POPULAR SCIENTIFIC ABSTRACT

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[Reengineering school – Contextualised teaching of technology]

In recent years we have seen an ever-expanding increase in the usage of everyday technology and jobs requiring technologically skilled workers. However, the industry is currently struggling with finding qualified workers within the field of STEM (Science, Technology, Engineering, and Mathematics), while forecasts predict a severe shortage of STEM-workers within the near future. A field already suffering from a severe gender disparity, further limiting the size of the STEM-workforce. Consequently, we have seen an increasing focus on implementing STEM and CT (Computational Thinking) within K-12 curricula. In addition, we have likewise seen massive national investments in ER (Educational Robotics) technologies, aimed at teaching these. Among these are the BBC and the national Danish Broadcasting Service led projects, micro:bit and ultra:bit, which combined have brought the micro:bit platform into the hands of more than one million pupils. Yet, while the micro:bit is a fully fledged microcontroller designed for teaching software and hardware in unison, very few curricula from the two projects make use of its capabilities for the latter. In addition, the breadboard – a popular tool for prototyping electronics, intended for higher learning institutions and engineering – has not seen any major updates since its conception in 1973**.** Furthermore, according to the Danish Ministry of Children and Education, the school subject Nature and Technology is currently lacking in-service teachers educated within the field.

The main objective of this thesis is therefore, to address a selection of the challenges currently present regarding the usage of ER to teach STEM and CT and to providing additional knowledge regarding these.

The challenges addressed revolves around providing research based and neutral information on the efficiency of commercially available ER products, to let institutions take informed decisions when choosing which products to invest in. The possible benefits of earlier interventions, for which an argument here for was found, due to the observation of mediated transfer of knowledge taking place. This observation was made when participants transitioned from an ER system with a tangible interface, a system with a virtual interface. Investigating the possibility of upgrading existing tools – breadboards and circuit diagrams – to make these more appropriate to use within a K-12 setting. This was achieved using 3D printable covers and a rethinking of how to design circuit diagrams, incorporating visual cues from the cover. Furthermore, it was investigated how ER can be used to foster girls' interest for STEM, through adjustments to the context, selection of prototyping-materials and a gender composition.

Overall, this thesis provides a series of readily implementable recommendations, materials, and tools, aimed at aiding the current in-service teachers and other practitioners within the field.