action-oriented approach.
- enables connected and self-regulated learning.
- takes up on trends and future-oriented topics of digitisation.
- supports the interdisciplinary embedding of informatics in school and learning environments.
- promotes the manifestation of key competences with digital media.
- contributes to the transfer of exemplary connected digital learning scenarios.

21st CCC

**The competence and innovation center
for educational offers with digital media**

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The 21st Century Competence Center

considers itself a competence centre for educational offers with digital media. It is an open digital learning lab for everyone that specifically accompanies children and teenagers and their adult companions in the digital world. As a project of the German Non-Profit Organisation Förderverein für Jugend und Sozialarbeit e. V. (Association for Youth and Social Work), the competence centre stands for innovative, pluralistic and dynamic child and youth services and social work to promote projects in the fields of digital culture, advanced training and community.

The Digital Learning Lab was funded by the German Federal Ministry of Education and Research. The 21st Century Competence Center developed the project and implemented it with support of Helliwood media & education at the Bellevue School in Saarbrücken. The project was presented at the 10th National IT Summit on Nov 16 and 17, 2017.

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