1.5 Teaching robotics

Robotics in education is an exciting field that has the potential to revolutionize the way our children learn. By introducing robots into the classroom, educators can provide students with engaging, hands-on learning experiences that stimulate their curiosity, creativity, and problem-solving skills. Robotics offers a unique opportunity to develop 21st century skills such as collaboration, communication, critical thinking, and creativity. It allows students to learn in a safe environment with no risk of failure, and fosters an environment of experimentation and exploration.

Robotics can also be used to enhance subject-matter learning, enabling students to write code and program robots to solve problems. This opens up possibilities for developing skills such as design thinking, algorithmic thinking, and computational thinking. Robotics also has potential to promote STEM education, as students can learn about topics such as engineering and computer science through the use of robots.

In addition, robotics can help to develop social and emotional skills. Through the use of robots, students can learn to collaborate, work in teams, and develop leadership skills. Robotics also encourages students to develop empathy and to think critically about the world around them.

Overall, robotics in education is an important tool for preparing students for the future. By introducing robots into the classroom, educators can create engaging and interactive learning experiences that teach students valuable skills. Robotics can also be used to enhance subject-matter learning, promote STEM education, and develop social and emotional skills."

1.5.1 Robotics and Education

Robotics in education has been gaining a great deal of attention in recent years. This is due to its potential to create engaging learning experiences that help to facilitate deeper understanding of complex topics. Robotics provides an opportunity to engage in hands-on learning that encourages students to explore, tinker and construct their own learning. This approach aligns with both constructivism and constructionism, two educational theories that emphasize the need for students to build their own knowledge and understanding through exploration and collaboration.

In this context, robotics acts as a conduit for students to explore and understand the world around them. The work of Seymour Papert, a renowned MIT professor, has been influential in this field. Papert was an early advocate for the use of robotics in education, and his work led to the development of the popular children's robotic toy, the Logo Turtle. Papert recognized the potential of robotics to engage students and foster meaningful learning experiences.

Similarly, the work of Resnick at the MIT Media Lab was influential in the development of innovative robotic programming tools such as Scratch and LEGO Mindstorms. These tools have become popular

in teaching children robotics and programming. By providing children with the ability to control and program robots, these tools provide a powerful means for students to explore the possibilities of robotics and to develop a deeper understanding of its principles.

Overall, robotics in education offers an exciting opportunity to foster meaningful and engaging learning experiences. Through robotics, students have the opportunity to explore the world around them, to tinker and construct their own learning, and to develop a deeper understanding of complex topics."

1.5.1.1 Definition of the robots in education

Slangen:
Definition of the robot must be based on the main operation that robot performs:

- zaznavanje (angl. Sensing),
- sklepanje (angl. Reasoning) &
- delovanje (angl. Acting).

This operation is constantly executing in a.k.a. S-R-A loop.

Slo. nat. curriculum:`Robotics in Engineering`
- almost exact interpretation of S-R-A loop Krmiljenje s povratnim delovanje (angl. feedback control regulation)

- including learning objective: . . . kjer učenci ugotovijo potrebe po **krmiljenju s povratnim delovanjem** in izpostavijo pomanjkljivosti, če takega krmiljenja ni.

(angl. where students identify the need for **feedback control** and point out shortcomings in the absence of such control)

- misconception: Playing with robots or using a robot is robotics.
- Robots are meant to be user friendly.

1.5.1.2 Robotics in Schools

- very popular in last decade

We can find robots in learning process as:

1. Robotics curses:

- Electronics
- Computer Science
- Engineering

2. motivation for learning other disciplines:

- Science
- Technology
- Engineering
- Math

1.5.1.3 Important educational impacts

1.5.1.3.1 LEARNING by DOING … learning as “BUILDING KNOWLEDGE STRUCTURES” through progressive internalization of actions… this HAPPENS especially felicitously in a context where the LEARNER is consciously engaged in CONSTRUCTING A PUBLIC ENTITY, whether it’s a sand castle on the beach or a theory of the universe. (Papert, S. (1980). Mindstorms. Children, Computers and Powerful Ideas. New York: Basic books.)

1.5.1.3.2 PRACTICAL APPLICATIONS Applying knowledge and skills learned into a `public entity` make us proud of ourself. We have something to show to people that matters to us (friends, parents, classmates).

1.5.1.3.3 CREATIVITY There is not an only one solution to the problem. Kids can explore their ideas and put it to the test.

1.5.1.3.4 LEARNING from MISTAKES Kids are ALLOWED to LEARN from MISTAKES!?! In general, MISTAKES has very bad reputation in school sistem. To degree, that kids are often afraid to give an answer so as not to make a mistake (-> they stop trying). However, Robotics is so complicated field that mistakes can not be avoided. Thus, MISTAKES are very common thing in this learning proces of robotics.

1.5.1.3.5 CRITICAL THINKING Critical thinking is ability to do analysis of facts and form objective judgments based on reasonable arguments.

1.5.1.3.6 SELF-ASSESSMENT Kids are able to see if they fulfill the intended task or not. They can asses their own performance based on results of intended tasks.