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Rethinking Digital Literacy in Nordic School Curricula

The position of digital technology in the Nordic school systems is currently being strengthened. One important part of this is the recent push to include programming or the concept of algorithmic thinking in curricula, not only in the Nordic countries but also across Europe and elsewhere in the world. A comprehensive overview of the situation in Europe is offered in the report «Developing Computational Thinking in Compulsory Education» from the European Commission's Joint Research Centre (Bocconi, Chioccariello, Dettori, Ferrari, & Engelhardt, 2016). Eleven European countries has recently concluded curriculum reform processes that include computational thinking and related concepts, while seven more are planning to introduce these into compulsory education.

European policy documents typically address economic development as motivation to introduce programming and digital competence in primary and secondary education, as seen for example in the «New Skills Agenda»[1]. Programming is regarded as part of essential 21st century skills, fostering problem-solving skills and analytical thinking, attracting students into the ICT industry and fostering ICT employability. In addition, knowledge of programming is important for understanding more of the increasingly technology-rich environments we find ourselves in, and might facilitate reflections on individuals' roles as producers and consumers, of power relations and opportunities to influence one's surroundings. Programming, in a wider context, is thus not regarded as exclusively fitting for STEM subjects, it is also highly relevant in social science subjects.

In March 2017, the Swedish government adopted changes in K – 12 curricula with the purpose to strengthen pupils' digital competence, to be effective from June 2018. The measure includes quite specific changes in several subject's syllabus as well as more broad curriculum changes, like this new text in the description of the school's mission: «The school shall contribute to the development of students' understanding of how digitalization has impact on development of both the individual and society. All students should be given the opportunity to develop his or her capacity to utilize digital technology. They shall also be given opportunities to develop a critical and responsible approach to digital technology, to be able to identify opportunities and risks, as well as be able to evaluate information». There are syllabi changes in several subjects and for all grades, the most substantial are in the two subjects mathematics and technology. Algorithmic thinking and programming are

1. http://ec.europa.eu/social/main.jsp?catId=1223

introduced in mathematics in primary school, for example in algebra for years 1–3: «How unambiguous step-wise instructions may be constructed, described and followed as a basis for programming. The application of symbols in step-wise instructions». One example from the subject technology, described in «work procedures for development of technological solutions» for years 4–6: «To control one's own constructions or other devices with programming».

Digital competence has been part of the Norwegian K – 12 education since the 2006 curriculum reform, when it was given status as a «basic skill», i.e. a transversal competence fundamental for learning and for demonstrating competence in all subjects. One – more recent – critique of the understanding of digital competence as expressed in the curriculum is that the perspective of *creating* technology is lacking. In a white paper on barriers for digital value creation (NOU 2013:2, 2013) the authors comment that there is too much emphasis on communication, text and humanistic aspects, and not enough on algorithms, numbers, mathematics, and technology. In another white paper on technology in primary and secondary education commissioned by the Norwegian Directorate for Education and Training, a group of experts conclude along the same lines (Sanne et al., 2016). The expert group recommends the introduction of a new compulsory technology subject in primary and lower secondary education, and that programming and digital technology should be a substantial part of this new school subject. The directorate is currently running a three-year pilot project on programming as an optional subject in lower secondary, where 154 schools participate. The government-appointed committee asked to assess the subjects in primary and secondary education and training in terms of the requirements for competences in future working life and society submitted their report in June 2015 (NOU 2015:8, 2015). Following this report, a revision of the K–12 curriculum is in progress – a process that will include the «basic skills» descriptions. At the same time, the Ministry of Education and Research are developing an ICT strategy for Norwegian primary and secondary education. This strategy will influence the conditions for learning about programming and digital technology in Norwegian schools.

The new National Core Curricula[2] for compulsory basic education in Finland came into effect in the fall of 2016. Finnish students are introduced to programming and «algorithmic thinking» already in their first school year. It is part of the subject mathematics in grades 1–9 and crafts in grades 7–9, as well as part of several of the seven mandatory, transversal competences defined in the core curriculum. In the Icelandic curriculum, the subject area of information and communication technology includes media studies, computer use and information and communication technology. In the category «Creation and communication» one competency criteria read: «At the completion of Grade 10, pupils are able to: […] use software for programming and communication in a creative manner» (Ministry of Education Science and Culture, 2014). As shown in an overview of the formal integration of programming in school curricula across Europe by European Schoolnet, «Computing our future» (Balanskat & Engelhardt, 2015), Denmark has integrated programming in the binding national Common Objectives for Physics and chemistry in lower secondary as well as in mathematics.

2. http://www.oph.fi/english/education_development/current_reforms/curriculum_reform_2016

In summary, programming and algorithmic thinking is finding its place in compulsory education in Nordic schools, although to varying degrees and in different forms. Even though some frameworks of digital competence (Ferrari, 2013) and interpretations of digital literacy may include programming, the broader concepts algorithmic thinking or computational thinking (which includes programming) are usually seen as not captured by the term «digital competence» (e.g. Bocconi et al., 2016, p. 20). However, at the Nordic Journal of Digital Literacy these concepts are regarded as closely related and we are looking forward to follow how these new developments will help shape Nordic schools in the time to come.

Ola Berge

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