
Perspectives on Digital Fabrication and Making in Special Education

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Abstract

In this paper we will focus on different perspectives on digital fabrication and making in special education. Firstly, we will bring up observations from field studies in a special education school. The observations concern the implications of different teaching styles based on whether the teacher is trained in design thinking or not. Secondly, further perspectives concern knowledge sharing among teachers in special education, and more specifically how to index a digital archive of digital fabrication teaching resources for special education. The paper will shortly introduce two of the projects where our perspectives stems from, and further discuss the perspectives. It is the hope of the authors that the perspectives will enrich the discussion on digital fabrication and making in special education.

Author Keywords

Digital fabrication; design thinking; making, special education; special needs;

Introduction

The authors of this paper are part of IDAC – Gothenburg working group for interaction design and children, and are active in many different kinds of projects. In this paper we will focus on questions and perspectives deriving from two projects in special education context, Makerspace in School and Touch AT.



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Background

The projects presented here concerns the Swedish special education, in which 10800 children attend Compulsory School for children with learning disabilities, Särskolan. This form of education is for intellectually challenged children with developmental disabilities. Groups of children within these schools are often very diverse with many different diagnoses, e.g. intellectual disabilities, Autism, Down syndrome and severe ADHD. Mixed groups of children with diverse disabilities is less common to work with in interaction design research [4]

MAKERSPACE IN SCHOOL (MAKERSKOLA)

The large-scale national Makerspace in School project started in 2015 and will continue until 2018. Geographically distributed all over Sweden, approximately 30 local education authorities (e.g. municipalities), businesses, science centers and academic partners are involved in the project [2]. The aim is to contribute to the development of new subject matter specific methodology based on the creative use of new as well as existing technologies, but also to develop an understanding of how these technologies affect and mediate the ways we live and how our societies work on a more fundamental level. Challenging young people to explore the boundary between analog and digital resources also means combining theoretical and practical work, in line with what happens in for example crafts, but in an even broader context. The project provides opportunities to develop and disseminate best practices in the field of maker culture between teachers, schools and local education authorities, who over time has the intention to improve our schools' educational activities in general and provide input for future curriculum development.

Among other things, the project has an *archive*: A website that serve as a web-based knowledge bank and a digital archive that will cater for the project's results survival after completing the project [1]. The archive is divided into activities for school subject specific matters, such as chemistry, music, mathematics, etc, but also into school forms; pre-school, elementary school, after school, high school, special education, and informal learning. The archive is still under development, but so far also include information about products, suppliers, project members, instructional videos, a library, information about the project and about maker culture, etc.

TOUCH AT!

Touch AT! aims to investigate how interactive assistive touch based technologies for children with special needs in grade 6-9 in special education schools can be designed [3]. Children in special education and their teachers participate as co-designers in the development process. Through active participation in the education, we will also investigate the possibilities for establishing digital fabrication as part of the workshop setting and setup. Field studies have been made for almost two years, e.g. participant observations throughout the school day, during morning assemblies, lectures, breaks, lunch and during also field trips. In addition, design sessions have been held in the school with children and teachers. We have engaged with the children, teachers and pedagogues in their daily activities, as well as taken part in a parental meeting.

Perspectives

The first perspective stems from the field studies in the Touch AT project, where it has become obvious that the researcher who is trained in design thinking and digital



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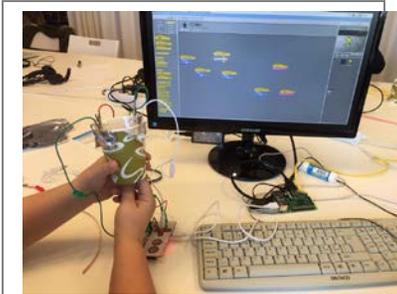


Figure 1: Maker activities

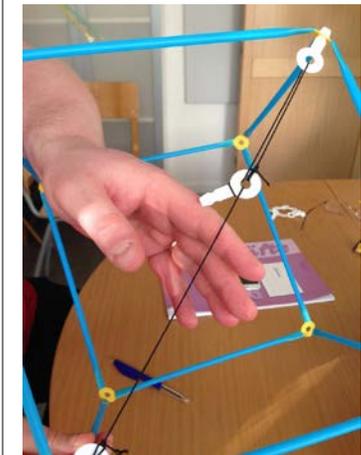


Figure 2: Strawbee activities in special education

fabrication has a different teaching approach to these subjects compared to the school teacher. As an example, during a session the researcher was asked to help out with assisting a group of children to program a game in Scratch, while the teacher assisted the other group of children. The *researcher's approach* was to have the children come up with as many ideas as possible and really work in depth with finding a game concept that had emerged from them and that could motivate them to program. The *teacher approach* was rather to keep the number of ideas down and have a more directed ideation for a game idea. In the evaluation with the teacher afterwards, his reason for doing this was that it was a convenient way of actually getting something done, and that could be implemented realistically. A similar perspective on the role of a design thinking training for teachers is also discussed in [5].

The second perspective derives from dialogues within the national Makerspace in school project. Although many activities have been initiated in different educational settings within the project so far, activities and meetings within the area of special education has just recently started, but will hopefully inspire to generate more activity now when it is initiated. Though, a question that came up during an initial meeting is how to support knowledge sharing and teaching resources among teachers in this area. The projects digital archive is filling up with inspiring teaching resources in many different contexts, but how to share and index resources for special education seems a bit more problematic. Inspiring images and short reports can be seen in the project blog and social media, but the archive is still empty. Questions that were discussed were if the archive should contain similar

exercises as for other type of education, but perhaps targeted towards younger ages, or lighter in complexity. Or if it was relevant to have some kind of index in relation to certain subjects, or even to different disabilities? This discussion will continue, and we will run different experiments and versions within the project, and through shared experiences find out what works best in daily practice.

Conclusion

In this paper, we have presented two perspectives from implementing digital fabrication in special education. The first perspective is in relation to the relevance of the training in design thinking of the teacher. The second perspective relates to how to support knowledge sharing among teachers, and more specifically how to index a digital archive for teaching resources for digital fabrication in special education. It is the hope of the authors that these perspectives will inspire and enrich further discussions in this area.

References

- [1] Makerspace in School – Digital archive (2016). Online resource. Retrieved April 2016 from <http://kunskap.makerskola.se/>
- [2] Makerspace in School – Project website (2016). Online resource. Retrieved April 2016 from <http://makerskola.se/>
- [3] Touch AT! – Project website (2016). Online resource. Retrieved April 2016 from <http://touch-at.se>
- [4] Börjesson, P. et al. 2015. Designing Technology for and with Developmentally Diverse Children - A Systematic Literature Review. In Proc. of IDC'15, ACM Press, New York, NY.
- [5] Smith R, Iversen OS, Hjorth M. (2015) Design thinking for digital fabrication in education. In IJCCI, Volume 5, Pages 1-38. Elsevier.