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Research and Development Projects with ICT and students as learning designers in Primary Schools

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Title: Development Projects with ICT and students as learning designers in Primary Schools – a methodological challenge

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Introduction

In this paper we present some methodological challenges that emerged during the process of shaping the research design for the comprehensive and complex research project *Children as learning designers in a digital school*. The project is the realization of our proposal to a research call from the Danish Ministry of Education named *Development projects and pilot school experiments* (Udviklingsprojekter med demonstrationsskoleforsøg vedr. it i folkeskolen – see Undervisningsministeriet 2013) in the spring 2013.

The call was based on a governmental decision to allocate 500 million DKR to increase the use of ICT in the Danish primary school from 2012-2015 combined with an increased focus on fulfilling learning objectives and to build competencies. This effort is on the one side due to a decade of disappointing Danish PISA results regarding reading, writing and math; on the other side due to the need to strengthen the populations' digital literacy and 21st century competencies. The call's scope was research and development projects as pilot school experiments in relation to five selected areas. The selected projects should contribute with new generalizable and practice oriented knowledge of how

- ICT supports students learning
- ICT release time for more teaching
- teachers digital literacy impact on the role of ICT in the educational practice

Further the call required collaboration between universities and university colleges in order to disseminate knowledge and new practices to the Danish teacher educations.

Project aims

Among the selected areas in the call our proposal was directed towards the area: *Students own production and student involvement* and aimed, based on our previous research, at exploring 1) How students' digital production impact on learning processes and the qualification of learning results regarding subjects and trans disciplines; and 2) How ICT involving designs for learning that allow students to act as learning designers of their own learning practice in terms of form, framing and content impact on their learning, engagement and motivation. The specific requirement in the call regarding release of time is integrated in the project as a study across the entire project of whether and how time may be re-organized.

Theoretical framework

Several aspects of present digital technologies invite the school to implement and exploit ICT as an everyday factor in the learning environment. ICT is omnipresent and demands digital literate citizens (OECD 2001; Rychen & Salganik 2003; Martin 2006) as our roles as citizens, entrepreneurs or employees are intertwined with technology (Dourish 2001; Ihde 2012). Intuitive interface design based on the principle of affordance (Norman 1999; Shneiderman 2010) makes ICT increasingly user friendly. Thus, ICT realized as e.g. multimodal and touch interfaces and mobile devices directly address our intuition and tacit skills and competencies (Dourish 2001). Cloud technologies and Web 2.0 expand our interaction with ICT from being consumers to being agents: participants, producers and knowledge sharers. Young users voluntarily participate in the digitally expanded creative space where they perform a variety of practises through which they acquire digital literacy (Buckingham et al. 2005; Ito 2010; Klastrup & Tosca 2013; Sotamaa 2003). Today it is easy to create, manipulate and transform within the digital universe where instant multimodal feedback facilitates our creative and reflective processes as users (Levinsen & Sørensen 2013) and

support transfer of experience between contexts (Norman 1999; Dourish 2001). Due to these changes, children's starting age as internet users has fallen to an average of 4 years (Medierådet 2010). Therefore children are digital literate and expect ICT to be part of going to school (Plowman, Stephen & McPake 2010; Levinsen, Ejsing-Duun & Sørensen 2013). Wireless and mobile devices take this a step further and expand the definition of the space for agency beyond the school as brick and mortar, where students are situated in a hybrid space of inseparable and intertwined digital and physical space (de Souza e Silva 2006; Sørensen, Audon & Levinsen 2010; Ejsing-Duun 2011).

The body of research into the combination of project work, students' productions, ICT, and learning is still incoherent and dispersed. It is found that older students' digital production and collaboration impact positively on learning as reflection is strengthened and that learning emerge situated in the actual process of working in a multimodal digital production environment (Atkinson 2006; Cebeci & Tekdal 2006; Miller 2006; Lee, McLoughlin & Chan 2008) when students are assigned to the shared responsibility to both work process and product that is the core of problem based project work (Dillenbourg 1999; Dirckinck-Holmfeld, Hodson & McConnell 2012). Lazarri (2009) finds that students' digital production improves cognitive processing and critical thinking. In primary school the documentation is rather strong regarding language learning (Gilakjani, Ismail & Ahmadi 2011; Jewitt 2011) but weak in relation to other subjects. Recent Danish studies present similar findings regarding young students' digital production where the impact is apparent when ICT's intuitive, mobile, multimodal and space expanding potentials are combined with learning designs that create an arena for the students to act as learning designers (Levinsen & Sørensen 2013, Sørensen & Levinsen 2013).

The above outlined socio-technological changes both offer possibilities and impose requirements to the school in order to meet the challenges of a digitalized environment, and to support new approaches to learning that emerge from the research. Based on the research, we expand the Danish primary school's conceptual understanding of project work to encompass students' digital and multimodal productions and the conceptual understanding of student involvement to encompass students active participation and influence as learning designers. We combine this with Dale's three didactic levels (Dale 1989 & 2000): practice, planning/framing and theory/reflection and understand the concept *design for learning* as a process that involves actors performing as *learning designers*. In a recent project - *1:1 – Netbooks for young students 2009-12* - we found that even young students are able to operate at Dale's three levels. This occurs when ICT based learning designs that involve students' productions, place the students learning process and reflections on the subject in the centre. Thus, didactics and design for learning is no longer exclusively the teachers' domain. As the students' reflections are based on practice and they cannot operate at a theoretical level of reflection we have further developed Dale's levels from three to four: 1) practice, 2) framing/planning, 3) reflection, and 4) theory, where level one to three are both students' and teachers' domain, while the fourth level is the domain for teachers only (Sørensen & Levinsen 2014).

Research questions

In the present project we want to further explore and consolidate the results from project *1:1 – Netbooks for young students* by exploring the results in relation to the weak explored domain of students learning regarding single subjects and trans-disciplinary subjects. The research questions are as follows:

1. Which elements of the students' design for learning and of their process of digital production qualify their learning?
 - a. Which framework designed by the teacher promotes the students' performance of learning design and completion of the productions?
 - b. Which framework designed by the teacher promotes the students exploit their informal learning strategies in the school work?
2. Which potentials for learning and cognition are offered by ICT, when learning designs combine intuitive interfaces and interaction design with students' production?
3. Which framework designed by the teacher promotes release of time for teaching and makes it possible to re-organize the time shared by the teacher and the students regarding the subject matter?
4. Which technological potentials promote authenticity and creativity when students perform digital production?
5. Which productions inspired by the students everyday life strengthen the coherence and knowledge sharing

between contexts

Methods and methodological challenges

The project runs from autumn 2014 to spring 2016 and is conducted by a consortium of two universities with five researchers, three University Colleges with seven researchers and the LEGO foundation. The project follows interventions at 1.-2. and 5.-6. grade at four schools and 2 cohorts at a 10. Grades Centre. At each school one class on each level are followed intensively while the parallel classes are followed extensively. Approximately 30 teachers participate and the schools are chosen from a pool of candidates to meet geographical and socio-economic dispersion.

Due to the comprehensive and complex nature of the project and the demands of the call, the project is designed as a development and research project based on an overall mixed methods approach. According to Johnson and Onwuegbuzie (2014) mixed methods seeks to overcome the often argued incompatibility between quantitative and qualitative research designs in educational research. However, mixed methods are still not full-grown as a theoretical frame. Therefore Johnson and Onwuegbuzie along with others (Sale, Lohfeld & Brazil 2002; Creswell 2003; Tashakkori & Teddlie 2003) recommend a pragmatic and balanced or pluralist position in line with the classical pragmatists, e.g. Charles Sanders Peirce, William James, and John Dewey. Johnson and Onwuegbuzie suggest that the pragmatic "... bottom line is that research approaches should be mixed in ways that offer the best opportunities for answering important research questions (2014, p. 16).

For us this leads to linking *Practical action research* that emphasize close collaboration between participants and researchers and *Dialogic action research*, that focus on development oriented processes between participants and researchers (Argyris & Schön 1996; Nielsen & Nielsen 2010), with *Design-based research* that emphasize experiments and collaboration with practitioners (Cobb et al. 2003; Magnussen & Sørensen 2011). Inspired by Design-based research, the researchers have designed the frame for six experimental interventions. Inspired by action research, the actual shaping and operationalization of these interventions within the frame are left to the practitioners at each school in collaboration with the researchers. As many aspects of students agency and learning as learning designers are not directly accessible and observable phenomena and may even be inexpressible (Polanyi 1958 & 1968; Hastrup 1999; Hasse 2002) the data collection focus on the first person perspective of both researchers, teachers and students (Schraube 2013). The methods range from combined with qualitative methods as observation, interviews, Thick Description, media anthropological methods, informal chat and interviews with teachers and students and quantitative methods such as digital surveys. We also collect artefacts as students' digital productions, learning objectives, learning contracts and other material objects.

The diversity of 1) the data collection methods; 2) the researchers' scientific background; and 3) the actual performed interventions (all though these are designed within the same overall framework), forms a challenge for the reliability, validity and comparability of data and analysis across the project. We will discuss this in our presentation and in our final paper through the exemplary case of our baseline study, which, as a demand from the Ministry of Education, must serve as a zero-measuring line in order to measure the impact of the interventions as designs for learning on the students' learning, and the students agency as learning designers when constructing digital productions. The baseline combines a digital survey with structured observations. Schraube (2013, p. 13) argues that the intertwinement of humans and technology can only be dealt with by systematically including the subjective dimension - the first-person perspective. According to Schraube, the concept refers to the ontological subjective point of view of the 'I' and 'we', which in our case involves the teachers in the digital survey and the researchers during the baseline observations, where the awareness of the 'I' and 'we' are directed towards the ontological objective present space, actors, artefacts, agencies and their emerging interrelations.

The diversity of the researchers scientific background combined with the general challenges of subjectivity to data collection is a major challenge to the production of a usable, valid and reliable baseline across the project. In our presentation and the final paper we will discuss the construction of ontological objective index signs or indicators that aim to align the researchers' ontological subjective first person perspective into comparable and workable raw data in the spirit pragmatics of the mixed methods approach.

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