Welcome to the third issue of NorDiNa in 2022

As with our last issue, the publication is presented in two parts, both of which all have gone through the normal peer review process, but with different thematic backgrounds. Four articles are from a conference, the “13th Nordic Research Symposium on Science Education” (NFSUN), and four are regular articles.

PART 1

In the article “How encounters with nature has been legitimated in the national curricula of Swedish school” Karin Andersson focuses on outdoor education in schools in order to contribute to a critical discussion about the aims and goals of outdoor education in schools. The study presents a discourse analysis of the national curricula in Sweden from the end of 19th century until today. The analysis shows six different motives that have changed over time: a) developing scientific knowledge, (b) environmental education, (c) recreation, (d) aesthetic education, (e) social education, and (f) learning to use nature. Aspects of continuity and change connected to the identified motives are also included in the analyses. The results show that a scientific perspective on encounters with nature has dominated during the last hundred years. In recent years, more instrumental motives are expressed in the curricula, while students’ personal experiences and feelings are less focused.

Festo Kayima presents an article, “Teaching graduate attributes along with subject content: Perspectives from science teacher educators”; an analysis of how 51 Norwegian science teacher educators say they introduce, teach, and assess graduate attributes. Kayima’s definition of these attributes is in line with “the skills, knowledge, and abilities of university graduates beyond disciplinary content knowledge, all applicable in a range of contexts and are acquired as a result of completing any undergraduate degree” (Barrie, 2006). The results indicates that these graduate attributes are not explicitly scheduled and taught implicitly along with the canonical subject. The suggested implications are for examples to enhance the science educator’s knowledge of how to teach these attributes and clarify who is responsible for the teaching and assessment of these skills.

The article “Reading the Code Between the Lines – Exploring the Structure of metaphors in educational programming resources” by Andreas Larsson explores metaphorical expressions in four computer programming textbooks and online resources in Swedish upper secondary education. The Metaphor Identification Procedure was applied to identify metaphoric language. The metaphors reveal how expressions such as the ‘program asking’ or the ‘function building’ are structured in relation to embodied experiences. The results show that central concepts are structured in relation to metaphors such as Inanimate Phenomena are Human Agents and Organisation is Physical Structure. Findings also demonstrate differences in the types of metaphors present in each resource, with Events are Actions communicated most frequently. Lastly, the resources vary in how they describe the role of the programmer: as a ‘constructor’ or ‘instructor’. This implies that the discovered metaphoric structure in textual resources might influence students’ subsequent learning of programming concepts.
Ene Ernst Hoppe and Henriette Tolstrup Holmegaard’s article is entitled “Art-based research methods in science education research: A systematic review of their prevalence and an analysis of their potentials in addressing complex questions”. This article explores the potentials of applying art-based research methods in science education research. Art-based methods are a range of qualitative methods that draw on performative, creative, and visual elements and thus propose innovative ways to produce knowledge in research. The article is based on a systematic review of the literature applying art as research-methods in science education research. The review shows how only few studies within science education use art-based methods as a methodological approach in research. Additionally, literature identified through a snowball approach were thematically analysed. Four themes were identified: Knowledge made available through artefacts, non-verbal language, more balanced power and positions, and time to reflect. The analysis outlines the strengths embedded within applying art-based research methods and the potential they present to science education research. Implications for research and limitations related to art-based methods are discussed.

Are Turmo and Clas Olander

PART 2

The 13th Nordic Research Symposium on Science Education (NFSUN) had “Science Education in the light of Global Sustainable Development – Trends and possibilities” as its theme. The three keynotes dealt with motivational perspectives, re-imagination of science education and action in era of the Anthropocene. The symposium was hosted by VIA University College, Aarhus, Denmark as an online symposium June 1.-2., 2021. The online mode was chosen due to the COVID-19 situation. All in all, the symposium had 131 participants and a total of 78 presentations. All presenters were given the option to present their work in an online publication, 12 researchers or research groups accepted this invitation and their contributions are published in the online available proceedings from the 13th NFSUN symposium (Clausen et al., 2021).

To facilitate discussions and avoid technical challenges in the online format all the sessions were hosted by a representative from the five-person organizing committee. This meant that the committee after the conference had a good overview of all the presentations and the research they were based on. Each committee member pointed out 2-3 presentations that could be given the opportunity to publish their work in Nordina. Two members of the organizing committee were given the task to make the final selection based on general academic standards, relevance to the symposium theme and originality. In the following editorial process these two members from the organizing committee collaborated closely with the Nordina editors. Not every author wanted to contribute to the a Nordina special issue for different reasons e.g. some had already published their research elsewhere. After the Nordina standard peer-review process four high quality papers are now finally ready for publication.

Marianne Isaksen and Steinar Thorvaldsen from Norway investigates the connections between science teachers’ orientation toward the textbook and the enabling of inquiry-based teaching in their article “What Stimulates Inquiry-Based Teaching in Science? A study of the role of the textbook in some secondary schools in Norway”. They map the connections to learn how to improve the facilitation of inquiry-based teaching. They have made a survey among 108 Norwegian lower secondary school teachers regarding the importance and use of textbook for their application of inquiry-based teaching. The data show great variation in science teachers’ orientation towards textbooks in planning and enactment of science teaching. There is negative trend between the orientation towards textbooks and the inclusion of inquiry-based science teaching. Meaning that teachers that doesn’t follow textbooks more often include inquiry-based teaching. Generally inquiry-based science teaching is more based on local environment, external resources and interdisciplinarity than in the textbooks.
Dennis Dietz and Claus Bolte from Germany present a study, “Multidimensional Analysis of Knowledge-Linking within the Concept of Energy in Student Essays”, on 132 German grade 9 students (age 14) knowledge linking in relation to the subject of energy. They use a multi-dimensional model for analyzing vertical and horizontal linkage of the students understanding of energy. Vertical linkage relates to facts and relations applying from everyday notions to generalisations. Horizontal linkage relates to terms and concepts from different scientific disciplines. The data were essays that students had written based on an elaborate prompt. The students had not had any kind integrated science teaching. The analysis of the essays show some vertical linkage between energy and biological terms and also energy and physical terms, but also ungrounded relations between everyday terms like nutrition and electricity and energy. The author's main conclusion is that study has proven the value of the analytical tool and are doing other research that will compare subject-differentiated and integrated science education.

Sanne Schnell Nielsen and Jan Alexis Nielsen from Denmark contribute with the paper: “Alignment between teachers’ practices and political intentions in the context of a reformed modelling-oriented science curriculum in Danish lower secondary school” focusing on the Danish 2015-2016 curriculum and what the authors call substantial changes in how teachers should address models and modelling. Based on the analysis of multiple qualitative data it is concluded that models and modelling in the teachers’ practices and rationales is mainly treated as the product of a scientific process rather than part of a scientific process, and that students’ own processes of designing, evaluating and revising models only play a minor role. The authors discuss how to enhance the alignment between curriculum intentions and teachers’ practice emphasizing among other things the importance of awareness among students of how models can be used as an inquiry tool and that the use of models as representing content knowledge could help students to connect laboratory work with theoretical knowledge.

In the final of the four papers: “Computational thinking as part of compulsory education: How is it represented in Swedish and Norwegian curricula?” the authors Peter Vinnervik and Berit Bungum from Sweden and Norway discuss computational thinking practices, concluding that the most frequent practice in both the Swedish and Norwegian curricula is programming and that this is primarily recognized as a method and tool for learning other subject matter not as a knowledge domain in its own right. Teachers could of course take action to implement a broader approach to computational thinking, but this would according to Vinnervik and Bungum require much time, teacher competence and effort. It is problematized that what the authors call “under-communication in the curricula” leaves schools and teachers with major challenges and therefore it is suggested that future curriculum revisions should represent a more elaborate and explicit approach to practices where computational aspects are applicable.

Birgitte Lund Nielsen and Peer Daugbjerg

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