The ScienceHumanities research group at ILU – Open Seminar

Drawing and Art to Learn Science

22 November 13.00-18.00 in A120 (Arkitekt Christies gate).

13.00-13.45	Keynote: Science and arts combined in learning and teaching ***Tone Pernille Østern,*** *Professor of Arts Education with a focus on Dance,* ***Victoria Husby*** *and PhD candidate in dance/dance education and visual poet,* *Department of Teacher Education, NTNU*
13.45-14.30	Practice-Based Learning: Research between Art and Science ***Joosten Mueller*** *Research assistant and PhD student, University of Groningen, Art History and Material Culture, and University of the Arts, Bremen*
14.30-15:00	Slow, silent, observational drawing - what may come out of it? ***Anne Helga Henning*** *Assistant professor, Department of Architecture and Technology, NTNU*
15:00-15.20	*Coffee break*
15:20-16.00	"What happens between the magnets?" Young students' multimodal meaning making about invisible science phenomena ***Sofie Areljung*** *Docent in educational work, Umeå University, Sweden*
16.05-17.00	Keynote: The contribution of the arts to science education ***Michael J. Reiss*** *Chair of science education, Institute of Education, University College London*
17:00-17.20	*Coffee break*
17.20-17.40	Supporting dynamic modelling by performing relativistic thought experiments through drawing ***Floor Kamphorst*** *Associate professor of physics education, ILU, NTNU*
17.40-18.00	Investigating drawing as an inclusive practice in science education ***Mostyn de Beer*** *PhD candidate ILU, NTNU*

ABSTRACTS:

Keynote: Science and arts combined in learning and teaching

Tone Pernille Østern and Victoria Husby

In this entry I offer suggestions and poetics about how arts-based pedagogies and inquiry-based science education might offer a radical relational perspective needed to bridge a troubled planet. Science and arts combined in learning and teaching means that there is learning going on in science and in arts, in ways that are transformative, challenging, embodied, and affected. Arts and science combined develop arts-based methods in science that seek to function as activating and pedagogical forces promoting indeterminacy and openness for spaces of transformation. Gravitating towards arts and science combined work with children, teachers, artists, and teacher educators developed by me and my colleagues in arts and science education collaborations, I seek to articulate productive entanglements between arts and science learning and teaching.

Practice-Based Research between Art and Science or: "How Artistic Research can Contribute to Science Education"

Joosten Mueller

It is difficult to think science education without models: they are surrounding us as illustrations, diagrams, pictograms, sketches, as physical or digital artefacts. But what are models and what is their purpose? The talk will focus on different aspects to approach these artefacts of knowledge beyond common interpretations as "illustrative" demonstrating tools and will explore their nature as epistemic tools. Furthermore, it will focus on "modeling" as epistemic practice between design and natural sciences. Problems models face due to their actors' individual competences will be addressed: Can pupils grasp models' nature and purpose? Are they literate to understand their full potential as research tools? And how can design- and practice-based research methodologies help to bridge this potential gap by creating new ways of practice-based learning for science education?

Slow, silent, observational drawing - what may come out of it?

Anne Helga Henning

This lecture will focus on my experiences with slow, observational drawing as part of different artist-led collaborative, visual research. I have found that this approach when exploring certain subjects, might lead the participants out of their preconceived often prestigious ideas about what both drawing and observation is. The method seems to settle the researchers in the now, and to connect looking and drawing closely together through this concentrated state of mind.

This then becomes a highly personal study, where the personal flow through the method is the icebreaker for observing from a personal angle the subject observed. Naturally follows an engagement to articulate and put emphasize upon personal findings, and interesting discussions among peers about the findings happens. Because of the personal approach in this, there is no right nor wrong in either how one draws or what one finds of particular interest as one draws out one's observations. The focus is on the observations in themselves.

The drawings made seem to reflect the personal process that has gone on while drawing them, and this again engages onlookers which also often settles into a slow-looking researching state. In this approach I find myself

closely connected to the Reggio Emilia approach where exploring the world through aesthetical approaches is highly encouraged.

Besides being educated as an artist, I am also a certified atelierista from the Reggio Emilia institute in Stockholm. The atelierista is primarily an artist working together with the pedagogues in a kindergarten. However, I have used this approach in several different projects, involving schools, refugees and elderly as well as smaller children.

"What happens between the magnets?" Young students' multimodal meaning making about invisible science phenomena

Johanna Andersson, Sofie Areljung, Carina Hermansson, Marianne Skoog, Bodil Sundberg

When magnetism is taught in early childhood, the focus is often on the concrete. A typical classroom task is to practically determine which objects and materials that are magnetic and not. In contrast, the current study focuses on how students experience the invisible, abstract dimensions of magnetism. Our overarching purpose is to challenge conventional ways of teaching about invisible science phenomena, by making room for young students' subjective explorations. A second purpose is to make use of students' representations to widen the way magnetism is commonly represented in teaching and textbooks.

The study builds on data from two classrooms (students aged 7 years) where the task was to test and describe how it felt to press two bar magnets towards each other, and then to draw "what happens between the magnets". The data consists of student drawings, video recorded science lessons, and video recorded group interviews with students.

Employing a social semiotic approach to multimodality, we seek to contribute knowledge about: (1) how students represent what happens between magnets that repel and attract, and (2) how students make use of different modalities (drawing, body language, speech) to make meaning about magnetism. During the presentation, I will present preliminary findings from our ongoing analysis.

Keynote: The contribution of the arts to science education

Michael J. Reiss

For too long, school science education has emphasised only the written word and a rather narrow understanding of materiality through practical work. In this talk, I begin by looking at what precisely we are trying to do in science education and then examine how in teaching science we might better help school students to develop richer understandings of the material world. In doing so, I discuss how words, images and bodies might be used more effectively in teaching science.

Supporting dynamic modelling by performing relativistic thought experiments through drawing

Floor Kamphorst

Special Relativity has a long tradition in the upper secondary physics curriculum of the nordic countries. Still, teachers struggle with introducing this topic to their students in a way they can grasp the relativistic concepts and phenomena. Relativistic phenomena only become visible when the same phenomenon is described relative to two different reference frames. These frames have to move relative to each other, with speeds beyond speeds observed in daily life. This makes relativity fundamentally different from other physics subjects and difficult to learn.

In thought experiments, physicists reason in an idealized world to explore the consequences of a theoretical principle. Such activities can help students to bridge the gap between their current understanding of the world and abstract physics concepts. However, secondary students tend to make mistakes in the deductive reasoning when performing thought exepriments. Therefore, a visualization in which students can track their reasoning, reflect about it and adjust for missteps, can help students' to perform thought experiments and build an understanding of relativistic concepts.

In this talk I present a dynamic modelling tool, the Event Diagram, that was designed specifically to this end. The Event Diagram is a represenation of spacetime that supports students to perform relativistic thought experiments through drawing light propagation. The presented results show how students work with the Event Diagram, in individual and small groups settings. Students try out different ideas and build a preliminary understanding of relativistic concepts. Showing that drawing in Event Diagrams fruitfully supports students' reasoning.

Investigating drawing as an inclusive practice in science education

Mostyn de Beer

This study is concerned with exploring possibilities of making the subject of science more accessible to students

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Organized by Helena Bichao and Annette Lykknes (for the ScienceHumanities research group)