Co-funded by the Erasmus+ Programme of the European Union

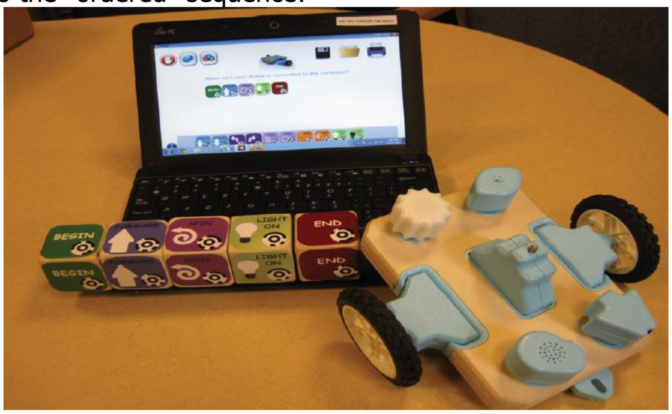
BotSTEM – Erasms+ KA2 Project

2017-1-ES01-KA201-038204

Good practice template

1. Title of the activity / practice	**Bringing together the S, T and E of STEM in Early Childhood Education**
2. Origin of the activity	The good practice presented here is in form of a commercial robotic kit, presented in a paper by Bers, Seddighin and Sullivan (2013): „Ready for Robotics: Bringing together the T and E of STEM in Early Childhood Teacher Education". The paper discusses how we live in a world of technology that we do not teach our children about. Early schooling teaches children about e.g. polar bears and cacti, although these are probably more remote from children's everyday experience than cellular phones or elevators (who mysteriously „knows" when someone's little hand is in between the doors and they should not close). Given the increasing mandate to make early childhood education more acedemically challenging, while honoring the importance of play, robotics can provide a playful bridge in meaningful projects. The paper discusses the importance of Mishra and Koehler's TCPK framework for Early Childhood Educators, when integrating technology and engineering: • Content knowledge (CK): robotics as a subject matter, the engineering aspects of building an artifact than can move and sense its environment, and the programming aspects that determine the sequence of its behaviors. • Pedagogical knowledge (PK): knowledge about the processes and practices, strategies and methods of teaching engineering and technology content with developmentally appropriate pedagogies that take into account cognitive, social, emotional and other devepomental aspects of learning in early childhood. • Technology knowledge (TK): understanding the affordances and constraints of robotics as an educational technology and the transferable skills and concepts. This is crucial for sustained technology integration in the classroom. Platforms change rapidly, but there are certain ways of thinking about and working with technology in the classroom that will not. For example, regardless of the specific robotic kit used, children need to know how to problem solve and debug. The paper focus the KIWI Technology and its benefits in work with young children and robotics. Since 2011, the KIWI prototype (now called KIBO) has gone through several design iterations and has been tested in numerous public and private schools in the greater Boston area as well as in summer camp and lab settings. This testing with children and teachers has informed teach stage of the re-design of KIWI and the commercially available KIBO robotic kit. Bers, Seddighin and Sullivan (2013). Ready for Robotics: Bringing together the T and E of STEM in Early Childhood Teacher Education. Journal of Technology and Teacher Education. 21(3), 355-377. http://ase.tufts.edu/DevTech/ReadyForRobotics/index.asp (February 5, 2018)

3. Age of the students	4-7 years old
4. Target group (type of the learners, size of the group) **5.**	
6. School subjects + topics concerned	Science, technology and engineering, but also social and democratic aspects of the preschool curriculum, through group activities.
7. Educational goals of the practice	Knowledge of sequential thinking and programming, through hands-on exploration of for instance the natural science phenomena sound and light.
8. Duration	
9. Place	Classroom / lab / outdoors / at home, etc.

10. Short description of the activity	In many of the commercial robotic kits on the market, children do not have opportunities to engage in the building of the robotic artefact and thus explore engineering ideas. Also, many of the existing commercial robotic kits are not easy for young children to operate. The KIBO robotic kit utilizes a software called CHERP that allows young children to physically construct the computer programs by connecting interlocking wooden blocks, representing a series of events (begin, shake, sing, etc.). When photographing the blocks using a standard webcam connected to a computer, the picture is converted into a digital code, making the KIBO robot move or act according to the "ordered" sequence:  Instead of relying on pictures and words on a computer screen, this kind of programming uses physical objects to represent aspects of computer programming. While it is possible to make mistakes in program logic, the wooden blocks make the code visible and open for discussion, eliminating syntax errors. Except for the incorporation of the T and E of STEM in the KIBO robotic system, S could easily also be fused into the work. The KIBO robot can be programmed to sense light and darkness or to react to sound, allowing exploration of these natural science phenomena.
11. Evaluation	
12. Materials / Resources / technical requirements	Computer, KIBO robotics kit
13. Tips for educators / theoretical background (if applicable) or curriculum context	