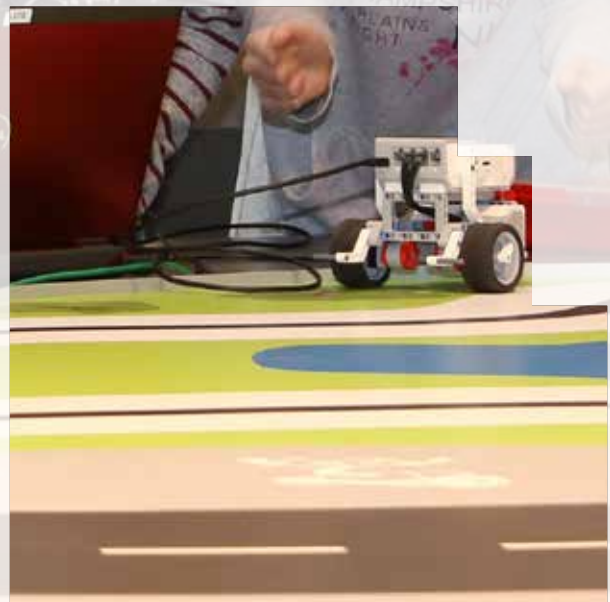
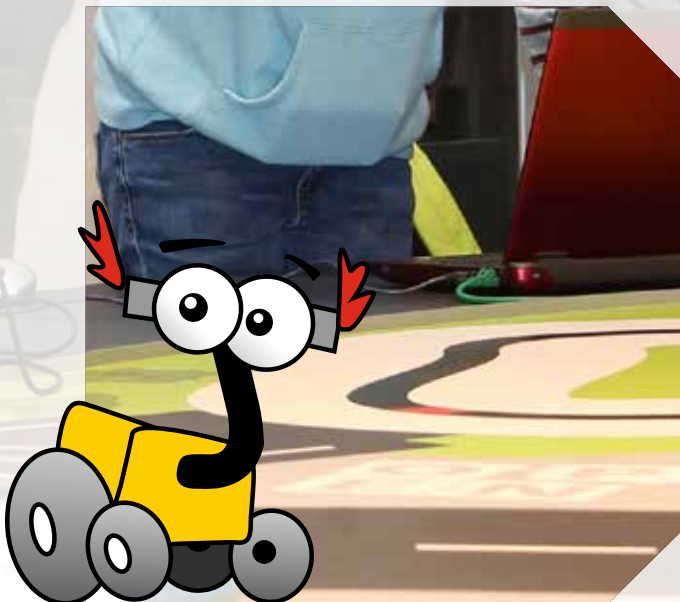


ROBERTA – LEARNING WITH ROBOTS



THE ROBERTA INITIATIVE

ROBERTA KINDLES ENTHUSIASM FOR SCIENCE AND TECHNOLOGY

Smartphones in pockets, interactive smartboards in classrooms and learning apps on tablets – in the 21st century, digital media are part of everyday life for children and young people. Girls and boys intuitively learn how to use electronic devices from an early age. But how can these young users actively shape our digital future?

The “Roberta® – Learning with Robots” initiative guides young people into the digital world. Since 2002, the educational program set up by the Fraunhofer Institute for Intelligent Analysis and Information Systems IAIS has been training teachers from elementary school level up to secondary level II. By designing and programming robots with their pupils, certified Roberta teachers prove that using modern technology is not only interesting, but you can also create and design something new with it.

The Roberta Initiative has already trained more than 2000 teachers with its successful educational concept and has thus reached more than 400,000 school children. By using the “Open Roberta Lab” graphical programming platform, each year more than 225,000 young programmers are bringing real robots and microcontrollers to life.

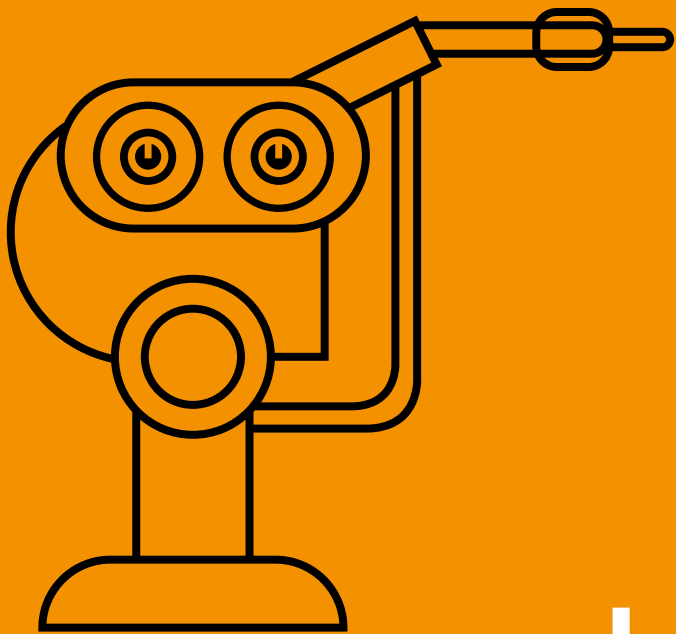
With the help of Roberta coaches, teachers and sponsors, the initiative is attracting more and more people across Germany, and also internationally, to the world of pixels and bytes in a sustainable way. Would you also like to become part of the network and support tomorrow’s digital talents today?

Welcome!

*“We need to attract
a generation of designers,
not users.”*

Prof. Dr. Stefan Wrobel,
Director of Fraunhofer IAIS





7

German states
cooperating
with Roberta

1

open
programming
platform

21

Roberta Regional Centers

+2000

certified Roberta teachers
at German schools

+24

Roberta Coaches

+400,000

pupils reached

+20

Open Roberta
Coding Hubs

+15

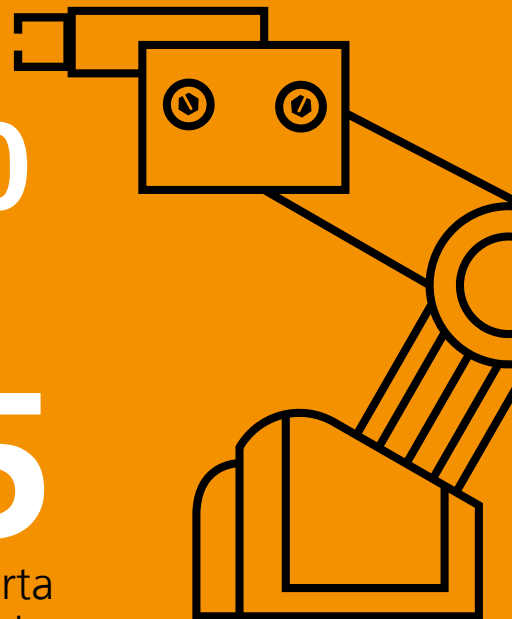
years that Roberta
has been attracting
children and young people

1

Roberta

+225,000

visits to
lab.open-roberta.org
each year



THE ROBERTA CONCEPT

In the “Roberta® – Learning with Robots” initiative, Fraunhofer IAIS created an educational program in 2002 that gets children and young people interested in science and technology as early as elementary school age. Teachers, who want to provide Roberta courses do not only receive the necessary training and material, they are also subsequently supported during the performance of the courses.

The open source platform Open Roberta® Lab is continuously expanded with further useful functions and different hardware. Roberta regional centers and Open Roberta Coding Hubs offer local schemes for in-school and extracurricular activities. The Roberta Initiative works on a regular basis to create new interdisciplinary material and makes it available to teachers for download. The Roberta concept consists of six modules:



**ROBERTA
COURSES**



**ROBERTA
TRAININGS**



**ROBERTA
MATERIALS**

**ROBERTA-
NETWORK**



**OPEN
ROBERTA
LAB**



**OPEN SOURCE
COMMUNITY**





ROBERTA COURSES



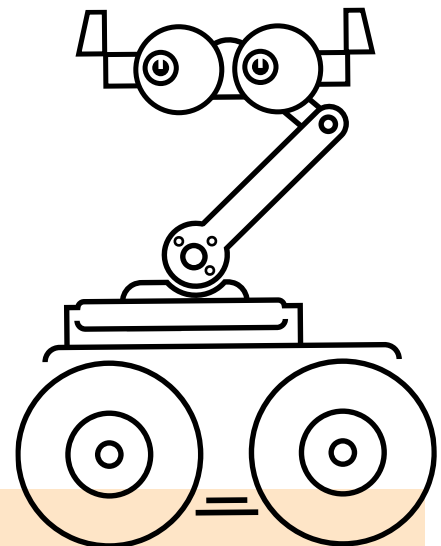
Robots are particularly fascinating for children and young people and can be used as a fun approach to complex technology. However, not every robot course is a Roberta course because our courses have to meet special requirements:

- The course leader has successfully taken part in a Roberta training course and has thus become a certified Roberta teacher.
- The course leader is aware of gender-specific behavior patterns.
- The course leader caters to the different learning methods of girls and boys.
- The tasks are incorporated into the chosen topics that are interesting for girls and boys.
- The course leaders play an active role in a pan-European Roberta network.

Roberta courses promote the scientific interests of both genders and are also adapted to the different age groups. They begin with simple tasks for pupils from the age of eight years and increase in abstraction and complexity for older children.

Each series of courses covers interesting topics for the respective target group: using the firebug, for instance, participants learn about the temperature sensor. The principle of the ant trail forms a basis for learning about automatic tracking and communication between robots.

The analogies to natural and everyday phenomena not only simplify understanding of the functional procedures, but also encourage students of all ages and both genders to deal with technical challenges.



COMPETITIONS

“Roberta” enables young people and, above all, girls to start tackling technical topics. Following the courses, many sites set up their own robot work groups. They take part in robot competitions, for example, the RoboCupJunior or the FIRST LEGO League, on a regular basis and also enjoy international success. Different disciplines like “OnStage” for stage performances by robots or “Rescue” for rescue assignments appeal to participants from different age groups. In 2017, “NEPO®” the graphical programming language in the Open Roberta Lab was used at the FIRST LEGO League as an official programming language. At the regional competition in Königswinter, the first pilot teams entered with NEPO instead of the official LEGO MINDSTORMS software.



ROBERTA TRAININGS

Taught quickly in a fun and exciting way – the aim of the Roberta training courses is to communicate knowledge and skills in handling digital and innovative teaching material to teachers from elementary school to secondary level II. Since 2002, the Roberta initiative set up by Fraunhofer IAIS has been training teachers to become Roberta teachers. Roberta training courses are based on the Fraunhofer IAIS training concept that has been evaluated many times. Gender-sensitive teaching and learning material as well as lesson content are produced by Fraunhofer scientists in collaboration with experienced educationalists.

The training scheme within the Roberta initiative uses a multiplier system: the Roberta head office at Fraunhofer IAIS certifies Roberta coaches. The coaches train teachers all over Germany to become Roberta teachers, who in turn offer the Roberta courses to school children.

The training concept is divided into the following modules:

Basic training: The Roberta Basic Training allows teachers and people with a didactic and/or technical background to easily start out into the world of educational robotics. Participants learn how to setup and program a robot with NEPO, they familiarise themselves with material and put together first lesson units.

Requirements: No previous knowledge needed.

eXpert training: The Roberta eXperts Training offers a deeper access into visual programming with NEPO. Participants will program robots by using the experts mode of the Open Roberta Lab, which offers functions, lists and much more. Requirements: Roberta Teacher Certificate and/or previous experience in graphical programming.

Programming training: The Roberta Programming Training allows participants to deepen their knowledge in text-based programming of robots, i. e. Java for the EV3 LEGO MINDSTORMS robot or the like.

Requirements: Previous basic knowledge of programming; Roberta Teacher Certificate (preferred, not obligatory)

Hardware training: The Roberta Hardware Training offers a deeper access into the field of robotics. Participants will learn about sensors and actuators in combination with advanced programming.

Requirements: Previous experience within the field of educational robotics; Roberta Teacher Certificate (preferred, not obligatory)

TEACHING AND LEARNING MATERIAL



The Roberta materials document the Roberta concept. Online we provide a great choice of various teaching and learning aids, i. e. in-depth experiments, new models, and further programming

languages. Teachers will find the teaching and learning material on the Roberta website: roberta-home.de/en/teachers





ROBERTA NETWORK



The Roberta network is used to apply and spread the Roberta concept. The Roberta coaches, who train the teachers to become certified Roberta teachers, the partners and sponsors of the initiative, the Roberta regional centers and the Open Roberta Coding Hubs all belong to the network. Furthermore, the Open Roberta Developer Community is continuously working on the technical advancement of the Open Roberta Lab.

ROBERTA REGIONAL CENTERS

All over Germany, Roberta regional centers are being set up to promote and support the initiative – in particular the Roberta teachers – on a regional level. We select institutions whose core area is teaching and training young people to be the Roberta regional centers. At the sites, teachers can, for example, borrow robot building sets if no resources are available at their schools. In addition, courses, workshops, and meetings are staged for Roberta teachers in the respective regions allowing them to share ideas and experiences.

Further information: roberta-home.de/en/regionalcentres

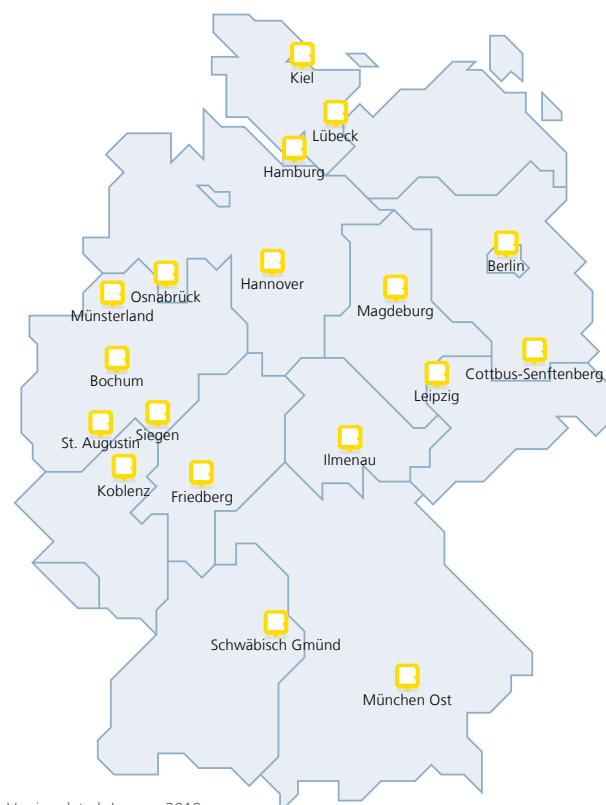
With the aid of the “Roberta Goes EU” project, which was funded by the European Union, we have been able to successfully expand the Roberta concept to other EU countries. A European network of Roberta regional centers is now forming to support international collaboration between country-specific education facilities. Regional centers are currently located in Switzerland, Austria and Italy.

OPEN ROBERTA CODING HUBS

In order to promote learning and teaching courses also outside school, the Roberta initiative provides “Open Roberta Coding Hubs” across Germany with support from Google Zukunftswerkstatt. Here, interested children and young people also have the opportunity outside school to immerse themselves in the world of robots and microcontrollers individually or in classes. The Open Roberta Coding Hubs are set up in libraries, interactive museums, and other interesting places of learning and are looked after by certified Roberta teachers.

Further information: roberta-home.de/en/coding-hubs

Roberta Regional Centers in Germany



Version dated: January 2019



THE OPEN ROBERTA LAB

The “Open Roberta® Lab” is a freely available graphical programming platform that makes it simple to learn programming. Thanks to the Fraunhofer IAIS open source platform, even beginners can create their first programs in next to no time by dragging and dropping.

The best feature: in the Open Roberta Lab, real robots and microcontrollers come to life. Young programmers learn the basics of coding with a hands-on approach. They discover the countless possibilities that the world of science and technology has in store for them in a fun way.

NEPO GRAPHICAL PROGRAMMING LANGUAGE – IDEAL FOR BEGINNERS AND ADVANCED USERS

The intuitive graphical programming language “NEPO” allows you write simple and complex programs in next to no time. The NEPO programming blocks can be fitted together in the Open Roberta Lab like building bricks – from the first simple steps to programming intelligent robots with a range of sensors and capabilities, creativity knows no bounds in the Lab.

MINIMISING TECHNICAL AND SPECIALIST OBSTACLES

The platform can be used anytime free of charge at lab.open-roberta.org on any device with a common Internet browser – no matter whether PC, Mac or tablet. There is no need to install additional software. You can also use the lab offline. In this way, technical and specialist obstacles are minimized both for teachers and for the young programmers across the world.

PROGRAMMING VIRTUAL ROBOTS IN THE OPEN ROBERTA LAB

You can program robots in the Open Roberta Lab even if you do not own any. You can immediately test your new NEPO programs in the browser using two-dimensional robots and microcontrollers in the Web Simulator. Individual driving surfaces allow online training for the next robot competition.

To the lab: lab.open-roberta.org

Data protection: www.roberta-home.de/en/privacy-policy-open-roberta-lab/

OPEN SOURCE COMMUNITY



The Open Roberta Lab has been developed as an open source project and is provided on Fraunhofer servers. Science, technology, engineering and mathematics (STEM) students as well as interested programmers have the option of actively contributing to the platform design. Fraunhofer IAIS welcomes anyone who wants to help provide open, scalable, and sustained Open Roberta solutions and best practices for school education. For further information: open-roberta.org/en/lab



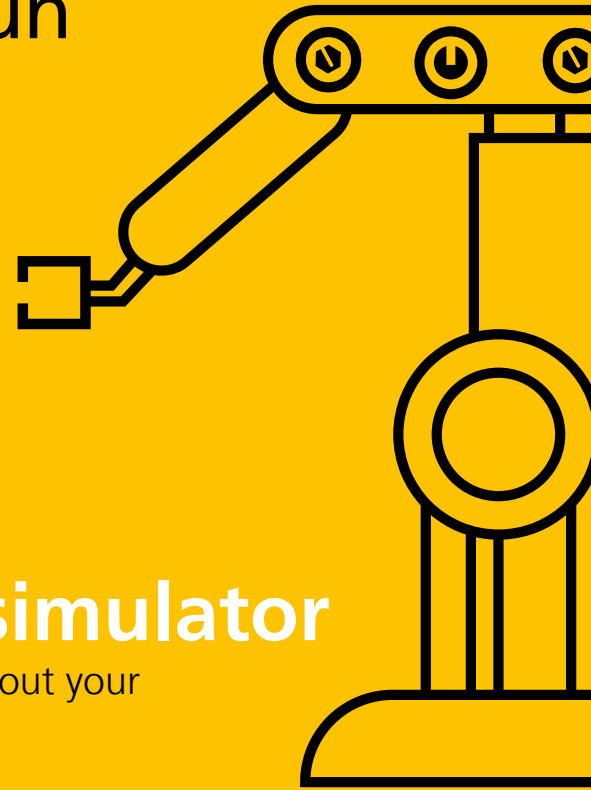
»»12

Robots and
microcontrollers

» Intuitive
and fun

»» NEPO®

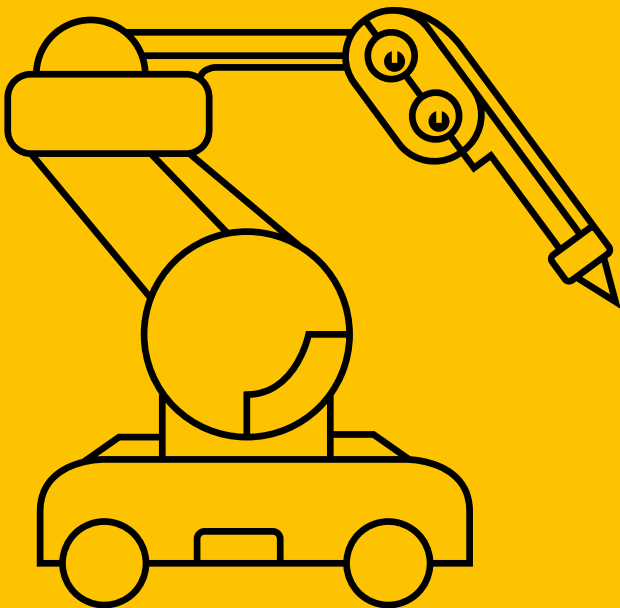
Graphical programming language



» Beginner and
expert mode

» Web simulator

can be used without your
own robot



» Programming
online and offline

»»14

languages available

» Programs

store, export and share

» Open Source

on Fraunhofer servers:
lab.open-roberta.org

QUALITY ASSURANCE AND DEVELOPMENT

ROBERTA EVALUATION 2018

As part of a yearly Roberta evaluation, Roberta teachers have the opportunity to send detailed feedback to the Roberta head office: What are your experiences with Roberta in the network? In what form do you apply the course concept? How do you evaluate the Open Roberta Lab? More than 350 Roberta teachers were involved in the 2018 evaluation and assessed the Roberta concept with an average grade of 1.8 (1 being the best grade to 6 being the worst).

Further information: roberta-home.de/evaluation2018

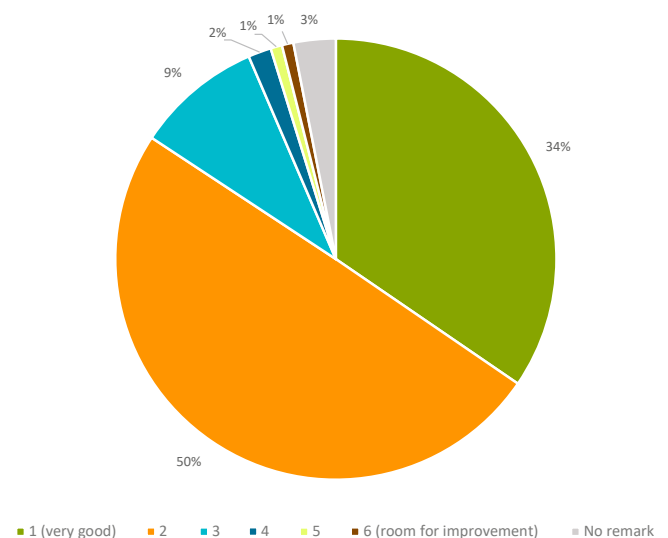
ACCOMPANYING RESEARCH

The appeal and quality of the Roberta courses have been evaluated over a period of three years by the University of Bremen in an independent empirical companion study. This kind of evaluation is indispensable for research projects that have a sustained impact and are to become a model for other projects. The investigation was conducted taking both gender aspects and also didactical viewpoints into consideration by means of two central questions:

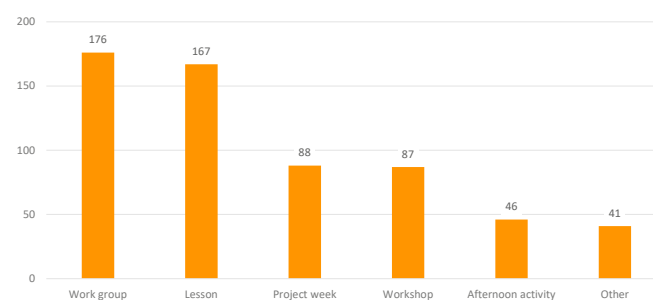
- How is interest in the active design of technology created by using and understanding technology?
- How should learning environments be designed so that an ideal combination of, on the one hand, course goals/content and, on the other, learning requirements is achieved?

The results of the study show that the basic concept of the Roberta courses proves itself in practice. 94 percent of the participants see the courses as positive and enjoy them. In particular, the Roberta courses boost the self-confidence of girls in the area of technology and information technology as well as encourage them to follow a corresponding career path.

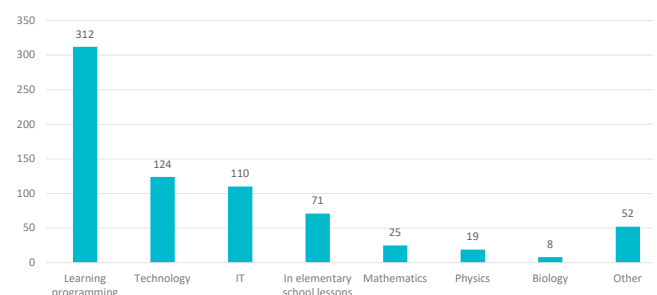
Evaluate the Roberta concept with school grades



How do you use Roberta?



In which context do you use Roberta?



GET INVOLVED – SUPPORT DIGITAL EDUCATION

WORKING TOGETHER FOR YOUNG PEOPLE IN TECHNOLOGY

As a non-profit educational initiative, the Roberta initiative set up by Fraunhofer IAIS is sponsored by partners from the public sector, from business, and within Fraunhofer. Common goals are the technical advancement and further distribution of the Roberta concept, above all, through support for Roberta training courses as well as financial support for the ongoing development of the Open Roberta Lab.

Partners so far include the German Federal Ministry of Education and Research, the European Union, the Fraunhofer Academy, the Ministry for Education and Science of the State of Schleswig-Holstein, the Ministry for Innovation, Science and Research of the State of North Rhine-Westphalia, the Berlin Senate Department for Education, Youth and Family, the Oracle Academy, Hands on Technology e.V., Google.org, LEGO Education and the Wilhelm Stemmer Foundation.

INITIATIVES AND COOPERATIONS – THE ROBERTA CONCEPT COMES TO SCHOOLS

The aim of the Roberta initiative is to comprehensively integrate digital education into the German education landscape. In Berlin, Roberta is one of the leading projects in the “eEducation Masterplan”. Within the framework of this scheme, more than 250 elementary school teachers received a Roberta training course supported by the “Google Zukunftswerkstatt” project free of charge as well as their own class set of Calliope mini microcontrollers. In similar models, the Roberta Initiative is cooperating with further German states to allow hundreds of teachers to take part in Roberta training courses.

In other German states, central organizations are working for the comprehensive distribution of the Roberta initiative in the local education landscape. For example, in North Rhine-Westphalia, a total of 21 zdi Roberta centers were set up as part of the “Zukunft durch Innovation” initiative (Future through Innovation, or zdi for short). In Saarland, the state’s Ministry for Education and Culture is supporting the distribution of the initiative in the region. In Schleswig-Holstein, the Ministry for Education and Science helped more than 70 schools add the Roberta concept to compulsory subject options.

Collaboration with German states:





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