Welcome to the first issue of NorDiNa in 2022.

Maria Sparf, Håkan Löfgren and Susanne Kreitz-Sandberg’s article “Design for learning programming: Approaches taken by novice learners” builds on observations and informal conversations during programming lessons at three Swedish science centres. At the time of the study, science centres already had experience of programming education as they offered courses for pupils. This was used as a complement to teaching at compulsory school. The authors apply a design-for-learning perspective to help us understand how contextual aspects influence what novice pupils do and how they design their learning during programming lessons. During the analysis process, they combine thematic analysis with the Learning Design Sequence (LDS) model. The authors identify five qualitatively different approaches that pupils take to solve programming problems: mathematically, trial and error, step-by-step, routine as well as aesthetic. Each of these approaches allows pupils to use and practice different abilities that are important for programming. The authors discuss how these abilities can be compared to computational thinking (CT). The study provides an insight how pupils are involved in designing their own learning when using their abilities to solve programming assignments.

Alexina Thorén Williams and Maria Svensson’s article “Student teachers’ challenges addressed by science didactics when reflecting upon teaching at a science centre” aims to examine student teachers’ challenges addressed by science didactics in a fieldwork assignment at a science centre. From a teacher educator perspective, it is central to understand how student teachers’ theoretical understanding of science didactics comes into play in practice. The empirical material consists of video-stimulated reflections on teaching science at the science centre. By using a didactic model, the influence of artefacts as representations emerges as the most prominent challenge with science didactics at the science centre. This, together with the identified challenges: knowledge about school students’ science understanding, making science content accessible, and the complexity of asking questions, indicates that the didactic model becomes a valuable analytical tool. To create didactical situations in teaching practice, the didactic model provides a powerful ‘thinking tool’ for student teachers – as well as teacher educators in their practice.

Eva Knekta, Pia Almarlind and Christina Ottander’s article “The purpose of science education – Guidance provided by Swedish science syllabuses” uses a quantitative deductive approach based on Biesta’s functions of education and Roberts’ curriculum emphases to analyse the purposes that are stressed in the Swedish science syllabuses in lower and upper secondary school. The study shows that the syllabuses advocate multiple purposes both with respect to functions of education and curriculum emphases. Most sentences stressed the function of qualification, indicating that the overall purpose of science education is to provide students with knowledge and skills, while transmitting certain norms or creating independent critical thinking skills is less prioritised. The extent to which the different
Curriculum emphases were stressed differed both between different science syllabuses and between different parts of the syllabuses. Possible consequences of these differences are discussed in relation to teachers’ design of teaching and students’ possibilities to develop knowledge and skills necessary for active participation in science-related issues as citizens.

Annika Manni and Eva Knekta’s article is entitled “School-Age Educare - a neglected potential in education for sustainable development?”. School-Age Educare is an integrated part of the Swedish compulsory school organization, focusing on social relations, children’s interests and play. Although included in the national school curriculum, there is a lack of knowledge of how School-Age Educare currently works with the mandatory task of education for sustainable development (ESD). This article thus seeks to examine the educational potentials, but also possible need for support, of School-Age Educare in relation to ESD. Through analyzing teachers’ responses to a questionnaire with open and closed questions, the authors reveal that most teachers find ESD important, but also want to learn more about it. There is potential in the educational task, and pedagogical approach, supporting ESD as a transactional and pragmatic approach. The constrains contributing to ESD lie in the somewhat absent awareness among the teachers themselves, but also in the limited resources and time available of carrying out sustainability education at the centers.

Henrik Levinsen and Thomas Stuart Lindsay’s article is entitled “School-industry partnerships in science education: experiences from a problem-based innovative teaching course at lower secondary school”. Data and analysis deals with development of problem-based science teaching for lower secondary school in Denmark. Among the identified positive outcomes was that students engaged in working with the authentic problems. Further, the student’s possibilities for building relations with the employees during the course was of central importance e.g. when they received feedback. Challenges reflected that the teachers and students were uncomfortable with the innovative problem-based teaching method and had a curricular-dominated view on science education. This was expressed in their concerns about what they see as indistinct connections between work phases and a lack of scientific content. It is proposed to use pedagogical link-making as a tool to create spatiotemporal coherence for the students and make connection between scientific concepts based on examples from the study. Link-making may be particularly relevant when the complexity of teaching increases as in school-industry partnerships.

Astrid Johansen, Bojana Gajic, Erik Mogstad and Berit Bungum present an article entitled “Creativity as a 21st century skill: What are teachers’ and students’ views on creativity in school science and mathematics?”. The article reports from a project that investigates how lower secondary teachers and gifted students understand what creativity is, how it can be promoted and what hinders creativity in schools. The study involves 8 teachers and 20 students, and their views are investigated by means of written notes from students as well as group interviews with teachers and students. It is found that the teachers express three perspectives on how creativity can be fostered in the classroom: the nature of the task and how it is presented and organized, the need for background knowledge and the need for a supportive classroom climate. The students express, although more limited, views that are in line with the teachers. A major concern for the teachers, however, is how creativity can form part of assessment, since the assessment system is influential of what takes place in the classroom. It is concluded that school traditions and assessment systems that emphasize convergent thinking and reproduction of knowledge is a major challenge in realizing intentions of fostering creativity in school science and mathematics.

In the article “Providing Professional Development for Physics Teachers through Participation in a Design-Based Research Project” the authors, Thomas Frågåt, Maria V. Bøe and Carl Angell, examine professional development among twelve upper secondary physics teachers. The teachers were involved in developing and testing learning materials in modern physics, and attended workshops and seminars with peers, disciplinary experts, and physics education researchers. Through a qualitative analysis of four focus group interviews, the authors found that the teachers had experienced profes-
sional development (PD) in content knowledge and pedagogical content knowledge (PCK), gained confidence, and discovered a need for more PD regarding assessment of qualitative competence. The teachers talked about content knowledge as the most important knowledge and skills to be a good physics teacher, but also valued knowledge about student thinking and misconceptions. Content knowledge was mentioned as a prerequisite for PCK. Our results show how involving physics teachers in a DBR-project stimulated professional development in several areas and uncovered needs for continuing PD.

Lina Varg, Helena Näs and Christina Ottander highlight the voices of teachers in their article “Science teaching in upper primary school – through the eyes of the practitioners”. Data is generated through interviews with 14 upper primary teachers, describing science teaching as fun, mainly due to the inherent practical work. The same practical work was also identified by the teachers as the main cause of stress and was therefore conducted less frequently than desired. The data enabled construction of seven teacher roles, closely connected to both their described teaching practices and views on science education. Teachers’ accounts of their science teaching speak of a varied practice with emphasis on practical work and facts, and less articulated descriptions of work to develop students’ abilities to examine and communicate science. The results provide insights into the interactions between teacher views and teaching practices which could prove valuable for improving upper primary science education.

We hope you enjoy your reading,

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