

**MUNI
PED**

Robotics in STEM EDU in Czech Curriculum

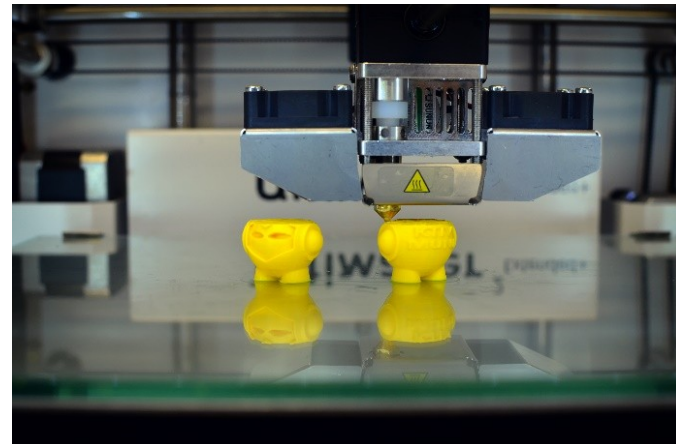
Mgr. Karel Picka, Ph.D.

Department of Technical and Information Education
Faculty of Education
Masaryk University



There was big change in ICT education i our country in last couple of years

- After years of stagnation, the national informatics/ICT curriculum (compulsory for all elementary schools) has changed
- shift from simple user skills to algorithmic thinking, programming, robotics...
- in development since 2018, mandatory for all elementary schools from **4.9. 2023**
- However, some schools have been implementing changes for a year or two



There was big change in ICT education in our country in last couple of years

- Informatics as a subject in primary schools has also gained more hours in the hourly allocation
- Instead of one hour per week, pupils will now encounter 2 to 3 hours per week (depending on whether it is the lower or higher level of elementary school*)



*Lower: 6 – 10 years of age, Higher: 11 – 15 years of age

~~What was drop out of the curriculum?~~

Lower Elementary

- Computer basics** (concepts, hardware, OS, file formats, multimedia, troubleshooting and maintenance, safety and prevention)
- Information retrieval and communication** (information flow, communication methods, information retrieval)
- Information processing and application** (word processing, graphical editor)

Higher elementary

- Information retrieval and communication** (ict developments, information verification and value, internet)
- Information processing and use** (graphics, spreadsheets, presentations, law and intellectual property)

So, what's new?



New curriculum

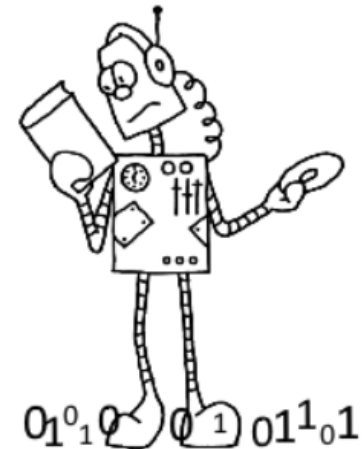
□ New sections of curriculum:

□ 1) DATA, INFORMATION AND (data) MODELLING

□ 2) ALGORITHMISATION AND PROGRAMMING

□ 3) INFORMATION SYSTEMS

□ 4) DIGITAL TECHNOLOGIES



New curriculum

- All of these categories are taught at different levels of difficulty across the lower and upper primary levels
- **For example:**
- **2) ALGORITHMISATION AND PROGRAMMING**
- At the lower elementary level, pupils will meet the very basics of programming in Scratch, step robots (Bee-bot, Vex), etc.
- At the upper elementary level, pupils will encounter more demanding programming in Scratch, but also, for example, the development of programmable robots or microcontrollers such as Ozobot, Micro:bit or Arduino

New Textbooks for Primary/Secondary Schools

	MŠ	ZŠ / 1. stupeň					ZŠ / 2. stupeň				SŠ			
		1	2	3	4	5	6	7	8	9	1	2	3	4
Programování a algoritmizace	Tomáš													
	Robotické hračky Bee-bot													
						Scratch 1. st.								
								Scratch 2. st.						
									Scratch 2. st. (pokročilí)					
Informatika (ostatní témata)					Základy informatiky 1. st.									
							Základy informatiky 2. st.							
							Práce s daty							
												Základy informatiky SŠ		
Základy robotiky					LEGO WeDo									
									LEGO Mindstorms					
									Micro:bit s Makecode					
											Micro:bit s Pythonem			

MUNI PED

What can our students encounter?

Lower Elementary
Examples of robotics



Bee bot/Blue bot

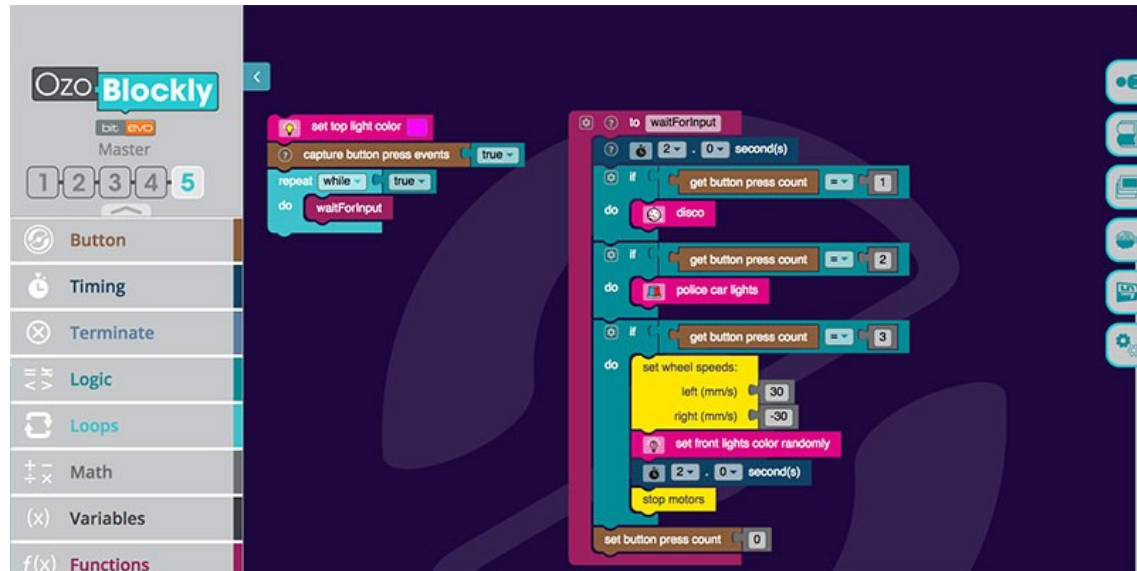
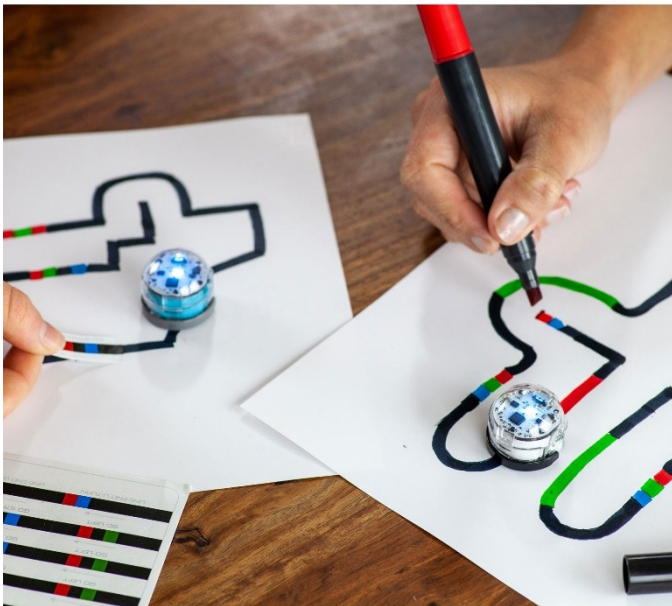
- Step robot
- Very easy to handle for younger kids
- No need for computer or tablet/smartphone
- Can help teach basic algorithmisation even for very young kids
- Lot of materials



Ozobot



- Can be programmed on paper or via computer/tablet
- Can read codes made by colour markers on paper
- Can be programmed by visual programming language based on Blockly



Dash & Dot



- Programmable via several tablet/phone apps
- Uses block programming but also its own interesting visual programming language



LEGO

- LEGO WeDo has established itself for lower primary schools
- Today, it is being replaced by other programmable Lego, but an official textbook accredited by the Ministry of Education has been created for the popular WeDo in past two or so years



M U N I
P E D

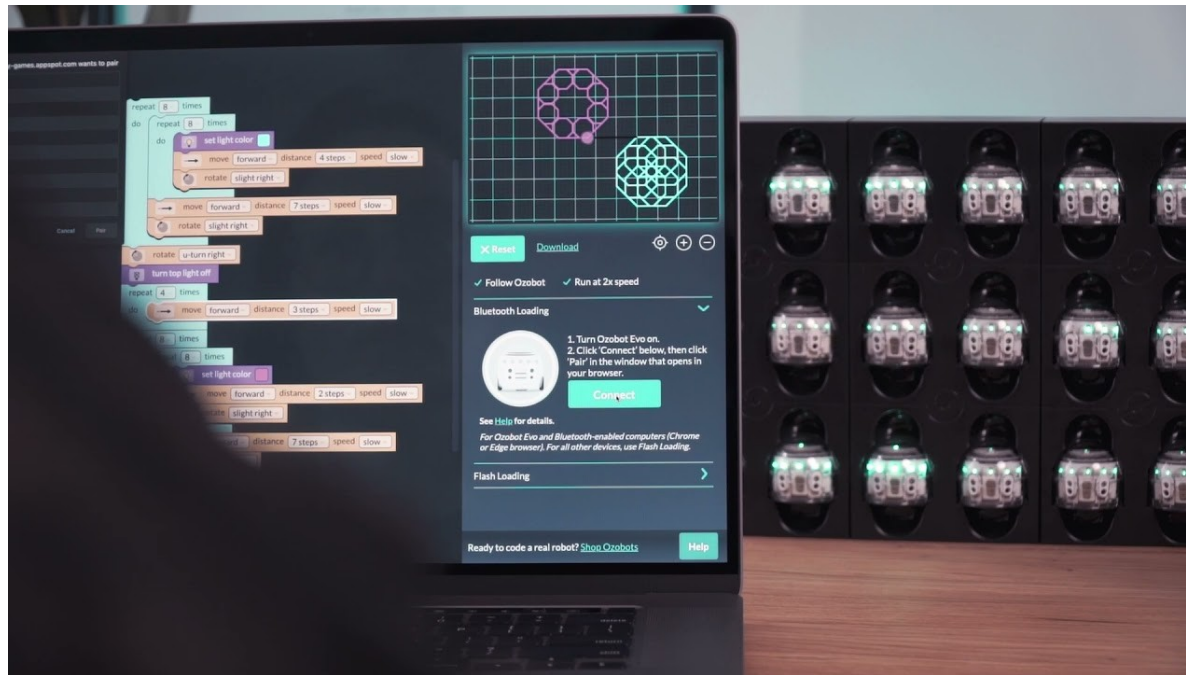
What can our students encounter?

Upper Elementary
Examples of robotics



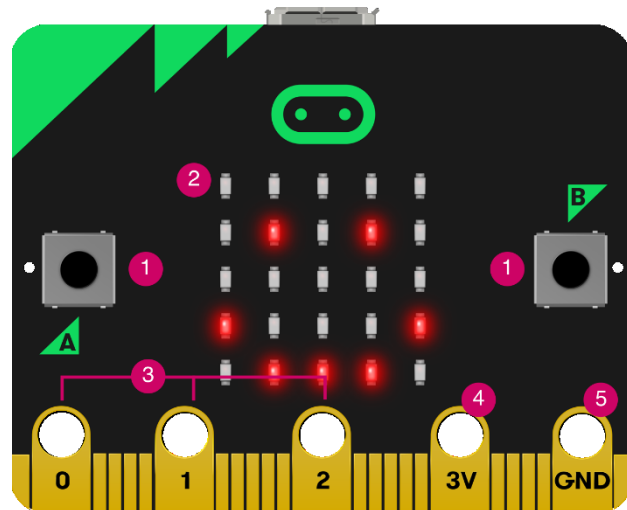
Ozobot

- Same as above, but with more focus on programming with higher levels of visual coding and not so much on the paper with markers



Micro:bit

- small single-board computer for programming and electronics education
- includes various sensors, such as an accelerometer, magnetometer, and LED display
- **Programmable:** Micro:bit can be programmed in various programming languages, including Blockly, JavaScript, and Python, making it versatile for use in education at different levels.



LEGO Mindstorms

- educational robotics platform that combines hardware, such as programmable bricks and sensors, with a user-friendly programming environment (mostly visual block based)
- Mindstorms allows students to engage in hands-on learning, teaching them programming, engineering, and problem-solving skills while building and coding their own robots.



Arduino

- open-source microcontroller platform that introduces students to the world of electronics and programming
- „More challenging“ than Micro:bit
- Can be use as a good vessel to transfer from visual programming languages to text based (C, C++, MicroPython, Java,...)
- Can connect to various hardware and be used to virtually any project the teacher or student can handle



MUNI PED



And much more...



Thanks for your attention!

Mgr. Karel Picka, Ph.D.
Assistant Professor

MUNI
PED

Masaryk University | Faculty of Education
Department of Technical and Information Education

A: Poříčí 31 | Brno

E: picka@ped.muni.cz