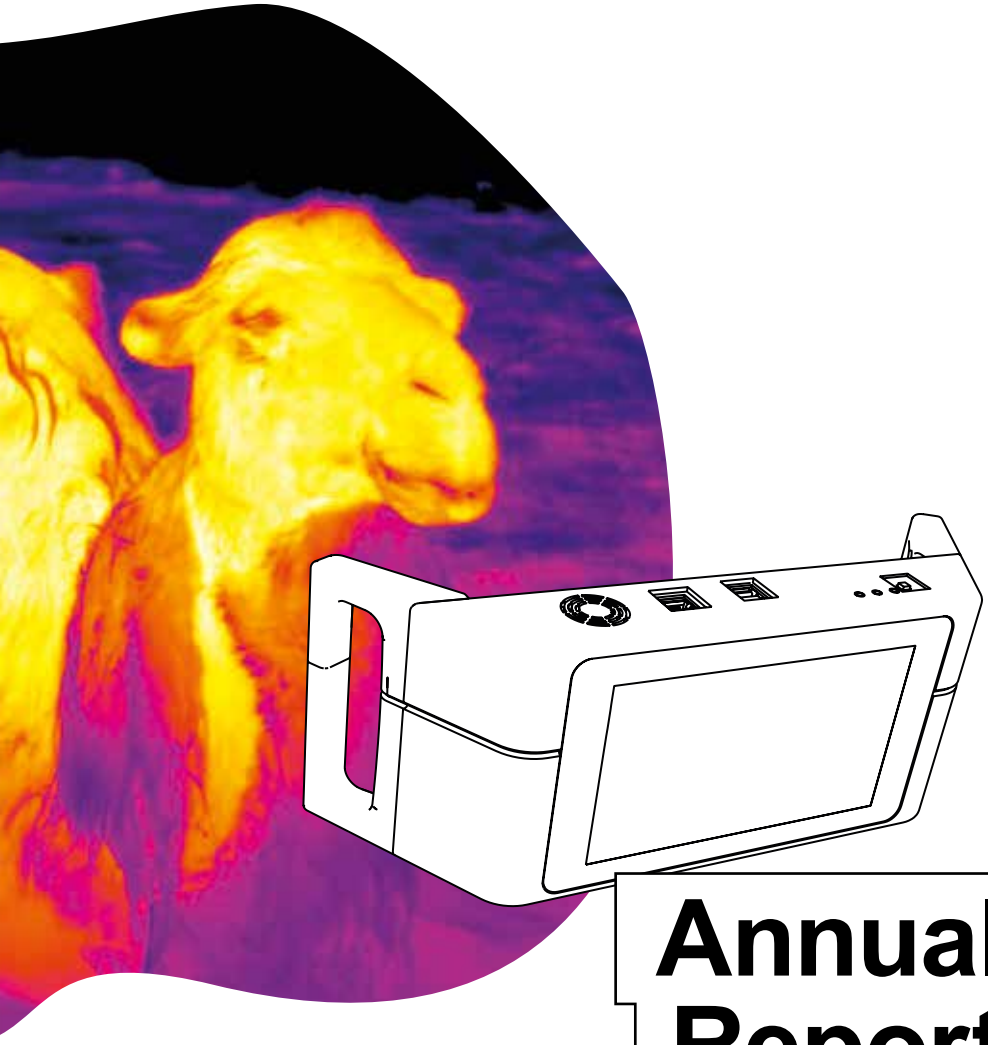
NEW TECHNOLOGIES
RESEARCH CENTRE
UNIVERSITY OF WEST BOHEMIA

Lab IR Edu



Annual Report 2021

LabIR Edu

Educational Project
of the NTC UWB in Pilsen

Dear Readers,

we've stepped into the year 2021 with many plans and goals for our educational project LabIR Edu. We've already managed to realize and complete many, despite the numerous restrictions put in place due to Covid-19, but there are still a lot more ahead of us.

The whole idea of how the NTC Research Centre could contribute to improving the quality of education at primary and secondary schools was born in 2019. We used our research experience, created the first prototype of an infrared (IR) camera for educational purposes, and introduced it to the teachers.

The responses were fantastic. We knew that our work was meaningful thanks to the enthusiastic teachers from the project Elixir for Schools (Elixír do škol, z. ú.). We started working on other didactic tools, planned workshops for both children and teachers, and created a website that serves as an inspiration-sharing platform.

Today, LabIR Edukits are touring throughout the Czech Republic equipped with 5 or 10 IR cameras. We would like to express our thanks to our alma mater – the University of West Bohemia in Pilsen – our financial partners who were essential to launching the project and who put trust in us during these challenging times, as well as to the amazing teachers whose enthusiasm keeps inspiring us.

This Annual Report summarises our joint activities. Thank you for working with us!

Jan Šroub

Head of LabIR Edu Project

Our Vision

We want to share our enthusiasm for science and new technologies with the new generation and to motivate it to study **STEM.**

Science
Technology
Engineering
Mathematics

We are showing the children that they can discover, research, and create new things in their future careers and that they can find such kind of work fun and fulfilling.

We pass on the knowledge closest to our hearts and our unique know-how. Specific to our research team of 20 years, it is infrared technology and non-contact temperature measurement.

We have utilized our experience with professional IR cameras, their hardware and software to develop special infrared cameras for educational purposes. IR cameras for 21st-century children who will handle them just as easily as a tablet and who will use them to see the invisible dimensions of various school items. The IR camera is controlled using a large, intuitive touch-screen, while fitting in the hand and equipped with a chassis made by a 3D printer.

The IR cameras are only one of our science communication and educational activities. In cooperation with educators, we are working on other accompanying tools and didactic materials to spice up classes of physics, biology, chemistry, technical or environmental education.

Such modern aids make learning fun and help the students to see thermal reactions with their own eyes. They become researchers discovering the functioning of heat, thermal processes, and the laws of the world around us.

Educational Challenges We Respond To

Employers are lacking educated employees, especially those working in technical fields and professions. One of the reasons behind that is a very narrow connection between theory and practice in comparison with other European countries (so-called dual education). At the same time, however, cooperation with companies is an integral part of quality education and constitutes a key factor in promoting youth employment.

It is essential to promote STEM studies at high schools and universities in the Czech Republic. STEM fields are essential for the development of the economy and competition.

Source:
Pícl, M. – Černý, J. – Gargulák, K. (2015). The dual system of vocational education as a solution to the needs of the labour market in the Czech Republic. *Department of Analyses and Information of the Office of the Government of the Czech Republic.* p. 17-23.

Educational Institutions Lack Modern Aids

The access to them and the overall quality of education differs significantly across regions. The Czech Republic has one of the largest differences in the quality of its schools and institutions.

Source:
Prokop, D. – Dvořák, T. (2019). Analysis of the challenges of Czech education. *Eduzměna Foundation*, p. 12.

Our Contribution to Change and Our Goals for 2022

Thanks to our cooperation with companies, more vocational schools were involved in our activities in 2021. We aim to focus our workshops, along with our accompanying tools and materials, on hands-on learning to excite and inspire the students through our programme. In cooperation with Valeo, we have developed an educational model of an air conditioner that we lend to schools along with IR cameras. In 2022, we want to further develop our cooperation with companies and respond to their needs.

With LabIR Edu workshops, we focus on the initiative and creativity of students. We encourage their interest in STEM, including the young pupils of primary schools just beginning to learn the basics, while at the same time shaping their attitudes, which are crucial for their future study and career choices. We also give students the experience of working as researchers and want to motivate them for a similar career path.

We Offer Schools Our Edukits with IR Cameras

We believe that a practical and demonstrative attitude inspires children to apply gained knowledge in a creative way. Working with a modern optical device and accompanying evaluation software also promotes their digital skills.

In 2022, we want to focus on schools/regions with low accessibility to modern aids in particular.

Education That Matches Current Needs

The Czech education system must keep up with modern trends in education.

We Train Educators to Spice Up Their Classes with IR Cameras

We promote the professional growth of teachers. We organise workshops for educators on how to use IR cameras during their classes. Eighteen workshops for educators across the Czech Republic took place in 2021.

We Promote Creative Educational Methods

We are convinced that modern technologies contribute to a holistic approach and deeper understanding of the subject matter taught. We encourage the students to come up with their own findings.

We Organize Project Days in Schools

In 2021, we lent our IR cameras to 9 student projects. By organizing a competition on the best IR experiment, we encourage students to work on a long-term team project, explore their subject in-depth, perform and record the infrared measurement and finally, present their discovery.

In 2022, we want to participate in the further development of research and project-based learning in schools.

We Educate Online and Using Social Media

When the schools have been closed during the pandemic, we have added a live-streaming function to our IR cameras.

To promote science and communicate with teachers and students, we use social media such as Facebook, Instagram, YouTube and LinkedIn, and want our website to become an inspiration-sharing platform.

Events of 2021

Cooperation with Schools and Educational Institutions

In 2021:

2800+ children worked with IR cameras

we trained 230+ educators

we organized 18 workshops for educators and 18 project days in schools

Cooperation with Companies

Valeo:

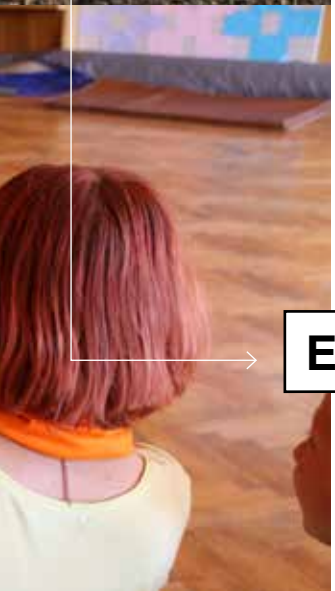
Supported the development of the educational model of an air conditioner and its lending to 10 selected schools

Bosch:

Purchased 4 infrared cameras for selected schools

ŠKODA AUTO:

Incorporated IR cameras into the educational project ŠKODA AUTO EDU.LAB



Equipment Expansion

2019: +6 2020: +21 2021: +60 manufactured IR cameras → Currently available **87** IR cameras

LAP Rokycany a Kralovice

Our Cooperation

Thanks to a joint project with Local Action Plan - LAP Rokycany and Kralovice taking place in 2021 and 2022, eleven elementary schools in Rokycany and Kralovice districts have the opportunity to use our IR cameras.

We train educators, lead introductory classes in schools and lend cameras for use during classes.

Current State

In 2021, we carried out planned activities at 6 schools in Rokycany district with the support of LAP.

In 2022, we will continue at 5 schools in Kralovice district.

rokycany.mapplzensko.cz/o-projektu.php

kralovice.mapplzensko.cz/

About the Partner

Local Action Plan for Education Development of MEP Rokycany II.
and
Local Action Plan for Education Development of MEP Kralovice II.

The LAPs are carried out under Call No. 02_17_047 for Local Action Plans for Education Development in the 3rd priority axis, OP Research, Development and Education (OP RDE) and are supported by the EU funds and Czech state budget.

Local Action Plans for Education Development are effective tools for joint community planning of pre-school, elementary, non-formal and leisure-based education in the administrative district of the municipality with extended powers (MEP).

The main goal of the project is to improve the quality of elementary and pre-school education in the area of MEP Rokycany through creating and developing a sustainable system of communication and cooperation among education authorities, educational institutions, non-formal and leisure-based education organizations, parents, public, and other stakeholders who have an impact on education in the area.

EUROPEAN UNION
European Structural and Investment Funds
Operational Programme Research, Development and Education

MINISTRY OF EDUCATION, YOUTH AND SPORTS

Sluňákov

Our Cooperation

Sluňákov has incorporated our IR camera into its environmental programme researching the impact of greenery on the environment and its benefits to humans.

Thanks to our IR camera, the children had the opportunity to see the forest through a different lens, to research the differences in temperature in various places or differences based on species composition.

slunakov.cz

About the Partner

Sluňákov – Center for Ecological Activities of Olomouc, o.p.s.

Sluňákov is a public-benefit corporation offering experiences and knowledge developing respectful relationships between a man and nature, as well as among people.

Pevnost poznání

Our Cooperation

Our IR cameras are used in the education programmes of the Olomouc-based science centre *Pevnost poznání* (Citadel of Knowledge).

Among other activities, it lends IR cameras to schools.

About Our Partner

Pevnost poznání in an interactive science musem and a centre of non-formal education in Olomouc.

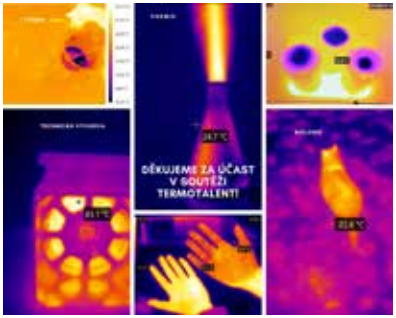
pevnostpoznani.cz/termokamera

Student Competitions

Every year we organize a competition for the most interesting activities and experiments carried out with our IR cameras. The competitions are a great reason for schools to borrow the camera, incorporate it into their classes and let the students present their projects.

2020/21 - Termotalent

Despite restrictions related to the pandemic, the Plzeň region hosted the TERMOTALENT competition in the previous school year. A total of 72 young researchers in 10 teams entered the competition. Even though the teams worked mostly long-distance, they delivered very inspirational experiments of high quality. The announcement took place online on 25th June 2021.

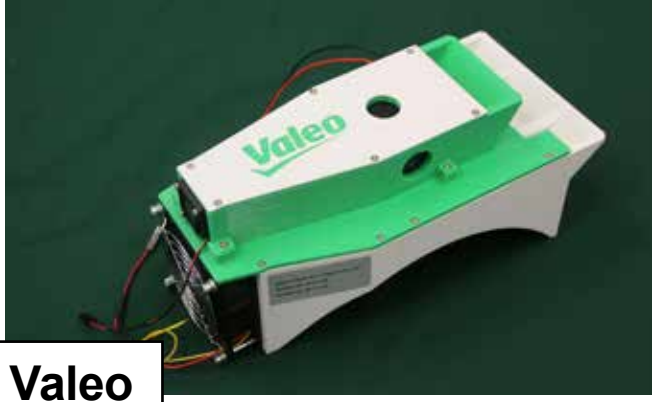


2021/22 - #ocima_termokamery

In October, we announced the 2nd run of the annual competition for the best infared experiment, this time for teams from all over the Czech Republic. The task is to create a scientific experiment using an IR camera. The best entries will be published on the website and social media under the hashtag #ocima_termokamery (“through the lens of an IR camera”).

A jury of thermography experts will select and evaluate the methodology and creativity of the three best entries in two age categories.

We have lots to look forward to. There are already 183 students registered in 27 teams!



Valeo

Our Cooperation

Thanks to the financial support provided by Valeo, we have developed a new teaching tool – an air conditioning model. Both air conditioning models and IR cameras are being distributed to ten selected schools across the Czech Republic in 2021/2022.

Air Conditioning Model + LabIR Edukit

This teaching aid helps to explain the principle of air conditioning and to understand how common devices (such as refrigerators) work.

The teaching aid comes with a detailed instruction manual explaining how to make it work and how to correctly measure the changing temperature using the IR camera.

About The Partner

Valeo is a stakeholder in the Czech automotive industry regarding both production and research and is also one of the largest employers.

Valeo has been operating in the Czech Republic since 1995, when it opened its first production company in Rakovník. Subsequently, two plants in Žebrák (2001) and Humpolec (2002) were founded to manufacture air conditioning systems, exhaust gas recirculation systems, internal control panels, and front-end modules. The plant in Podbořany (2006) produces hydraulic actuators for clutch and brake systems.

Valeo is working towards the same goal – to inspire the youth to pursue science and technology in order to gain qualified employees and innovators.

valeo.cz

Bosch

Our Cooperation

Thanks to Bosch, the LabIR Edu Project had the opportunity to organize interactive workshops for teachers and students at four high schools – in České Budějovice, Jihlava, Brno and Břeclav. Each school could borrow the Edukit with IR cameras for six weeks.

bosch.cz

About The Partner

For more than 125 years, Bosch has been linked to innovative technologies and ground-breaking inventions that create history. Bosch operates all around the world and is active in numerous fields.

There are several production plants in the Czech Republic: Jihlava-based Bosch Diesel s.r.o., Robert Bosch, spol. s r.o. in České Budějovice, Brno-based Bosch Rexroth s.r.o and Krnov-based Bosch Termotechnika s.r.o.

Bosch has built a reputation as a significant manufacturer and investor in the Czech market. Bosch products include automotive, electric tools, household appliances, along with thermal and industrial technology.

Bosch has been promoting technical education at every level for many years, from pre-schools to universities.

ŠKODA AUTO

Our Cooperation

In September 2021, the Czech car manufacturer launched a project introducing state-of-the-art technologies to students at elementary schools to promote technical education.

The NTC Science Centre has cooperated with the project by lending two IR cameras and accompanying tools. Other partners in this project include ABB, Prusa Research and Scania.

About the Partner

ŠKODA AUTO EDU.LAB is a mobile technology laboratory equipped with state-of-the-art technologies. It offers non-contact temperature measurement options and introduces artificial intelligence, 3D printing, virtual and augmented reality, and the abilities of collaborative robots.

It tours the country with a focus on the surroundings of car plants in Mladá Boleslav, Kvasiny and Vrchlabí.

skodaauto-edulab.cz

Edukits Have Become Comprehensive Educational Packages

In 2021, the number of IR cameras that we can lend to schools significantly increased. We have provided the Edukits with robust cases to make transport easier. The schools can now receive a comprehensive educational package ready to be used during classes:

- 5 or 10 infrared cameras
- chargers
- instruction manual
- a set of sample experiments is available on our website
- evaluation software can be downloaded from our website
- tools for basic experiments

We would like to thank the sponsor of the project, printing company Typos s.r.o., for the case pasting and print of leaflets and stickers.

In the course of 2021, we also enhanced the IR cameras' features.

The biggest news is the option to use a higher measuring range of up to approx. 400°C.

We also improved the automatic calibration of the IR sensor.

We Are Expanding the Regional Network of Distribution Centres

As of 2021, Edukits are available to the public in the following distribution centres:

- NTC, Pilsen
- Episcopal Grammar School, Brno
- Pevnost poznání, Olomouc

We are gradually deploying a pilot version of a reservation system for lending IR cameras.

The system is currently being used by NTC of the University of West Bohemia, Pilsen, mainly to administer the joint project with LAPs Rokycany and Kralovice.

In 2022, we want to offer the reservation system to other distribution centres.

We Are Expanding the edu.labir.cz Portal

Besides the above-mentioned reservation system, the website offers a collection of inspirational activities and IR camera experiments.

Testimonials

Infrared cameras allow us to put a new angle on previously studied phenomena during classes. This opens up many opportunities for research using a technical device, which always has a tremendous motivational effect on both students and teachers. I have put the IR cameras to the test when lecturing teachers and the responses have been overwhelming!

Mgr. Ing. Andrea Tláskalová

ZŠ J. V. Sládka Zbiroh.

2nd place in Global Teacher Prize Czech Republic 2017 awarded to inspirational teachers

The IR cameras are built just how the students need them to be; they're simple, easy to use and indestructible. And of course, interesting – they immediately bring the children to action. They're most useful in Physics (although maybe that's just my point of view because I'm a physicist) but even so, I wouldn't be afraid to divert into the fields of chemistry or biology during classes. And I'm sure the children will come up with a creative idea you (nor we) have not thought of yet.

Mgr. Kateřina Lipertová

Physics and Math Teacher at Church Grammar School, Pilsen

Head of the Pilsen-based regional centre Elixír do škol

The opportunity to look at familiar and unfamiliar situations through a different lens was a motivational element at all types of schools. The use of IR cameras leads to a deeper understanding of the subject matter taught, and allows us to see the links between individual natural phenomena.

Mgr. Vladimír Vochozka, Ph.D.

Assistant Professor at the Department of Applied Physics and Technology at the University of South Bohemia in České Budějovice.

He teaches Physics, IT, 3D printing and Physical Experiments at the elementary school in Planá nad Lužnicí.

ČEZ Ámos Award for the most popular Physics teacher of 2018.

What's Ahead of Us

1

We will evaluate the entire pilot version of IR camera distribution funded from public and private sources.

2

We will expand our activities into other regions in the Czech Republic and search for their funding.

3

As we want to introduce our project abroad as well, we are translating the teaching materials and our website into English.

4

We will work with our partners to expand and enhance the learning content and its focus on specific fields.

5

Because our team needs new troops, we will actively search for new workshop instructors and other enthusiasts who will help us to create our learning content.

6

We want to improve the way how experience with IR cameras is shared amongst teachers and other partners. Therefore, we plan to organize a meeting of partners and supporters of the project in 2022.

to be continued

The People Behind the Project

LabIR Edu Team

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Infrared Technologies Research Team

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New Technologies - Research Centre

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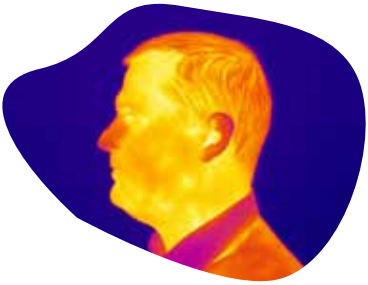
University of West Bohemia in Pilsen

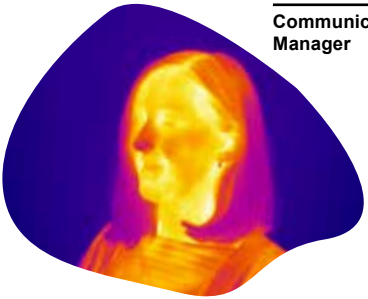
LabIR Edu Team



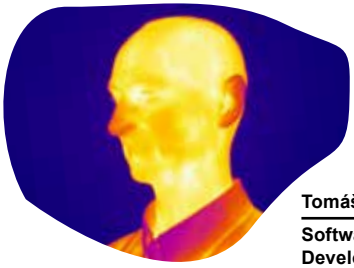
Jan Šroub
Head of Project

Vladislav Lang
Head of Development

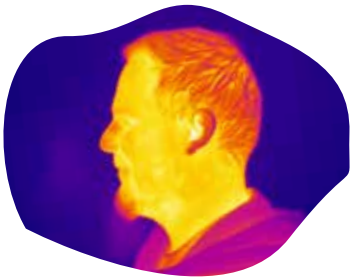
Alice Nováková
Communication Manager

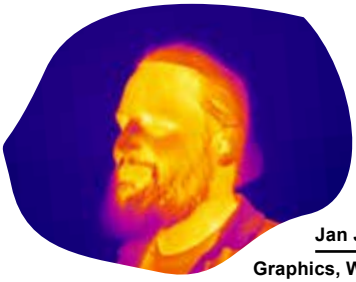


Jan Klepáček
Constructions



Tomáš Kohlschütter
Software Development





Jan Jáchim
Graphics, Website

Ján Šikula
Instructor

University of West Bohemia in Pilsen → zcu.cz

↓

New Technologies – Research Centre → ntc.zcu.cz

↓

Infrared Technologies → irt.zcu.cz

Our research team focuses on applied research and education in infrared technologies. For 20 years, we have been developing infrared measuring systems for various applications. We closely cooperate with industrial companies and public institutions – our activities respond to their current needs.

In connection to the COVID-19 pandemic, one of the burning topics our team deals with is **medical thermodiagnostics**. Related to this field is the joint project of NTC, Faculty of Health Studies of the University of West Bohemia and Techmania Science Center o.p.s. named “Security Research for the Efficient Use of IR Cameras in the Event of Epidemic Threats and Crisis Situations” funded by the Ministry of Interior of the Czech Republic. We engage in the development of a functional system for the reliable thermodiagnostics of people, and also in raising awareness regarding the limits of the current use of IR cameras for such a purpose.

→ medical.labir.cz

As an approved training centre of the Association of Technical Diagnostics of the Czech Republic (ATD) in the field of thermography, we also provide professional consulting and training for people who are looking to get certified in the use of thermodiagnostics in various areas such as healthcare, construction, or power engineering.

↓

ssptermo.zcu.cz


NTC
výzkum, vývoj, inovace
ntc.zcu.cz
H
NTC

Besides the NTC team, the project is backed by other people who share our vision and goals, with each one of them providing their unique know-how.

TIMI CREATION, s.r.o. → timic.cz

A university spin-off established to produce innovative teaching tools. TIMI and the University jointly run the educational project LabIR Edu – Termovize do škol. TIMI produces the teaching tools and distributes them, while the University ensures educative, organizational and communication activities.

Faculty of Education UWB in Pilsen → fpe.zcu.cz

The Faculty supports our project through educative and methodic means. It cooperates with us by preparing didactic materials in the form of worksheets, aids, or videos.

Active Teachers from the project Elixír do škol → elixirdoskol.cz

The non-profit organisation Elixír do škol, z. ú. has been creating conditions for meaningful classes of Physics and Digital Technologies since 2013. Teachers from Elixir have been supporting our activities from the very beginning, helping us organize workshops and make new contacts; we consider them to be indispensable members of our team.

Our Partners

TIMI CREATION

PEVNOST POZNÁNÍ
CENTRUM POPULARIZACE

ELIXÍR DO ŠKOL

Pedagogická fakulta
Faculty of Education
Jihočeská univerzita v Českých Budějovicích
University of South Bohemia in České Budějovice

FACULTY OF EDUCATION
UNIVERSITY
OF WEST BOHEMIA

ŠKODA

EDUbus

Sluňákov

nvias

Our Sponsors

SPIE.

TYPOS

Valeo

BOSCH

Printed by Typos, tiskařské závody, s.r.o., project sponsor

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2021

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