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Digital Didactical Designs as research framework: iPad integration in Nordic schools

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ABSTRACT

In this research, the design of teaching and learning with web-enabled technologies, such as iPads, in 64 one-to-one (1:1) Nordic classrooms was explored using the Digital Didactical Design (DDD) framework. DDD focuses on both teachers' activities and students' learning activities in the classroom and how web-enabled technologies are integrated into teaching, learning, and assessment. Semi-structured classroom observations were conducted to investigate how teachers apply the elements of DDD in their classroom practice, and what kinds of learning they support. The analysis resulted in three clusters: Cluster A demonstrates integration and alignment toward meaningful learning; Cluster B shows the potential for deep learning but a semi-alignment of teaching, learning, assessment, roles, and technology; and Cluster C indicates non-integration of the five elements. The findings point out that tablet integration needs the alignment of all five DDD elements to achieve meaningful learning. Pedagogy has to evolve to include new uses of the technology: it is a co-evolutionary growth of the five DDD elements together. DDD can be used by teachers for planning, self-assessment or reflective collaboration with peers and by schools to plan, document, evaluate, and rethink the interwoven pedagogy-technology relationship in tablet classrooms.

In the last few years, school professionals have made large investments in digitalization, especially through one-to-one (1:1) programs, using mobile devices such as laptops and tablets (Bocconi, Kampylis, & Punie, 2013). Almost every student has a mobile device, requiring school professionals and teachers to rethink pedagogy and curriculum to integrate technologies in the classroom. Unlike previous technologies, mobile devices have a relatively higher acceptance rate by teachers than stationary desktop PC (Ifenthaler & Schweinbenz, 2013), they are owned by students, merge offline (i.e., in-classroom) and online (i.e., non-classroom) spaces, and dissolve classroom borders toward CrossActionSpaces (Jahnke, 2016). Online information and resources, as well as easy-to-use apps for production and communication, are available to students in the classroom, leading to new opportunities for teaching and learning within the classroom and the need for teachers to rethink their pedagogies.

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As shown by Harper and Milman (2016), the majority of previous studies of 1:1 classrooms focused mainly on a) the use of technology in classroom environments, b) effects on learner motivation, student achievement, positive effects of student engagement and collaboration (Tay, 2016). Studies focused on a small number of classrooms and followed them over time (Smith & Santori, 2015).

The purpose of this study was to identify how teachers integrated media tablets into their pedagogy, and inversely, how pedagogy was influenced by the iPad use. We focused on classrooms of a 1:1 initiative in schools in Denmark (seven schools), Sweden (seven schools), and Finland (two schools). We used classroom observations and follow-up interviews with teachers to document how teachers make use of the iPad in their classrooms. In total we analyzed 64 classrooms to determine and categorize the types of designs teachers applied in their classroom practice. This contribution focuses on the analysis of technology integration across multiple classrooms. Although we acknowledge the value of studying individual classrooms, we believe that this research is significant because it presents a framework for non-experimental research and the analysis of multiple classrooms and different types of designs used by teachers in their practice.

1. Theoretical framework: Digital Didactical Designs

Research on technology integration in school classrooms has a long tradition and has previously used frameworks such as the Substitution Augmentation Modification Redefinition (SAMR) model (Puentedura, 2014); Technological Pedagogical Content Knowledge (TPACK; Koehler, Punya, & Yahya, 2007); and Technology Integration Matrix (TIM; Florida Center for Instructional Technology, FCIT, 2013), which have focused on stages of technology integration and the ways in which teachers make use of technological, pedagogical, and content knowledge.

For this research, we used the Digital Didactical Design (DDD) framework based on the European tradition of Didaktik (i.e., didactic), which views teaching, learning, and technology integration as a system of three components: the teacher, the student, and the content (Sensevy, 2012). DDD is useful for studying designs-in-practice that involve web-enabled technologies to gain a comprehensive picture of what goes on in individual and multiple classrooms where teachers design and implement activities using media tablets. DDD comprises five elements, which we have described in detail below: (a) teaching goals, (b) learning activities, (c) assessment, (d) social relations/roles, and (e) web-enabled technologies.

DDD is the act of modeling and forming processes in educational settings. DDD is an interplay of several elements that initiates, develops, and enhances teaching and learning processes.

The term *didactic* comes from the Scandinavian and German concept of Didaktik, which focuses on the relationship between content-student-teacher and emphasizes the differences between teaching activities and learning activities (Hudson, 2008; Klafki, 1963; Lund & Hauge, 2011). Didaktik not only includes methods, but it also embraces the question of what to learn (i.e., curriculum and content); when and in what kinds of situations and locations; and how learning can be achieved (e.g., resources, institutional strategies, academic staff development; Wildt, 2007). One central component in Didaktik is the cultivation of social relationships. Without social relationships, a didactical design would be teacher led instead of learner centered. Didactic implies the science of planning and performing both teaching and learning as a social practice (Lund & Hauge, 2011), giving a form to teaching and learning.

The approach is called *digital* because, in an Internet-driven world, teaching practices are usually technology based but range in their support of different forms of learning in which the quantity and quality of the technology integration vary (Jahnke, Norqvist, & Olsson, 2014). Technology integration in teaching affects existing didactical designs and vice versa. Teacher adoption of technology influences and challenges the didactical design.

With the concept of *design*, the focus lies on specific educational components. To design is to give a form to something (Dohn & Hansen, 2014); in education, to design is to shape a focus and key points for teaching and learning as a process, usually with the aim to reach certain learning outcomes. Using the DDD approach is useful to explore the interplay and network of the design elements such as teachers' activities and students' activities with technologies. Additionally, based on Biggs and Tang's (2007) work on constructive alignment that incorporates teaching goals, learning activities and assessment, these three elements were included in the DDD. Finally, the social aspect was included due to the importance of social relationships (Koole, 2009; Kukulska-Hulme & Traxler, 2013) and the dynamics of social roles (Jahnke, 2010) as design elements in educational settings. Together these five elements cover the majority of human actions in educational settings.

Listed below are the five design elements and their ideal characteristics for deep, meaningful learning:

- Teaching goals (TG) and intended learning outcomes (ILO) are clear and visible for students. The teacher communicates the relevant learning criteria so that the students know how they (the students) can make progress in their learning.
- Learning activities (LA) involve a variety of meaningful learning activities that help students achieve ILOs. Learning activities are provided, for example, in terms of assignments that help students to achieve intended learning outcomes.
- Assessment (ASM) is a process-based form of feedback and evaluation for students to receive guided reflections within the learning process for performance or skill development.
- Social relations and multiple social roles (RO) are supported. For example, teachers are experts, but they are also process mentors and learning companions, and they design learning processes in which students are not only consumers, but also producers, prosumers, meaning makers, creators, reflectors, and co-designers of learning.