The EARLI SIG 9 Conference
10-11 February 2021

PROGRAMME

GÖTEBORGS UNIVERSITET

Dear Colleagues,

We are delighted to welcome you to the 2021 conference: *Phenomenography and variation theory – continuity and change!* We hope that you will find the programme richly stimulating and valuable for your own programme of research.

We look forward to a great conference!

Åke, Guy & Jaana

The SIG 9 Coordinators

Conference Programme

Wednesday 10 February 2021

(Times in Swedish time GMT+1)

TIME	ACTIVITY
9-9.15	**Welcome address** SIG9 coordinators Åke Ingerman & Jaana Kettunen
9.15-10.30	**Keynote:** On the relationship between Phenomenography and Variation Theory, as exemplified by a study of young children's discernment of some critical aspects of the numbers 1-10 *Ference Marton, Angelika Kullberg & Camilla Björklund, University of Gothenburg, Sweden*
	Short break
10.45-12.10	**Extended presentations:** **Chair: Jonas Emanuelsson**
10.45-11.25	Distinguishing more precise objects of learning through comparison of two mathematics lessons *Arthur Lee, The University of Hong Kong,* *Ming Fai Pang, The University of Hong Kong,* *Robert Gunnarsson, Jönköping University, Sweden,* *Pernilla Mårtensson, Jönköping University, Sweden* *Ka Lok Wong & Wing-wah Ki, The University of Hong Kong.*
11.30-12.10	Extending phenomenography by taking account of multiple dimensions of variation in complex phenomena *Ann-Sofie Jägerskog, Stockholm University, Sweden &* *Peter Davies, University of Birmingham, United Kingdom*
	Lunch
13.00-14.20	**Extended presentations:** **Chair: Airi Rovio-Johansson**
13.00-13.40	Sustainable Learning and Variation Theory *Hanan Innabi & Ference Marton & Jonas Emanuelsson* *University of Gothenburg, Sweden*
13.40-14.20	Afforded and experienced variation *Angelika Kullberg, Ulla Runesson, Camilla Björklund, Maria Nord, &* *Tuula Maunula, University of Gothenburg, Sweden*
	Short break
	Paper presentations **Chair: Kristoffer Larsson**

14.30-15.30	Phenomenographic outcomes for locating rhizomatic elements in the experience of a phenomenon *Maria Cutajar, University of Malta, Malta* Student teachers' conversations about field experiences – qualitatively different objects of discussion *Marlene Sjöberg & Åke Ingerman, University of Gothenburg, Sweden* Identifying critical aspects of vocational objects of learning in interaction *Nina Kilbrink, Stig-Börje Asplund & Jan Axelsson, University of Karlstad, Sweden*
	Short break
	Discussion on prerecorded presentations **Chair: Pernilla Ahlstrand**
15.45-16.30	The complexity and challenges of teaching numbers' cardinality to toddlers *Camilla Björklund University of Gothenburg, Sweden &* *Hanna Palmér, Linnaeus University, Sweden* Practitioners conceptions of ethical practice in social networking in career services *Jaana Kettunen, University of Jyväskylä , Finland* What matters for students' learning in the laboratory? – pedagogical design more important than the technology used! *Jonte Bernhard, Linköping University, Sweden* Teaching with Variation AND Connections *Anna Lena Ekdahl, Jönköping University, Sweden* Variation theory – a tool for modifying mathematical tasks: the case of pre-service teachers *Anna-Lena Ekdahl & Pernilla Mårtensson, Jönköping University, Sweden*
16.30-16.45	**Wrap-up and commentary** SIG9 coordinators Åke Ingerman & Jaana Kettunen

Thursday 11 February 2021

(Times in Swedish time GMT+1)

TIME	ACTIVITY
8.45-9.30	**Poster session** **Chairs:** *Angelika Kullberg, Camilla Björklund, Airi Rovio-Johansson, Pernilla Ahlstrand, Jonas Emanuelsson, Maria Svensson, Marlene Sjöberg*

	Newly Qualified Teachers' Conceptions of A Successful Chinese Language and Literature Lesson
	 Yuxin Liu, University College London, IOE, United Kingdom
	   Chair: Marlene Sjöberg
	
	 Screencast feedback: A learning study on how to develop the ability to revise written texts
	 Linda Söderlind, University of Karlstad, Sweden
	   Chair: Camilla Björklund
	
	 Teaching modelling using digital design tools
	 Helen Brink, Karlstad University, Sweden
	   Chair: Airi Rovio Johansson
	
	 Qualitative differences in Student Teachers' understanding of group work as a pedagogic strategy
	 Sonia Strand, UCL Institute of Education, United Kingdom
	   Chair: Pernilla Ahlstrand
	
	 Teaching and learning part-whole relations: Teachers opening for different learning in the same task
	 Maria Nord, University of Gothenburg, Sweden
	   Chair: Jonas Emanuelsson
	
	 Deciphering the Secret Birthday Message: A Learning Study of Two Chinese Lessons
	 Serene Chan &Wai Ming Cheung, The University of Hong Kong, Hong Kong
	 Chair: Angelika Kullberg

	Paper presentations **Chair: Camilla Björklund**

9.30-10.30	Different ways of knowing the object of learning - theatre as school subject *Pernilla Ahlstrand, University of Gothenburg, Sweden* A phenomenographic approach as a tool in teachers daily work *Anja Thorsten & Malin Tväråna, Uppsala University, Sweden* Towards a Design Thinking Pedagogy with Phenomenography: New Findings *Gnanaharsha Beligatamulla, Janice Rieger & Jill Franz, Queensland University of Technology, Australia*
	Short brek
	Discussion on prerecorded presentations **Chair: Angelika Kullberg**
10.45-11.15	Experiences of sustainability education and perceptions of the future *Kelly-Ann OBryan, James Cook University, Australia* Enhancing Grade One Students' Awareness of Transitional Competencies By A Picture Book Intervention *Wan Yi Eva Liu & Wai Ming Cheung, The University of Hong Kong* A phenomenographic investigation into how engineering students experience critical thinking. *Liezle Boshoff, University of Cape Town, South Africa,*
	Paper presentations **Chair: Camilla Björklund**
11.15-12.15	Teacher beliefs about intelligence, developing growth mindset through Physical Education *William Zoppelini, Solent University Southampton, United Kingdom* Describing learning as gradually increasing differentiations with variation theory *Jonas Emanuelsson, University of Gothenburg, Sweden* How teachers understand and strategize on emerging conflicts *Ilse Hakvoort, University of Gothenburg, Sweden,* *Kristoffer Larsson, University of Gothenburg, Sweden &* *Agneta Lundström, Umeå University, Sweden*
	Lunch
	Paper presentations Chair: Airi Rovio-Johansson

13.00-14.00	Catching view-turns for more pupils to see the subject matter in more powerful ways *Kristina Ahlberg, University of Gothenburg, Sweden,* An exploratory study on critical aspects when designing technological solutions with BBC Micro:bit *Anne-Marie Cederqvist, University of Gothenburg, Sweden* Children experiencing fact and fiction in informational books containing faction *Anna Backman, University of Gothenburg, Sweden*
	Paper presentations **Chair: Pernilla Ahlstrand**
14.00-15.00	Understanding of Humor in Teaching of Primary School Teacher Candidates *Engin Baysen, Turkey & Fatma Baysen, Near East University, Cyprus* Continuity of phenomenography – Learning study is the answer to "What is to be learned?" *Wai Ming Cheung, The University of Hong Kong,* *Ference Marton, Göteborg University, Sweden &* *Stephanie Wing Yan Chan, The University of Hong Kong.* Transfer of knowledge in movement education through practice based research *Heléne Bergentoft, University of Gothenburg, Sweden*
	Short break
	Paper presentations **Chair: Jonas Emanuelsson**
15.15-15.55	Pedagogical encounters with unaccompanied asylum-seeking adolescents. A case based study *Kyriaki Doumas, Linnaeus University, Sweden* Black British Undergraduate Students' Conceptions of Academic Achievement *Mike Mimirinis, University of West London, United Kingdom &* *Elina Wright, Regent's Park College, University of Oxford, United Kingdom*
15.55-16.25	**Wrap-up and good bye** SIG9 coordinators Åke Ingerman & Jaana Kettunen

Keynote

On the relationship between Phenomenography and Variation Theory, as exemplified by a study of young children's discernment of some critical aspects of the numbers 1-10

Ference Marton, Angelika Kullberg & Camilla Björklund, University of Gothenburg, Sweden,

Abstract:

In this presentation, we explore and illustrate the relationship between Phenomenography and Variation Theory. The former is about describing perceptions of the world around us, and the latter is about how to learn to perceive the world around in more powerful ways. While maintaining the descriptive point of departure and the second-order perspective of Phenomenography, Variation theory adds focus on the object of learning, the second-order perspective and the theory of description to it. Here, we aim to give an example how these two intertwined research specializations open up for a way of describing variation in young children's learning of elementary arithmetic within the number range 1-10 and reveal what is to be learnt and how it might be learnt by means of discerning particular aspects of numbers. Both Phenomenography and the Variation theory of learning informed the analysis, placing the focus on what constitutes the ways of experiencing numbers that were observed among four- to seven-years-old children solving arithmetic tasks. In the study we show particularly how the discernment of the aspects opens up for more powerful ways of experiencing numbers. Our way of describing arithmetic skills, in terms of discerned aspects of numbers, makes it possible to explain why children cannot use certain strategies and how they learn to solve tasks they could not previously solve, which has significant implications for the teaching of elementary arithmetic.

Abstracts

In alphabetical order of first author's family name

Catching view-turns for more pupils to see the subject matter in more powerful ways

Kristina Ahlberg, University of Gothenburg, Sweden,

The purpose of this research project is to investigate whether more pupils in schools can achieve national goals and curriculum knowledge requirements. Within Variation Theory researchers have successfully used Learning Studies to investigate relations in teaching between the Intended, Acted and Lived Objects of Learning. The model of Catching View-Turns, as pupils' perceived learning of different subject matters, has been used during supervision of degree projects with Students, School Teachers and Leaders at the Department of Education, Uppsala University, 2006-19. The method has been robust enough to visualise pupils' perceived learning in most school subjects in grades 0-12. Results are subject-specific and methodologically general didactic. Current research plan involve development at the Department of Education, University of Gothenburg, through supervision of teacher students' degree projects in collaboration with teachers at compulsory school and high schooling in the area. The method is to Catch View-Turns by pupils and to offer them more Powerful Ways of Seeing different subject matters. The goal is to investigate whether teachers can offer more pupils to view subject matters in more powerful ways, by making visible to their class the variation of differently powerful ways of seeing the same subject matter.

Different ways of knowing the object of learning - theatre as school subject

Pernilla Ahlstrand, University of Gothenburg, Sweden

This paper presents preliminary results from an ongoing research project at upper secondary school level where dance and theatre as school subjects are being investigated. It is argued that using phenomenography develops the subject specific knowledge involved with the object of learning, something which is crucial for planning teaching situations in a systematic way and working with feedback and assessment. Learning study is used as the research approach while phenomenography is used to analize filmed material collected during the pretest and the research lessons. The phenomenographic analyses has been a feasible way to answer the research question concerning what are the qualitatively different ways of knowing the object of learning. The phenomenographic analyses of the pretest pinpoints critical aspects which have been the starting point for planning the research lessons. In this project the physical expressions are the unit of analyses. It is argued that this inventive approach of using phenomenography on filmed material of acting situations where physical knowledge is

being articulated constitutes a contribution to the phenomenographic field. Moreover it is something which is crucial for being able to research knowledge that is expressed in a physical form in an acting situation.

Children experiencing fact and fiction in informational books containing faction

Anna Backman, University of Gothenburg, Sweden

This presentation is about a study on 5-year-olds experiencing fact and fiction in informational books containing 'faction' (a fusion of fact and fiction). The study focuses on what children need to discern in order to experience both fact and fiction when a content is depicted by faction, and how teaching based on variation theory principles can facilitate children developing their ability to interpret faction by distinguishing fact and fiction. Previous research present that children may have difficulty distinguishing between fact and fiction when mixed and merged together in children's books. However a combination of fact and fiction in children's books could according to other researchers generate educational opportunities if children are given the opportunity to sort out fact from fiction. The four reading activities of this study are conducted as design experiments in preschool settings. In accordance with the principles of variation theory of learning, patterns of variation are used to create opportunities for the children to distinguish fact and fiction in informational books about dinosaurs depicted with faction. The presentation focuses on how the design of the study facilitates the discernment of the complex learning object 'distinguishing fact and fiction' and the learning outcomes of the reading activities.

Understanding of humor in teaching of primary school teacher candidates

Engin Baysen, Turkey & Fatma Baysen, Near East University, Cyprus

Humor is an inevitable dimension for communication. Although utilizing humor in teaching is mostly considered a requirement, there are still contradicting ideas about the issue, researchers assert and proved that it spoils the education environment. This dualism creates a problem for the teachers. Should they stay away from joking in class or insist on utilizing it? The present study tackled with this problem focusing on understandings of humor and its use, seeking the problem source in teachers' perceptions. Primary school teacher candidates (TCs) attended the study. The study used phenomenography to find a spectrum of understandings. The data is collected in two phases. The first phase included written explanations of the TCs about humor conception and its use in teaching. The second phase included written and oral self-reports of the TCs soon after their teaching exercises. The analysis results showed that humor and its usage understandings emerged in three categories, low understanding, medium understanding, and high understanding. The study concluded with a proposal for the theory of phenomenography. Although teacher candidates may not have a right

theoretical knowledge of humor they can use it properly in their teaching. The study finalized by giving recommendations for future research, and applications.

Towards a design thinking pedagogy with phenomenography: new findings

Gnanaharsha Beligatamulla, Janice Rieger & Jill Franz, Queensland University of Technology, Australia

This paper is an extension to our presentation at the EARLI SIG9 2018 conference at Birmingham, which argued for a phenomenography of design thinking pedagogy. Design thinking refers to methods or strategies that traditionally, designers use during the process of designing. Despite it being a core aspect of designing, different people interpret design thinking in different ways. This plurality is becoming more apparent today where it is being increasingly applied in non-design professions for dealing with complex problems. Such take-up by non-design professions has led to the development of a plethora of courses in higher education in a variety of disciplines. Despite this increasing application, there is, however, limited research of and informing design thinking in higher education. Most notably, absent is an understanding of how both teachers and learners currently experience design thinking in non-design disciplines. This paper is based on research that aims to explore the qualitatively different ways in which university educators across different disciplines experience design thinking pedagogy in relation to their curriculum development and teaching activities. The paper will present findings based on in-depth interviews with educators from different disciplines, providing an understanding of variation and the structure of design thinking pedagogy as a phenomenon.

Transfer of knowledge in movement education through practice based research

Heléne Bergentoft, University of Gothenburg, Sweden

Practice based research is one way to develop teaching, through understand the relationship between teaching design and students' learning. At practice based research a process-oriented, iterative approach is used to understand and improve interventions (Van den Akker, 1999). This paper explores how variation theory can contribute to transfer of knowledge in movement education. Transfer is de-fined as individual construction of knowledge instead of use of knowledge pro-duced elsewhere (Beach, 1999). The study is a meta-analysis of three conducted learning studies, with two different objects of learning in movement education and variation theory as theoretical framework. In total 166 students age 16-19 years and seven PE-teachers from two different schools participated in the study. The findings emphasize that variation theory created a common tool and shared knowledge base to analyze and design instruction. The teaching contributes to students' ability to transfer generic movement abilities between different movement contexts.

What matters for students' learning in the laboratory? – pedagogical design more important than the technology used!

Jonte Bernhard, Linköping University, Sweden

A fundamental purpose of labwork is to enhance students' capabilities to link concepts and theoretical models to real world phenomena. The design of interactive engagement labs and the use of digital probeware in microcomputer based labs in, for example, the RealTime Physics (USA) and "conceptual labs" (Sweden) projects have demonstrated that participating students can achieve good learning results. However, the use of digital probeware technology does not guarantee good learning results; if this technology is used in more traditionally designed labs with less interactive engagement it has been reported that this resulted in poor achievements in the conceptual tests. In this study the task structure in different designs of labs were re-analysed with variation theory as an analytic lens. The analysis suggests that there were critical differences in terms of discernment, simultaneity, and patterns of variation prescribed in the task structure correlating well with students' achievements in conceptual tests; when important patterns of variation were missing, or less prominent, in the design of labs students were also less successful in the tests. The design of tasks in line with variation theory seem to be essential. Moreover, the pedagogical design seem to be more important than the technology used.

The complexity and challenges of teaching numbers' cardinality to toddlers

Camilla Björklund, University of Gothenburg, Sweden & Hanna Palmér, Linnaeus University, Sweden

In the developmental and research project DUTTA we aim for contributing to the field of mathematics education research by investigating young children's number sense development and how to facilitate their learning based on variation theory (VT) principles. 24 toddlers (aged 1-2-years) participate in an 18 months intervention where their preschool teachers work together with researchers to develop the mathematics education in preschool. A large body of research suggests that awareness of numbers' cardinality is essential for developing number sense, but also that children do not generalize cardinality as a feature of any number before the age of 4. Numbers' cardinality, or in VT terms, the meaning of manyness, was thereby found to be a critical aspect (among others), which was confirmed by individual interviews with the toddlers in the project. In our presentation we address the complexity of learning basic meaning of numbers, the challenges of designing teaching of new (in a real sense 'new') concepts to toddlers in accordance with VT principles and how we have implemented patterns of variation to face these complexities and challenges. We will thereby discuss the development, enactment and outcome of one particular example of a preschool teaching activity concerning toddlers' discerning numbers' cardinality.

A phenomenographic investigation into how engineering students experience critical thinking

Liezle Boshoff, University of Cape Town, South Africa

It is a popular complaint amongst engineering lecturers that their students cannot think critically. Furthermore, many engineering lecturers struggle to teach critical thinking, and their skill is often limited to modelling their own thinking. In order to develop students' critical thinking, there is a need to better understand how students think (rather than showing them how to think.) Understanding how students think, will provide both lecturers and students with the information of what would be required for students to move from less to more powerful ways of thinking. To study critical thinking is, however, difficult for two reasons: Critical thinking is an elusive concept, and critical thinking is a skill which is difficult to assess. The research was designed by constructing a framework to analyse engineering students' conceptions of critical thinking. Model eliciting activities (MEAs) were constructed to stimulate critical thinking and ensure a shared experience of critical thinking amongst the students. Phenomenography will be used to understand the qualitatively different ways that critical thinking can be experienced by engineering undergraduates. Knowing how engineering undergraduates think will help in the development of activities that will develop in students more sophisticated ways of engaging in critical thinking.

Teaching modelling using digital design tools

Helen Brink, Karlstad University, Sweden

In secondary technology education, teachers often teach design and they let pupils make models of artifacts, systems and processes, using simple construction materials. Today, many teachers teach modelling using digital design tools; models created in digital environments, displayed on a screen, partly to meet the demand of digital competence in a contemporary society. This teaching is a relatively new element and there is a lack of knowledge concerning this teaching. Using a phenomenographic approach, the aim of this study is to categorize technology teachers' experiences of teaching modelling using digital design tools, to gain more understanding in this specific area of technology education.

An exploratory study on critical aspects when designing technological solutions with BBC Micro:bit

Anne-Marie Cederqvist, University of Gothenburg, Sweden

The design of programmed technological solutions (PTS) with programming materials, is a way for developing pupils' technological knowledge related to PTS. However, we know little of what pupils experience from these activities. The aim of this

phenomenographic study is to explore what phenomena are in focus and discerned differently when pupils are designing a PTS with the BBC Micro:bit; and to identify necessary knowledge in terms of critical aspects. Data consists of sketches, interviews and video-recordings when pupils, aged 10 and 14, are designing a burglar alarm. The result shows that pupils are struggling with two intertwined phenomena; the dual nature of the PTS, and the BBC Micro:bit material. Critical to discern is what components to use, based on their function, and how to organize them to interact with a code in terms of feedback control. This is interrelated with the programming of conditional statements, and to combine these in terms of blocks, where to discern what the blocks represent, to find them in the editor, and to understand their shape. The results have implications for teaching, suggesting a need to address the interrelated phenomena and facilitating discernment of critical aspects, for developing conceptual and procedural knowledge related to PTS.

Deciphering the secret birthday message: a learning study of two chinese lessons

Serene Chan & Wai Ming Cheung, The University of Hong Kong, Hong Kong

Multicultural children face many challenges learning Chinese in Hong Kong schools. In order to increase students' interest and enhance learning, picture books are a good medium, especially for lower primary children. This study aims to find out how to teach vocabulary effectively using a picture book in grade one of a local primary school. A Learning Study approach was adopted to support the teaching and learning of two 60-minute Chinese lessons with around 20 students in each class. The Chinese version of the picture book, "The Secret Birthday Message," was chosen as the teaching material. The book was taught over a week, and the teachers planned the lessons together. The final lesson of both teachers was observed, video-recorded, and analyzed using variation theory. The object of learning was to learn and apply the correct vocabulary words for shapes and verbs to complete sentences. The same lesson plan was used by the two teachers in the classes, but the variation in their execution led to different student outcomes in learning and also post-test results. This study reveals insights about effective strategies in teaching a second language to multicultural students, and such strategies may be applied to other classrooms with multicultural students.

Continuity of phenomenography – Learning study is the answer to "What is to be learned?"

Wai Ming Cheung, The University of Hong Kong, Hong Kong Ference Marton, Göteborg University, Sweden & Stephanie Wing Yan Chan, The University of Hong Kong, Hong Kong

The first learning study originated from Professor Marton with practitioners in Hong Kong in 2000 at times of Hong Kong's curriculum reform can be regarded as a

continuity of phenomenography which put forward teacher and student learning as the major instrument. With an example of a two-cycle Learning Study conducted to develop 122 Grade 5 students' argumentation structuring capabilities in Hong Kong, this paper discusses how Learning Study addressed the question, "What is to be learned?", the point of departure for studies aiming at improving learning in pedagogical contexts. Two Grade 5 classes participated in Cycle 1 of the learning study and a year later two other, but similar Grade 5 classes participated in Cycle 2. The same two teachers taught both cycles. From the analyses involving meeting notes, teachers' reflections, lessons, and students' argumentation across two cycles, and we found that both the educational objectives in question and students' learning were transformed in the Learning Study process. The learning study example illustrated how students and teachers interact to find the object of learning, the answer to "What is to be learned".

Phenomenographic outcomes for locating rhizomatic elements in the experience of a phenomenon

Maria Cutajar, University of Malta, Malta

Phenomenography is a research approach and correspondingly a family of methods for mapping out the variation in experiencing of a phenomenon. Two phenomenographic studies accomplished focus on the experiencing of teaching and learning incorporating contemporary digital technologies. One study specifically maps out variation in the students' experience of learning enhanced and mediated using digital technologies. Another study in the same local context maps out the variation in teachers' experience of teaching enhanced and mediated using digital technologies. When the resultant outcome spaces were put alongside each other, there was exposed a degree of correspondence which in this presentation will be set out and discussed. A most significant correspondence emerged in consideration of the critical dimensions underpinning perceptions. This correspondence suggests that the perceived affordances of digital technologies (creating the tools and spaces for learning), the perceived pedagogical strategies for learning (guiding and giving direction to the methods for learning) and the perception of human relationships for learning (determining pursued interpersonal relations for teaching and learning purposes) together are key networked learning rooting elements. Tracing out the theoretical foundations here lies a strategy for unearthing the rhizomatic foundations of an object phenomenon experience.

Pedagogical encounters with unaccompanied asylum-seeking adolescents. A case based study

Kyriaki Doumas, Linnaeus University, Sweden

This study focuses on the main aspects of the pedagogical encounter between teachers and unaccompanied asylum-seeking adolescents in introductory non-formal classes

within the frame of a non-governmental organization (NGO) on a Greek island.Specifically, the research questions concern: Which are teachers' main pedagogical and didactical challenges and concerns in this context? How do teachers approach the unaccompanied asylum-seeking students' heterogeneity in introductory non-formal classes? How do the unaccompanied asylum-seeking students experience the pedagogical encounter with their introductory non-formal classes? Which are their main challenges and concerns? Interviews with 10 teachers as well as three group interviews with 15 unaccompanied asylum-seeking students have been conducted. Contextual analysis (Svensson & Doumas, 2013) was used to analyze the material.The following types of pedagogical encounters were identified after the analysis of the interviews: The "school" as the bridge between depressing privacy and community learning life and The "school" as double-sided open window. Students' main concern was characterized by the category Uncertainty and vacuum.

Teaching with variation AND connections

Anna-Lena Ekdahl, Jönköping University, Sweden

The aim of this presentation is to discuss a variation theoretical analysis of teaching conducted in two research projects involving teachers in preschool and primary grades. The same mathematical ideas possible to emphasize in teaching number relation tasks were scrutinized in purpose to describe differences in learning opportunities being offered. Video-recorded teaching episodes were analyzed on a micro-level. Aspects that were opened up as dimensions of variation up (or not) associated with the focused mathematical idea were identified in each teaching episode. Also, how the teachers used connections (linking gestures and talk) to draw the learners' attention to target relations in the learning situation were analyzed. The analysis points to differences between an enactment where the dimension was opened up and the mathematical idea was made perceptually visible for the learners and an enactment where the teacher also explicitly draw the learners' attention to the specific idea by the use of connections. The results and the way of expanding a variation theoretical analysis might contribute to a discussion on how to use tools and theoretical concepts from variation theory.

Variation theory - a tool for modifying mathematical tasks: the case of pre-service teachers

Anna-Lena Ekdahl & Pernilla Mårtensson, Jönköping University, Sweden

In this study, we examine how 30 pre-service teachers designed and modified mathematical tasks to enhance primary students' learning. The pre-service teachers took part in a 5-week course in a teacher education program in Sweden in which a theory-based lesson study model entitled learning study were established to deepen the teachers' awareness about the relationship between instruction and student learning. The learning study course design consisted of two intervention cycles in which the pre-

service used variation theory as a tool for lesson design and re-design. The aim of this study is to explore in what ways the pre-service teachers modify mathematical tasks when employing variation theory during the 5-week mathematics education course in which LS cycles were incorporated. Data were collected at the end of the course and consist of written reports about task refinements based on their reflections about the students' performance during the lessons. We identified five different ways of task modifications: expanding tasks, making tasks more explicit, making tasks more implicit, bringing metaphors and representations to the foreground, and creating new tasks. These categories might become a complementary tool to variation theory, for reflecting about task design and redesign.

Describing learning as gradually increasing differentiations with variation theory

Jonas Emanuelsson, University of Gothenburg, Sweden

Anna Sfards' seminal article (1998) on metaphors of learning is used as a point of departure to suggest a third metaphor. The metaphor of learning as seeing is proposed as an extension to the two original suggestions of Sfard: the acquisition and participation metaphor of learning. In many research traditions and approaches the language of learning is heavily impregnated by the "seeing metaphor". This is especially prominent in "perceptual learning" c.f. Gibson and Gibson (1955); Adolph and Kretch, (2015) and the gestalt theory c. f. Werthemier (1959). The presentation is framed within phenomenography and variation theory (Marton & Booth, 1998; Marton, 2015). Here the process of learning is conceptualized as a succession of discernments of more fine-grained details of an object of learning. Typically, this process moves from learners seeing undifferentiated wholes towards seeing wholes as composed by its parts in a gradually more fine-grained manner. Several empirical examples are scrutinized with the same model of description. Using variation theory learning processes are described for different contents of learning and for learners from toddlers to adults in a variety of settings. It is concluded that the same model of description can describe these learning processes in diverse contextualisations.

Sustainable learning and variation theory

Hanan Innabi & Ference Marton, Göteborg University, Sweden

This session is a discussion on some ideas related to an ongoing review paper on sustainable learning. Sustainable learning refers to the general meaning of sustainability, that is, the propensity of something to continue and grow over time. It continues beyond the formal instruction context and can be expanded and used in other situations. The two characteristics of sustainable learning, namely learning that lasts and learning that enables the learners to deal with novel situations in powerful ways, shape quality learning. In the studies that built on variation theory, mainly teachers

and/or researchers tried to find the critical aspects of the object of Learning and tried to make it possible for the learners to discern the critical aspects, by bringing about powerful patterns of variation and invariance. An interesting question, which we intend to discuss is to what extent the learners, in addition to appropriating specific objects of Learning, might even become better learners, looking for critical aspects in novel situations and creating powerful patterns of variation and invariance. Previous studies have shown a positive effect of using systematic patterns of variation and invariance on sustainable learning in widely varying cases. These studies will be discussed.

How teachers understand and strategize on emerging conflicts

Ilse Hakvoort, University of Gothenburg, Sweden, Kristoffer Larsson, University of Gothenburg, Sweden & Agneta Lundström, Umeå University, Sweden

This project focus on what's been called mild misbehaviour, minor distractions or emerging conflicts, i.e. mild tension full situations between teacher and pupils in the classroom. Quite a lot of research has been done concerning these types of conflict. However, what we know less about is the link between how teachers understand these emerging conflicts and the strategies they suggest to handle them. This project focus on this link. We use a qualitatively-driven mixed-method design. In the project this means that two qualitative studies are carried out sequentially using different methods. The primary study, that form the base, use a phenomenographic approach, capturing teachers' different understandings of emerging conflict. The second study, building on the primary study, use a hermeneutic approach, capturing how teachers link a certain understanding of emerging conflicts to at certain set of suggested action. In this way we were able to investigate the focused link and build a model of nine different understandings each linked to 1-4 particular suggested strategies. From a phenomenographic point of view this project is particular interesting as it, in a new way, investigates the theoretically presumption that a certain way understanding a phenomenon delimits certain actions towards it.

Extending phenomenography by taking account of multiple dimensions of variation in complex phenomena

Ann-Sofie Jägerskog, Stockholm University, Sweden & Peter Davies, University of Birmingham, United Kingdom

The aim of this presentation is to highlight the potential of multi-dimensional analysis, where different outcome spaces of the same phenomenon are understood in relation to each other. Building on earlier studies investigating students' conceptions of price, this study offers a new way of understanding the development of more complex conceptions of pricing by investigating how dimensions of variation in conceptions of pricing are related to each other. The study uses data from 94 upper secondary students who provided written answers to two problems before and after a short programme of teaching. The 328 open responses were analysed phenomenographically. The

analysis identified causality as an important dimension of variation in understanding pricing. The analysis also revealed new insights into how different dimensions of variation in conceptions of pricing are related to each other: less developed conceptions of how supply is related to price and unidirectional conceptions of causation were associated with treating pricing as a single producer decision rather than the outcome of interacting market forces. These findings prompt a discussion on the meaning and use of the term 'dimension of variation', as well as how multi-dimensional analysis could contribute to building on a rich phenomenography history in moving forward.

Practitioners conceptions of ethical practice in social networking in career services

Jaana Kettunen, University of Jyväskylä, Finland

This presentation reports findings from a phenomenographic investigation into practitioners' conceptions of ethical practice in social networking in career services. The results show that ethical practice was conceived as stemming from: (1) an information orientation, (2) a networking orientation, (3) an educational orientation, and (4) a collaborative orientation. Differences appared along six dimensions including: approach, activities, level of usage, perception, strategy and ethical principles. The findings give us a more profound understanding of critical aspects that may have an important role in relation to further developments and the successful implementation of existing and emerging technologies in the career service sector.

Identifying critical aspects of vocational objects of learning in interaction

Nina Kilbrink, Stig-Börje Asplund & Jan Axelsson, University of Karlstad, Sweden

In this paper, we discuss how to identify critical aspects of vocational objects of learning in interaction – based on a combination of variation theory and Conversation analysis (CAVTA – Conversation Analysis and Variation Theory Approach). CAVTA is used in two ongoing research projects, launched in Sweden in 2018; Vocational learning funded by the Swedish Research Council (ref no 2017-03552) and Learning to weld in vocational education funded by the Swedish Institute for Educational Research (ref no 2017-00056) and conducted in the context of vocational education. In one of the projects CAVTA is used as a research approach aiming for improving understanding of vocational objects of learning taught and learned in interaction and in the other project CAVTA serves as the theoretical basis for a Learning study on Welding. Results from those ongoing projects will be presented and discussed, focusing on how we use the concepts Objects of Learning; Critical Aspects; Critical Features and Patterns of Variation deriving from Variation Theory in CAVTA, and how CAVTA can help us finding critical aspects here and now in the teaching situation in relation to the enacted object of learning, and work as a research approach as well as a didactical teaching theory.

Afforded and experienced variation

Angelika Kullberg, University of Gothenburg, Sweden, Ulla Runesson Kempe, Jönköping University, Sweden, Camilla Björklund, University of Gothenburg, Sweden, Maria Nord, University of Gothenburg, Sweden & Tuula Maunula, University of Gothenburg, Sweden

The use of variation theory as a tool for designing lessons has been widely applied and received a lot of attention e.g. in mathematics education. More limited attention has been given to the use of variation theory as a means to analyze teaching and learning. This theoretical paper addresses the connection between the afforded and experienced variation when analyzing teaching and learning with a variation theory framework. Variation theory is in this case used as a tool for analyzing the relationship between teaching and learning, exploring the enacted, and lived object of learning. The connection between what is afforded in teaching and what students learn, can in this way be described in commensurable terms. With examples from a study about students' learning of number relations in mathematics in first grade, we highlight this connection by illustrating differences identified in the teachers enactment of the same task, and what the students' learned.

Distinguishing more precise objects of learning through comparison of two mathematics lessons

Arthur Lee, The University of Hong Kong, Hong Kong, Ming Fai Pang, The University of Hong Kong, Hong Kong, Robert Gunnarsson, Jönköping University, Sweden, Pernilla Mårtensson, Jönköping University, Sweden, Ka Lok Wong, The University of Hong Kong, Hong Kong & Wing-wah KI, University of Hong Kong, Hong Kong

Understanding the object of learning is a significant, yet often elusive, part of analysing a lesson through the lens of variation theory of learning. It involves not only specifying the usual learning objectives in terms of content and how to handle it, but also through identification of critical aspects to be discerned. The role of critical aspects in formulating the object of learning in an elaborate and useful way is the focus of this discussion paper. This is explored by comparing two mathematics lessons in China, designed and conducted by two teachers skilfully with bianshi pedagogy. As the content, textbook resources and students' characteristics are basically the same, the subtle difference in the observed objects of learning becomes apparent. This difference is reflected in two contrasting sets of critical aspects that are structuring the lessons. In Marton (2015), "the object of learning is described primarily in terms of critical aspects and features to be discerned" for a better precision. Our analysis may contribute to a further discussion about how far the critical aspects constitute the meanings behind the content, which is not commonly addressed when a lesson is mainly analysed in terms of patterns of variation in a mechanical manner.

Enhancing Grade One Students' Awareness of Transitional Competencies By A Picture Book Intervention

Wan Yi Eva Liu & Wai Ming Cheung, The University of Hong Kong, Hong Kong

Transitioning from pre-school to primary school is a challenging period for children. This study aimed at enhancing Grade One students' awareness of transitional competencies (TCs) through picture book interventions in reading lessons using Learning Study (LS). A cycle of LS was carried out in a primary school in Hong Kong. 98 Grade One students (F=40, M=58, Mean age= 5.79) and their reading lesson teachers (N=3) participated in the study. A picture book demonstrating different TCs was developed for the students. Before the lessons, the object of learning (OL) and critical features were identified during the collaborative lesson planning. The lessons were observed, recorded and transcribed. Student sentence writings of "I can…" were collected and analyzed in terms of TCs involved. It was found that the Grade One students were most aware of self-sufficiency competency followed by pre-academic competency. The variations in the lessons were also analyzed. It was suggested that students were more likely to write sentences that were original and related to TCs through teachers focusing more on the variation of the illustrations in the picture book.

Newly Qualified Teachers' Conceptions of A Successful Chinese Language and Literature Lesson

Yuxin Liu, University College London, IOE, United Kingdom

This study aims to find out what Chinese newly qualified teachers'(NQTs') conceptions of a successful CLL lesson are, which is an important teaching phenomenon in CLL teachers' daily experience, and what qualitative differences in NQTS' conceptions of it are by using phenomenographic methodology. The evidence is drawn from 10 NQTs (randomly selected eight women and two men). They all now work in different primary schools in Beijing. This study collected data by audio taping the interview and transcribed verbatim. Six hierarchy conceptions were finally proposed, and they show the diversity and complexity of NQTs' conceptions. The findings showcase that some NQTs have more than one conception when they describe their understanding of a successful CLL lesson. The diversity and complexity points can be concluded from two aspects, namely the difficulty and possibility in teachers' conceptions transformation and the tension between personal education belief and rules of community.

Black British Undergraduate Students' Conceptions of Academic Achievement

Mike Mimirinis, University of West London, United Kingdom & Elina Wright, Regent's Park College, University of Oxford, United Kingdom

Intense focus has recently been placed on closing the so-called "attainment gap"

between White and non-White students in UK higher education institutions. Within this context, the paper reports the provisional results of a phenomenographic study on black undergraduate students conceptions of academic achievement. A cohort of 19 students from various disciplines within a single institution participated in semi-structured interviews exploring their experiences of academic achievement at module and course level. Through iterative analysis of the interview transcripts, the study identified five qualitatively different ways in which black students experience academic achievement. Academic achievement was seen as : (A) getting a degree and a (good) grade; (B) succesful engagement with academic tasks through organised effort ; (C) gaining knowledge and understanding of the subject matter; (D) personal development and growth; and (E) contributions to society. Through a relational lens, the results thematise how black students understand academic achievement and represent incrementally expanding levels of awareness. The results contrast empirical accounts and policy discourses which focus on deficiencies and bridging gaps. More importantly, results can be utilised to inform which aspecs of university life warrant further attention for the improvement of black students experiences during their studies.

Teaching and learning part-whole relations: teachers opening for different learning in the same task

Maria Nord, University of Gothenburg, Sweden

The aim of this study is to examine ways of teaching the same content, part-whole relations to seven-year-old pupils with the help of finger patterns, and see if and how teachers open different possibilities for pupils´ learning. The analysed lessons are part of a larger intervention project in which teachers and researchers collaborate to develop teaching of early arithmetics using variation theory (Marton, 2015). Teaching sequences from five lessons and three teachers are analysed and the research question is: How do pupils´ learning possibilities differ between teaching sequences?

Experiences of sustainability education and perceptions of the future

Kelly-Ann OBryan, James Cook University, Australia

Research demonstrates that children who have hopeful perceptions of future ecological and social environments engage in actions for sustainability more readily than those who have pessimistic perceptions. However, many children fear severely degraded future ecological and social environments and feel helpless to contribute to the creation and maintenance of sustainable environments. This has implications for sustainability education and its role in preparing children for the future. This research employs a phenomenographic approach to explore the collective and the variable ways that children experience sustainability education and how those experiences instil or erode their levels of hope.

Student teachers conversations about field experiences-qualitatively different objects of discussion

Marlene Sjöberg & Ake Ingerman, University of Gothenburg, Sweden

Student teachers' critical discussions of and reflections on their field experiences as a teacher are seen as contributing to their development as teachers. The study investigated student teachers' conversations about field experiences regarding teaching and learning concerns. The data consists of approximately 11 hours of such conversations during a year of complementing pedagogical teacher education. A phenomenographic approach was used to identify qualitative differences in how meaning regarding teaching and learning was constituted in the conversations. The analytical focus was on the variation in how different (field) experiences were brought together, and the meaning thus constituted by the group in the conversation. Four categories were identified, in which the professional (field) experiences were brought together in different ways: individual articulation (not at all), articulation and association (from one experience to the next through some association), comparison (two or several experiences are compared), development from comparison (new meaning emerges in the conversation). This implies that group conversations might serve an important role in teacher training when it comes to learning from field experiences as a teacher.

Screencast feedback: A learning study on how to develop the ability to revise written texts

Linda Söderlind, University of Karlstad, Sweden

When focusing on the Swedish context, teachers are not only obliged to assess students' written and oral proficiency in English but also to assess how well students make improvements to their own communications. This study aims to find the critical aspects connected to students' ability to revise their written texts in English. In order to find these aspects a learning study will be conducted where teachers use a screencast tool when providing feedback. The expected results will consist of knowledge about the difficulties that students have in relation to the object of learning, which is the ability to revise their written texts and how teachers can use that knowledge in order to develop their teaching.

Qualitative differences in Student Teachers' understanding of group work as a pedagogic strategy

Sonia Strnad, UCL Institute of Education, United Kingdom

Collaborative group work can be a powerful pedagogical tool facilitating learning. Evidence suggests that there is lack of understanding of group work amongst

schoolteachers and that the benefits of collaborative learning are often unrealised. This suggests weaknesses in teacher education. An important first step in addressing these is to identify qualitative differences between student teachers' (STs') conceptions of group work. This study uses Phenomenography/Variation Theory in the context of an initial teacher education programme in England in 2019/20 to identify conceptions that could contribute to teacher educators' knowledge and form the basis of interventions to improve the sophistication of STs' understanding.

A phenomenographic approach as a tool in teachers daily work

Anja Thorsten & Malin Tväråna, Uppsala University, Sweden, Sweden

It is well described that critical aspects of a learning object are useful as vantage point for teaching designs (Marton, 2015). Pang and Ki (2016) state that the critical aspects should be based in a phenomenographic analysis of students' various ways of experiencing the object of learning. We have used these basic ideas when conducting research with teachers and supervising Learning Studies. In this presentation we will address the opportunities the theoretical framework of phenomenography and Variation Theory can offer teachers in their daily practice. This issue will be addressed through a theoretical discussion about why and how the theoretical framework can be powerful for teachers. We will base our discussion in studies where the theoretical framework has been used and we will highlight three points: 1)that the framework enables teachers to think about the subject matter in relation to students' various ways of discerning different objects of learning 2) that an understanding of the outcome space of a knowing can inform teachers' actions during a lesson, enhancing the quality of given feedback 3) that teachers can apply a phenomenographic approach in their everyday teaching.

Teacher beliefs about intelligence, developing growth mindset through Physical Education

Will Zoppellini, Solent University Southampton, United Kingdom

The Implicit Theories of Intelligence Framework has been extensively researched in education with specific focus on subjects such as English and Math. Research indicates that students who perceive intelligence as malleable (Growth Mindset) over unchangeable (Fixed Mindset) have better academic success and resilience. Nevertheless, the implementation of educational interventions that include growth mindset in classrooms has divided opinion amongst teachers. Utilising a phenomenographic approach this study aims to understand what influences teachers' view of intelligence and how this affects their teaching practice in developing growth mindset in Key Stage One focusing on Physical Education. Physical Education has not previously been the focus for studies and therefore, this research will investigate how teaching in the subject constrains or enables the development of growth mindset. The study adopts a phenomenographic approach to explore the variation in how teachers

perceive growth mindset, to highlight the different ways in which it is being interpreted and developed in different classes. Data collection consists of two stages, an initial stage of interviews and a second stage of observations. Previous research has been mainly quantitative measuring academic improvement from interventions, this study adopts a qualitative study to provide an in-depth approach to understanding teacher conceptions and practice.

KEY DATES IN 2020 AND 2021

14th December	Registeration opens
31th January	Final deadline for registration
10 th -11 th February	SIG 9 Conference 2021