Srednja
tehniška in
poklicna šola
Trbovlje

1961

8TH Conference

TRIii

INNOVATION IN TECHNICAL EDUCATION - CONTRIBUTION TO TECHNOLOGICAL DEVELOPMENT.

Trbovlje, 20th of April 2023

Conference organizer:
Srednja tehniška in poklicna šola Trbovlje
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We are delighted that you have accepted the invitation to the 8th TRiii conference, which is being organized for the first time on an international level. This year's conference has been planned in collaboration with the Centre RS for Vocational Education and is linked to the BlendVet - KIPSI project, which is introducing a blended learning approach on a pilot basis. Invited guests from Iceland and Norway will share with us their experiences and achievements from this project, which focuses on digitalization of the learning process, active and independent learning, as well as innovation and creativity among students.

At the Secondary Technical and Vocational School Trbovlje, we strive to equip both teachers and students with the skills to search for new relevant content, face technological advancements in all areas, encourage innovation, creativity and acquire practical knowledge. We cannot imagine the development of our school without collaboration and cooperation with the business sector. The interaction with companies and research institutions provides opportunities for incidental learning, gaining practical experience, and assuming responsibility, which every person should be aware of. We thank all the Zasavje region companies for their support and assistance.

Today's conference features contributions from students and teachers who have intertwined innovation, knowledge, creativity, usefulness, digitalization, entrepreneurship, and probably other competencies or soft skills in various ways and forms. Lastly, we are pleased to have the participation of primary school students who represent an excellent technical young generation.

I wish all participants and visitors of the 8th TRiii conference a successful day.

Vesna Kralj, principal of Secondary Technical and Vocational School Trbovlje

ABSTRACTS OF PRESENTATIONS

3D digital twin technology in construction teaching

Johann Thorsteinsson in Helgi Valur Hardarson, *Akureyri Comprehensive college – VMA, Iceland*

It is a huge challenge for young students to cope with the diverse environments of vocational education, and all the equipment and tools that welcome students can be overwhelming and cause anxiety. The implementation of 3D digital twin technology in construction teaching can make the school's environment and equipment less intimidating for students. With the help of Matterport, there is now an interactive 3D model of students' workspace with the ability to connect videos, pdfs, and projects to the model. An exciting addition that hopefully will allow students, to come better prepared to study, confident in an environment that is not as much alien to them as before.

Enhancing Learning in Norwegian Schools: 21st Century Skills and Interdisciplinary Approaches

Yngve Reime Erlandsen, *Åssiden videregående skole, Norway*

In the presentatiton, we explore ways to enhance learning in Norwegian schools by integrating 21st-century skills and interdisciplinary approaches into the curriculum. We discuss the importance of awareness around one's own learning and briefly review research on understanding the brain to learn better. We then examine the 21st-century skills included in the Curriculum for Norwegian schools since 2020 and propose research questions for students, providing examples from our classroom tasks. Finally, we discuss interdisciplinary work, suggesting that merging subjects and increasing hours can lead to deeper learning towards the research question. By incorporating these approaches, we believe that students can develop essential skills and knowledge for the future.

AiVSENIK – when Artificial Inteligence creates a new Slovenian Waltz

Žan Hribar & Danijel Tomić*, Secondary technical and vocational school Trbovlje, students*

We can find artificial intelligence everywhere. Most of the algorithms today are based on machine learning. Machine learning generates a model which is based on sample data which we also call learning data. That model can then make predictions. Machine learning also has multiple fields. LSTM is one of the neural networks that is used in machine learning or more specifically deep learning. With our final project we can generate music with the help of AI algorithms. We have created a repository of music pieces which we used as training data to

train the algorithm. We converted the music pieces into a format that the algorithm can understand. We have tried multiple algorithms and compared them. Then we chose the best one and converted the predictions back into a format MIDI. Our final project is based on a set of songs created by the folk group The Avsenik Brothers Ensemble.

Engaging Talented Students with Inquiry STEAM Projects

Askhat Zhumabekov, *Nazarbayev Intellectual Schools, Almaty, Kazakhstan*

We have explored effective ways to involve students in scientific projects to develop their research skills and scientific imagination. The study utilizes non-standard methods and approaches, such as problem-based learning and FILA methodology, to solve physical problems and build a solid foundation of knowledge and practical skills. The program recommends the use of training methods such as problem-based learning, partial search activity, and research methods to foster independent problem-solving skills and scientific thinking. The article also presents a research project focused on investigating gold nanoparticles' structure and composition for use in oncotherapy. The project involves theoretical studies, practical experiments, and computer modeling to explore the potential applications of gold nanoparticles. The experiments utilized various stabilizers and methods for obtaining and detecting gold nanoparticles. Spectrometry and transmission electron microscopy were used to identify the nanoparticles' morphology and size. Computer modeling demonstrated the process of gold nanoparticles' penetration and destruction of cancer cells.

STEM Stands Together

Selçuk Yusuf Arslan, *Ataturk Vocational and Technical High School, Ankara, Turkey*

The STEM Stands Together project aims to develop both digital and social emotional skills of Turkish and refugee students through STEM workshops. According to the researches, it is stated that there are cultural differences, communication barriers and not being accepted among the problems of refugee students. The starting point of STEM Stands Together is to contribute to the solution of these problems. BBC micro:bit kits are used in workshops organized on different subjects. Students are divided into groups of two, one Turkish and one refugee. In this way, students are supported to work together. Students who do not know each other produce a learning outcome even if they do not know any coding during the 2-3 hour workshops. It was observed that the students participating in the study started to communicate, participated in extracurricular activities together and made new friendships. The project was selected as winner of ETF New Learning and Teaching Award.

Enhancing research competences in problem oriented technical education

Žiga Podplatnik, *Secondary Technical and Vocational School Trbovlje*

It is very important to set goals for students that they can achieve in different ways and they often use the world web to do that. Therefore, they enhance their competences by researching different areas. However, with computer technicians we notice that they have problems evaluating these sources. They mostly evaluate the sources by trying out solutions they find on the web. However, these solutions are often very time consuming. We will present the students' project work and show how the way of searching for problem solving has recently changed. Moreover, we will present good practice that encourages the use of new technologies in problem solving. All in all, it's not the research that is changing, it is the use of technology that helps in the process.

SCiDROM makerspace – working on projects with students

Gregor Mede, *School Center Novo mesto*

Article shows an example of project work by students and a model of project-based learning that can be implemented in other schools as well. SCiDROM makerspace or incubator of ideas is an environment for multidisciplinary open innovative collaboration. It is a project of the School Center Novo mesto, in which groups from the economy, educational and research spheres, as well as creative individuals and interest groups participate and collaborate. Here, led by mentors, students of the Novo mesto school center realize their ideas in the fields of electrical engineering, computer science and natural sciences. Various projects and research papers are created in this environment, to which students have access both in the morning and in the afternoon. The Smart City project is implemented in cooperation with the Novo mesto municipality and includes the development and installation of environmental sensors for measuring air pollution and the field of smart buildings. Regarding this field, a greenhouse with sensors for capturing environmental information will be set up in the school's surroundings.

Company Management - online business management

Matija Bregar, *Secondary Technical and Vocational School Trbovlje, student*

"Company Management" is a web application developed using Django and several other tools to help companies manage their operations more efficiently. The application's primary goal is to provide a solution to the challenges faced by companies when managing their operations, such as inefficiencies, errors, and delays that can negatively impact performance. The application provides a wide range of features and functionality to help staff members view

and edit their company's stock of products, leave feedback on the company workflow, and communicate with team members using the built-in chat feature. The user interface is intuitive and user-friendly, and the application is responsive, making it accessible from any device. Additionally, the owner of the company can view an additional page where they can manage users and view their actions on the web app. Overall, "Company Management" is a powerful web application that can help companies become more efficient and productive by streamlining tasks, improving communication, and providing easy access to critical data.

Secondary technical and Vocational School Trbovlje and corporations hand in hand

Marjan Pograjc, *Secondary Technical and Vocational School Trbovlje*

The presentation is about good practices between corporations and schools. Moreover, it deals with the necessary adjustments the companies need to make because of the lack of labour force. The problem today is the fact that the school system adjusts to the economy demands too slowly and therefore, the teachers need to integrate in the companies by means of final assignments or different projects. The companies involved are: Hrastnik 1860 d.o,.o, Kovit d.o.o., Dewesoft d.o.o.and Audax d.o.o.
In all these cases the students have prepared the documentation, have tried creating videos and thus learned the process of actual work.

Photovoltaic blind/pergola

Patrik Božjak in Benjamin Nurikić, *Secondary Technical and Vocational School Trbovlje, students*

The assignment will present a solar blind, which is the result of cooperation between the departments of mechanical technician and electrician. Since European policy is based on the exploitation of renewable energy sources, my task is also designed in this direction. The task is made in the form of a model, but the product can also be made for practical - everyday use. This can be used in various subjects in the electrical, mechanical fields and computer science. The innovation differs from others in that it is interactive, which means that we have to be active when working with the mock-up if we want to learn how the whole assembly works. The electrical part of this task consists of two segments: the display of measurements and stepper motor control. In the first part, we use an OLED 0.96-inch screen, where the luminance is displayed with a luminance resistor and with corresponding DH11 sensor for displaying the temperature and humidity. The stepper motor is controlled via three buttons: forward, backward and automatic. The forward button drives the motor to open the blinds in steps of 1.8°, and the reverse button similarly in the other direction by -1.8°. The button au-

tomatic turns the blinds into the appropriate position so that the solar cells are perpendicular to the position of the sun, depending on the time of day and day of the year.

Elevate your learning with Open Badges

Tomaž Pintarič, *School Center Novo mesto*

Open Badge is a system for evaluating and recognizing educational achievements, competences and skills. Pupils, students or other participants in education and training with Open Badge can improve their learning and build an e-portfolio, and companies can recognize and verify these skills. An Open Badge is a digital credential – a certificate of acquired knowledge or skills that can be verified, as it contains all the necessary information about the issuer and the skills and achievements of the person to whom the credential was issued. Education and training programs that have an Open Badge must be properly prepared - based on learning outcomes, they must define what the participants must do in order to be issued an Open Badge. Contractors must obtain a license to issue an Open Badge. The standard behind it defines the entire procedure of how to prepare it. Pupils, students and others in education and training can open an Open Badge Passport, where they keep open badges. With this, they can build their e-portfolio. Employers can always check the open badge, as clicking on the badge takes them to the issuer, because all the evidence of how the open badge was obtained is collected. Open badges are spreading widely in the European area, as they can be used to evaluate short educational programs and also other skills and abilities. In 2022, over 74 million open badges were already issued. Competences are currency, and with Open Badges we make them visible, transferable and verifiable. Join the ecosystem of opportunity. Find Open Badge trainings with us, view the programs, do what is required, get an Open Badge and create a passport with your Open Badges. Build your skills profile by collecting and "stacking" learning in a flexible way, at your own pace and according to your own priorities.

Building a renewable energy boiler house

Žan Černivec, Jaka Kovče Zuccato in Luka Brglez, *Secondary Technical and Vocational School Trbovlje, students*

For the final product and service, we designed and built a learning boiler house in the Mechanical Installer programme. We assembled and interconnected a biomass stove, which uses wood pellets for heating, and a storage tank. The storage tank was then connected to the pump groups, which in turn were connected to the different heating sources and to the domestic water heater. A connection for a second alternative heating source, an air-to-water heat pump, was also made in the pipes between the stove and the storage tank.

How to raise the level of knowledge in mathematics and use modern ICT, and how better prepare students for further studies

Miha Simončič, *Secondary Technical and Vocational School Trbovlje*

In the last decade, the level of knowledge in mathematics in secondary schools has been declining. This can be seen in the easier tasks from the vocational high school diploma, the lowering of the criteria for grades, etc. Problems then arise in mathematics in high schools, colleges and universities. How to solve or at least alleviate this situation when teaching mathematics and at the same time make the work even more interesting with the help of modern technology. I presented the project to the students in the fourth year. They were given a set of four types of tasks that regularly appear in colleges and universities. The assignments are essentially an in-depth chapter on mathematical derivations and limits of functions. Their level is also much more demanding than that of students in the fourth year according to the curriculum. So, each student had to solve 4 tasks from more demanding and more in-depth topics, such as: Geometric meaning of derivative, local extrem, stationary points, local minimum and maximum, curves, notation of the equation of the tangent and normal of a function and their angle of inclination, … I attracted them so that they could help themselves with modern ICT technology. In this way, they could check their solutions, draw a given function, draw a tangent to it, a normal at a given point... I advised them the following programs: Desmos, Geogebra online, Microsoft matematichs, Photomath. The project took three days and their results were extraordinary and astonishing. I hope that one day, as students, they will say, "This math task is easy, because we solved a similar math project back in high school."

CNC milling machine

Tomaž Ostrožnik, *Secondary Technical and Vocational School Trbovlje, student*

For my final project, I decided to convert a 3D printer into a CNC milling machine. I used a Kossel XXL 3D printer that was out of order. The goal was to make a milling machine with a large work surface using as many parts from the printer as possible, as well as various parts that I already had. For the milling tool, I used a Dremel 3000 that I already owned. I used GRBL for the Arduino software and JS to CNC control. I create 3D models in Fusion 360 and then generate G-codethere as well. I plan to use the milling machine to make decorative signs and bases for other projects.

How to Become an Environmentally Friendly Sport Spectator of the Nordic World Ski Championships Planica 2023?

Lucija Mandl, *School Center Celje*

Nowadays, socializing and mass sports events, which have always been part of social culture, are faced with the challenge of responsible use of sources and a positive legacy. Between 21 February and 5 March 2023, Slovenia hosted the largest sporting event in its history, the Nordic World Ski Championships. At the Secondary School of Mechanical Engineering, Mechatronics and Media, students got a special challenge for a high-profile championship. The aim of this activity called “how to become an environmentally friendly sports spectator” was to present the solutions for attending sports events in a sustainable way. Participating in a sports event can be interesting for fans and environmentally friendly. High school students searched for the best solutions to the following questions: 1) How to sustainably travel to sports events? 2) How to reduce the amount of waste during the event? 3) How to eat during a sports event (waste food)? 4) How to encourage other visitors to behave environmentally friendly during the event? The students designed the entire day (from planning to execution) and presented the products in the form of a video. With this, we achieved the cooperation of the teachers and students of the mechanical and media technician program.

ROBOTIC ARM

Patrik Lazar, *Secondary Technical and Vocational School Trbovlje, student*

In the final assignment, I presented the creation of a prototype of a robotic arm that will be powered by electric motors. The goal was to print the entire prototype using a 3D printer. I prepared the task with software, namely the Solidworks 2022 modelling program and the so□called Ultimaker Cura 4.2.1 cutter. I made all the necessary components and documentation in Solidworks. I then prepared each component for 3D printing in Ultimaker Cura 4.2.1. After setting all the necessary parameters, I transferred the file to the 3D printer, which produced the piece. After the printing was finished, I put everything together into a finished whole as a product for my final assignment for my vocational high school graduation.

Modern didactic approaches in the physics classroom

Aljoša Berk, *Secondary Technical and Vocational School Trbovlje*

A modern teaching and learning process requires a wide range of didactic approaches, meaningful implementation of technology, an appropriate amount of project and experimental work, formative monitoring of lessons and usage of different learning techniques. Students become bored due to their passivity during the frontal classes. Flipped and experiential learning of the physics chapter "Heat" is described in my presentation. All the students within the classroom will be active and busy. Various tasks will be differentiated into several groups of students. With the help of schoolbooks and online articles, students will find and define the required terms and then make paper posters. Groups will compile online quizzes. They will search online for different physics experiments that will be thoroughly examined and studied. Appropriate materials and accessories will be chosen, and experiments will be demonstrated in front of the class. Video evidence of live experiments will be taken and the material will be added to online classroom for home study and repetition. Most talented students will theoretically investigate and practically build a Stirling heat engine. The engine's rotor will drive a generator connected to an electrical load. A 3D model and an animation of the machine's operation will be made with the appropriate software. The complex role of a teacher in such a flipped learning process is to be a mentor who carefully prepares instructions and tasks for students. The teacher coordinates and formatively monitors all the groups and gives them constructive suggestions and feedback. At the end of a project, a mentor plays a crucial role in leading joint analysis, evaluation, and constructive debate.

SHORT STUDENT PRESENTATIONS

ELECTRICAL TECHNICIAN

- Patrik Božjak: Blinds control
- Jakob Flere: Measuring station
- Matej Jakoplić: CO_2 overrun detection device
- Mitja Kink: Sound and light effects
- Uroš Markuljević: Stereo amplifier (HI-FI) 15W with discrete elements
- Tomaž Ostrožnik: CNC milling machine
- Vito Potisek Raušl: Solar Charge controler HP2410
- Matic Slapar: Monitoring parameters with STM32 Monitor
- Matija Trošt Čebela: Rectifier
- Aljaž Vidmar: Car and video surveillance

MECHANICAL TECHNICIAN

- Benjamin Nurikić: Fotovoltaic blind
- Urban Kovačič: Business plan for company, metalworking
- Jure Lisec: Technical documentation with SolidWorks for Bike stand
- Patrik Lazar: Prototyping using the 3D printing process (Robotic arm)
- Rok Kolenc: Analysis and calculation of chain drive
- Gašper Kovač: Planning and production of motocross starting gates

- Zinedin Ibrahimović: Manufacturing of water pump
- Anže Redl Kolar: Workplace desing on a practical example
- Nikolaj Pečnik: Creation of project and technical documentation of the steel preasure vessel for company Kovit d.o.o.
- Vid Drnovšek: 3D- scanning
- Matija Pavšek: Analysis and calculation of the belt drive
- Tian Gobovc: Improving work on a practical example
- Lovro Skrinjar: Aluminium – the material of the future
- Marko Markuljević: The potential of renewable energy sources
- Ambrož Arh: Improving work on a practical example
- Nejc Slatinjek: Business plan for company, metalworking

COMPUTER TECHNICIAN

- Amar Ahmetović: Application Healthy life
- Matija Bregar: Company management – online company management
- Hana Fele: A desktop application for displaying measurements of a digital industrial scale
- Tilen Gašparič: Interactive application for the simulation of organisms
- Žan Hribar: Generating music with AI , 1. part
- Dominik Janc: Web app store for selling coffee
- Domen Knez: Arcade machine
- Luka Košir: Online application for the login /logout appointments for the final customer
- Tian Košir: Mobile application for traffic sign recognition – augmented reality
- Davor Kovačič: MY HOME application for managing expenses
- Aljaž Kukovec: Upgrade of the ComLab web-based classroom control application
- Matej Laharnar: 3D Unity game – Neon Stride
- Luka Likar: Web app or application for renting tools and machines
- Luka Marinko: Unity game – Gears and Wires
- Gašper Nemet: Football's blog
- Anej Pajk: Rubik's Cube game
- Matevž Prašnikar: Phone application for organizing student obligations
- Amel Salibašić: Desktop application for calculating prices of building material
- Tadej Sevšek: A website for selling videogames
- Nik Šerak: Online application for business management of the independent enterpreneur
- Zak Škofljanc: Web application for managing car statistics
- Tilen Šuštar: Application for managing extracurricular activities
- Danijel Tomić: Generating music with AI, 2. part
- Mark Uranič: A program for automated posting on social media

Summaries of elementary school contributions to technical development

FLL – JUNIOR : Trbovlje Primary School

Primary School Trbovlje has been collaborating with the Institute for Knowledge Promotion - Super Glavce within the framework of the FLL (FIRST LEGO League) program for several years. FIRST LEGO League is an educational and research program that sets a new challenge for students every year - a project that equips children and young people with knowledge and competencies for the 21st century, familiarizes them with science and technology, and encourages initiative, entrepreneurship, creativity, and teamwork. The basis of the program is robotics and research, with a special emphasis on values.

A group of experts selects a new theme for the challenge every year, which is one of the current global issues. This year's challenge is Super Energy. Our task was to examine where we obtain energy from and how we use it. We created a plan for better energy production and storage, and reflected on the impact our energy-related decisions can have.

Mentors of FLL Junior Nina Fabijan in Maja Vezovišek

TOURIST CYCLING ROUTES IN TRBOVLJE - CŠOD Mission App: Tončka Čeč Primary School

At Tončka Čeč Primary School, we have prepared a presentation of tourist cycling routes. Dulina, Knapi, and Retje are the routes that we will showcase using the CŠOD Mission app. In addition to a map of the routes and descriptions of our town, the app also offers fun challenges that users can solve along the way on their mobile devices. The cycling routes can be completed with one's own or TRajBi bicycles. We have also recorded the routes and they can be viewed through VR goggles.

Mentor Tanja Božiček Simnovčič

Girls can do it, together we can do it too: Primary school Marjana Nemca Radeče

Girls from JZ OŠ Marjana Nemca Radeče have been programming for two years now as part of the GirlsDoCode project, under the mentorship of Alenka Gros, a math and computer science teacher. Two of the most successful sixth-graders participated in the GDC Hackathon in Ljubljana, and created their own world called "Sports Games at the Radeče Stadium" in the Minecraft Education Edition, which can be played by all students and pupils with an AAI login. We presented the game at the national festival of the Slovenian Tourist Association "Tourism Helps Itself" and received a silver award.

Mentor Alenka Gros

PHOTO DOCUMENTATION OF THE PREVIOUS TRiii CONFERENCES

THANK YOU TO:

Občina Trbovlje

Srednja tehniška in poklicna šola Trbovlje
Program 8. konference TRiii,
četrtek, 20. 4. 2023, Delavski dom Trbovlje

8.30–9.00	**Registracija**
9.00–11.00	**OTVORITEV KONFERENCE** Vesna Kralj, *ravnateljica Srednje tehniške in poklicne šole Trbovlje* Mag. Zoran Poznič*, župan Občine Trbovlje* **INOVATIVNI PREBOJI** ***VABLJENA PREDAVANJA:*** • Korak za korakom: premišljevanja in premisleki o vzgoji in izobraževanju za trajnostni razvoj, dr. Gregor Torkar*, Pedagoška fakulteta Univerze v Ljubljani* • 3D digital twin technology in construction teaching, Johann Thorsteinsson in Helgi Valur Hardarson, *Akureyri Comprehensive college – VMA, Islandija* • Enhancing Learning in Norwegian Schools: 21st Century Skills and Interdisciplinary Approaches, Yngve Reime Erlandsen*, Åssiden videregående skole, Norveška* • AiVSENIK – ko umetna inteligenca naredi nov slovenski valček, Žan Hribar in Danijel Tomić, *Srednja tehniška in poklicna šola Trbovlje, dijaka*
11.00–12.00	**INOVATIVNOST NA VSAKEM KORAKU …** (predstavitve dijakov, osnovnošolcev in predstavitve plakatov v avli; mreženje; predstavitev delodajalcev v spodnji avli)

12.00–15.00

- **INOVATIVNOST V VSEH ODTENKIH**
- ***PREDSTAVITVE REFERATOV:***
- Engaging Talented Students with Inquiry STEAM Projects, Askhat Zhumabekov, *Nazarbayev Intellectual Schools, Almaty, Kazakhstan*
- STEM Stands Together, Selçuk Yusuf Arslan, *Ataturk Vocational and Technical High School, Ankara, Turčija*
- Krepitev kompetenc raziskovanja v problemsko oblikovanem tehniškem izobraževanju, Žiga Podplatnik, *Srednja tehniška in poklicna šola Trbovlje*
- SCiDROM makerspace – projektno delo z dijaki, Gregor Mede, *Srednja elektro šola in tehniška gimnazija, Šolski center Novo mesto*
- Aplikacija Company Management – upravljanje podjetja preko spleta, Matija Bregar, *Srednja tehniška in poklicna šola Trbovlje, dijak*
- Srednja tehniška in poklicna šola Trbovlje ter gospodarske družbe z roko v roki, Marjan Pograjc, *Srednja tehniška in poklicna šola Trbovlje*
- Fotovoltaična žaluzija/pergola, Patrik Božjak in Benjamin Nurikić, *Srednja tehniška in poklicna šola Trbovlje, dijaka*
- Izboljšajte svoje učenje z Open Badgesi, Tomaž Pintarič, *Šolski center Novo mesto*
- Izdelava kotlovnice na obnovljive vire energije, Žan Černivec, Jaka Kovče Zuccato in Luka Brglez, *Srednja tehniška in poklicna šola Trbovlje, dijaki*
- Kako dvigniti nivo znanja iz matematike, uporabiti sodobno IKT ter kako dijake bolje pripraviti na nadaljnji študij, Miha Simončič, *Srednja tehniška in poklicna šola Trbovlje*
- CNC rezkar, Tomaž Ostrožnik, *Srednja tehniška in poklicna šola Trbovlje, dijak*
- Kako postati okolju prijazen navijač svetovnega prvenstva v nordijskem smučanju Planica 2023?, Lucija Mandl, *Srednja šola za strojništvo, mehatroniko in medije, Šolski center Celje*
- Robotska roka, Patrik Lazar, *Srednja tehniška in poklicna šola Trbovlje, dijak*
- Sodobni didaktični pristopi pri pouku fizike, Aljoša Berk, *Srednja tehniška in poklicna šola Trbovlje*

15.00 **Zaključek konference**