

# **Program Norsma 8, Paper sessions**

**Thursday November 19 th**

**11.00 – 12.30 Paper session 1**

**Room 20 – 425**

## **Tal och resonemang om representationer i förskoleklassen**

*Görel Sterner, Univ of Gothenburg, Sweden*

Förskolebarns matematikkunnsande vid skolstarten har starka samband med senare prestationer i matematik i grundskolan. Förskoleklassen har en särställning i det svenska utbildningssystemet som bryggan mellan det informella lärande som oftast dominerar i förskolan och det mer formella lärande som tar vid i skolan. Syftet med denna studie var att implementera och utvärdera effekten av en randomiserad intervention i förskoleklass. Interventionen var baserad på ett strukturerat och explicit tio-veckors matematiskt pedagogiskt program med fokus på tal och kollektiva resonemang om representationer, designat för förskoleklassens undervisning i matematik. En kontrollgrupp arbetade under motsvarande period med ordinarie undervisning i matematik. Resultaten visar en signifikant effekt på matematik från pre- till posttest till interventionsgruppens fördel. Det fanns också en bestående effekt av interventionen nio månader senare då barnen gick i årskurs 1.

## **Enhancing student learning and motivation in mathematics with computer-assisted instruction in vocational upper secondary education**

*Johan Korhonen, Åbo Akademi University, Finland*

*Sabina Törnqvist, Åbo Akademi University, Finland*

*Karin Linnanmäki, Åbo Akademi University, Finland*

This pilot study investigated the effects of using a computer program, MinecraftEdu on Finnish vocational upper secondary students. The study applied a pretest-instruction-posttest design. The experimental group (N=14) received computer-assisted instruction during their first mathematics course (8 weeks) in their second year in vocational upper secondary education. Students' mathematical skill development (basic arithmetic, geometry, and algebra) was examined, and compared to the performance of a control group (N=14), participating in a similar math course without computer-assisted instruction. Furthermore, the effects of the computer-assisted instruction on students' interest, self-concept, and anxiety were also examined. Implications for theory and educational practice will be discussed.

## **Room 20 - 427**

### **The characteristics of formative assessment that enhance student achievement in mathematics**

*Catarina Andersson, Umeå university, Sweden*

A previous study shows that the changes in classroom practice made by a random selection of Year 4 teachers, after participating in a professional development program in formative assessment, significantly ( $p = 0.036$ ) improved students' mathematics achievement (effect size,  $d = 0.66$ ). The present study analyses the characteristics of these changes in practice, based on a conceptualisation of formative assessment as a unity of integrated formative assessment strategies. Furthermore the paper discusses how this changed practice affords new learning opportunities, the complexity of this practice, and why such developments require major changes in most teachers' practices and significant support in professional development initiatives.

### **Collaborative research into mathematics teaching and learning in diverse classrooms**

*Jónína Vala Kristinsdóttir, Univ. of Iceland, Reykjavik, Iceland*

The implementation of the policy of inclusive education in Iceland and the growth of migration has welcomed previously excluded students into schools. As a consequence, teachers are currently faced with new challenges to differentiate teaching. This qualitative collaborative inquiry into mathematics teaching aims at learning to understand how teachers develop their mathematics teaching through a co-learning partnership with a teacher educator. Seven primary-school teachers worked at improving their mathematics teaching and researched their practice together with a teacher educator for four years. Data consisted of videotapes from workshops, audiotapes from interviews and classroom practices, notes from classroom observations and collections of pupils' work. Narrative inquiry was used as an analyzing tool to study the teachers learning in participating in this project. The results indicate that the teachers gained confidence in teaching mathematics in diverse classrooms as they participated in workshops and that collaborative research can support teachers in developing their practice when meeting new challenges in their work.

## **15.00 – 16.30 Paper session 2**

### **Room 20 – 425**

#### **Qual(Equ)ity and Legitimacy in Connection with National Testing in Sweden.**

*Anette Bagger, Univ. of Umeå, Sweden*

This paper presents a synthesis of parts of my dissertation: Is school for everyone? The national test in mathematics at Grade three in Sweden. The empirical data is mainly teacher and pupil talk but has been complemented with contextual analysis of the test situation. Two articles I am mainly focusing on builds on data from 201 pupils and their teachers during the national tests in 2010-2011. The analysis was made by advocating Foucault's theories of the discursive formations. The aim is to demarcate and analyze the discourse on legitimacy and its connection to equity and quality. Findings reveal that both teachers, pupils and the tests legitimacy are mentioned and that the focus on quality as performance is contrasted to issues of equity. I discuss a way of seeing this simultaneously. To consider the quality in the equity and the equity in the quality and suggest a new concept: Qual(Equ)ity.

#### **Content flow in mathematics – A support for recognition of similarities across situations**

*Helena Roos, Linnaeus University, Sweden*

How to conduct special education in mathematics and engage SEM-students in the mathematics is a difficult task. In this paper I discuss *content flow* in the teaching as one way of helping students who are in special educational needs in mathematics. How to consider situated knowledge in the teaching of mathematics is highlighted through *preparation, immersing and repeating* with the help of tasks and representations. If focusing on *how and what* in the teaching of mathematics, the teachers can help the students to recognise the mathematics by *identifying similarities* in the mathematics in different situations and it becomes a learning situation. This is one way of supporting inclusion in mathematics, since it is a way of including the SEM-students in the mathematics in the classroom.

## **Room 20 - 427**

### **The arithmetic learning of a low-achieving child from playing a digital game**

*Elisabeth Rietz, University of Gothenburg, Sweden*

*Ingemar Holgersson, Kristianstad University, Sweden*

*Wolmet Barendregt, University of Gothenburg, Sweden*

*Torgny Ottosson, Kristianstad University, Sweden*

*Berner Lindström, University of Gothenburg, Sweden*

*Fingu* is a game designed at helping children, 4 to 8 years old, develop competence and fluency with basic addition combinations. This paper presents a case study from an eight weeks intervention where children, 5 to 7 years old, played the game as a part of their ordinary curriculum. The case was selected from children with low performance on the arithmetic pretests. Initial analysis exhibits that the child has competences that cannot be seen in the pretests, but can be seen when playing the game. When solving the verbally presented tasks in the tests, the child almost never uses the fingers as a tool for finding the answers, but when playing the game, he is confident in using his fingers to solve the tasks. Development of strategies can be seen between video 1 and video 2.

### **Developmental trajectories of strategies in arithmetic – the role of decomposition**

*Pernille Bødtker Sunde, Danish School of Education, Aarhus University, Denmark*

The use of strategies in arithmetic depicts underlying conceptual knowledge of numbers. Developmental trajectories of strategies are thus important when working with difficulties in mathematics. I present a case of development of mental strategies in addition from 1<sup>st</sup> to 4<sup>th</sup> grade from a Danish school. The results show significant effects of school age in interaction with gender. Decomposition seems to play a role in the developmental pathways suggesting the importance of multi-dimensional or flexible quantitative understanding of numbers. The role of linear contra multi-dimensional thinking in development of strategies and implications for early intervention is discussed.

**Friday November 20th**

**10.00 – 11.30 Paper session 3**

**Room 20 – 425**

**Early math intervention for marginalized students – A mixed method substudy of high achieving students**

*Pia Beck Tonnesen, Metropolitan University College, Denmark*

*Steffen Overgaard, Metropolitan University College, Denmark*

This study is one of more substudies in the project Early Math Intervention for Marginalized Students (TMTM2014). The paper presents the initial process of this substudy that will be carried out fall 2015. In the TMTM2014 project, 80 teachers, who completed a one week course in the idea of TMTM (Lindenskov et al. 2015), are observing and teaching both high and low achieving students by the same teaching materials (Lindenskov og Weng 2013) . This makes the foundation that gives the teachers the opportunity to provide characteristics of both high and low achieving students with the aim that these teachers will be able to include this knowledge in their future teaching. In the presentation, we focus on the teachers' characteristics of the high achieving students and the teachers' ability to incorporate this knowledge in their teaching of high achieving students during the intervention.

**Exploring the affective domain in the teaching of mathematics – A qualitative study on students' perspectives on math in the Danish public school (primary education)**

*Maria Christina Secher Schmidt, Metropolitan University College, Denmark*

*Pia Beck Tonnesen, Metropolitan University College, Denmark*

*Stine Karen Nissen, Metropolitan University College, Denmark*

The paper presents the initial constructs of a study being carried out within the Danish public school (primary education) during the fall of 2015. It is based on a substudy conducted in connection with a study of the Early Mathematics Intervention Program for Marginal Groups in Denmark (TMTM i.e. Tidlig Matematikindsats Til Marginalgrupper). The 12-week intervention was implemented by 82 mathematics teachers in 41 schools in 31 different Danish municipalities. The presentation focuses on the development of a methodology aimed at capturing young students' voices and views on mathematics. The methodology forms the basis for a qualitative approach toward gaining insight into the affective domain, which contributes to a field of research significantly dominated by quantitative approaches.

**Developing test materials for developmental dyscalculia for Danish pupils in grade 4.**

*Lena Lindenskov, Danish School of Education, Aarhus University, Denmark*

*Bent Lindhardt, University College Zealand, Denmark*

The aims of this developmental work is to provide the Danish Ministry of Education (DME) with test materials for identifying students at risk of suffering by developmental dyscalculia. No such test exists yet, made for Danish 4. graders. However, test from Bjørn Adler is used in Danish institutions to a certain extent. Some existing test on dyscalculia around the world are published by private firms and sold to psychologists, teachers, schools or other institutions. However, DME decided to provide the test from the developmental project free of charge to schools and municipalities. In the present the aim of DME, and we describe the design for the developmental project, focusing on how we build upon existing research. We focus on how we document, explore and analyse critical issues in each part of the developmental processes, and give some preliminary theoretical results.

## Room 20 - 427

### **Elever med låga prestationer i matematik – bakgrund och orsaker**

*Ingemar Karlsson, Lunds Universitet, Sweden*

Syftet med studien som ingår i ett avhandlingsprojekt är att genom litteraturanlys av tidigare forskning samt intervjuer av lärare och elever redovisa förklaringar till uppkomsten av matematiksvårigheter. Dessutom undersöks mängden av de elever som enbart har matematiksvårigheter, den grupp som benämnes specifik SUM och därmed ej klarar godkänt i ämnet matematik i skolår 7, 8 och 9 i elva kommuner i nordvästra Skåne. Ytterligare en delstudie omfattar en kvalitativ studie med semistrukturerade intervjuer med matematiklärare för de elever som inte uppnått godkänt i årskurs 8 samt ett antal av dessa elever när de går i årskurs 9. En begränsad forskning har medfört svårigheter att ge en enhetlig definition av begreppet dyskalkyli. Denna term definieras ofta som en biologiskt influerad avvikelse vilken kännetecknas av svårigheter att lära och tillämpa matematik. Begränsningar i arbetsminnets kapacitet är associerade med inlärningssvårigheter i matematik. Matematikängslan kan leda till att elever kan hamna i en situation med ständigt låga prestationer. Brister i undervisningen kan vara en starkt bidragande orsak till uppkomsten av matematiksvårigheter. Sociokulturella faktorer, exempelvis föräldrarnas utbildning och kulturella kapital får allt större betydelse för elevernas resultat i skolan. I elevsvaren framkommer följande förklaringar till deras låga prestationer i matematik: låga arbetsinsatser, matematikängslan, svårigheter att förstå ämnet, täta lärarbyten, stökig arbetsmiljö och bristande undervisning. Lärarna lyfter fram elevernas dåliga förkunskaper, ointresse och låga arbetsinsatser. I vissa fall har sociala svårigheter i hemmet initierat problemen.

### **Relationen mellem matematiklæreres opfattelse af elever med særlige behov og lærernes praksis**

*Heidie Clemens, VIA University College, Aarhus, Denmark*

Dette projekt præsenterer resultater fra dele af et specialestudie på kandidatuddannelsen i didaktik (matematik). Resultaterne bidrager med ny viden angående, hvilke forklaringsmodeller danske matematiklærere lægger til grund for, at elever har *særlige behov* i matematikholdige situationer og hvilke didaktiske udfordringer matematiklærerne står overfor i mødet med disse elever. Projektet konkluderer, hvilke fagdidaktiske kompetencer det kan være relevant, at matematiklærere videreudvikler i egen praksis i arbejdet med at hjælpe *elever med særlige behov* videre i deres læringsproces. I forhold til et uddannelsesperspektiv præsenteres en interviewguide, der er udviklet i projektet, som kan anvendes i interventionsarbejde med lærere på efteruddannelse med følgende formål: a) at udvide læreres fortællinger om *elever med særlige behov* og b) at lærerne får øje på, hvor det kan være relevant at udvikle deres praksis, når målet er at give alle elever et fagligt løft inden for faget matematik.