Challenges and virtues of theory-driven education – a meta-study of variation theory implemented in early childhood mathematics education

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Abstract

This article contributes to the discussion on goal-oriented learning in play-based early childhood education, an issue highlighted in Sweden due to revisions of preschool curricula and contemporary research in education. The article presents a meta-study of insights from a project consisting of several studies conducted in authentic preschool practice. The purpose is to raise the question of theory-driven education, more precisely a phenomenographical approach to knowledge and learning, and the variation theory of learning, in early childhood education practice. Certain virtues, but also challenges, emerge in the analysis of the implementation of a theory-driven pedagogy and this article aims to discuss how these may be considered and handled in the dynamic practice of early childhood education. Play and participation, situated learning in the child’s everyday context and accepting children’s initiatives as variations of experiences are aspects that appear to be crucial in this debate and will contribute with awareness and knowledge to this topical discussion.

Keywords: early childhood education, phenomenography, variation theory of learning

Introduction

This article addresses issues of central interest to early childhood education (ECE) at a time when goals concerning academic knowledge areas and skills are included in national curricula such as the Swedish curriculum for preschool (National Agency for Education 2011). Play, children’s perspectives and initiatives are, however, still highly valued as the core for children’s exploration and learning. One challenge for preschool teachers in these practices is to conceptualise the idea of intertwined learning and play and a balance to organise for goal-oriented learning in which children's perspectives, initiatives and ideas are integrated. The discussion presented in this article contributes to this debate of current interest. It takes its point of departure from a phenomenographic approach to young children’s experiences and the implementation of the pedagogical theory “Variation theory of learning” as a conceptual tool for interpreting and orchestrating learning. The theoretical conjectures of powerful

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learning are discussed in the context of play-based ECE with a focus on the virtues and challenges that emerge in this specific pedagogical context, characterised by its dynamic nature and children’s flow of ideas.

The article presents a meta-study of insights from a larger project in which several research studies illustrating a phenomenographical approach and the variation theory of learning consolidated with ECE have been published. Of specific interest are: 1) the learning opportunities the theoretical framework contributes with; and 2) the challenges of implementing the pedagogical theory which teachers must address. Conclusions from this study may be of interest for teacher professional development but also shed light on specific challenges and virtues implied by the theoretical framework.

**Theoretical conjectures**

According to the phenomenographical ontological standpoint, there is only one world, yet it is experienced in different ways by different people. People’s experiences of the surrounding world differ and these experiences are decisive for how a person interprets encountered phenomena (Marton and Booth 1997). Young children’s conceptions may differ to a large extent from adults’ and may further be expressed in many ways other than verbal (Björklund 2007). Phenomenography (Marton 1981), as a methodological but also a pedagogical approach, directs attention to these different ways of experiencing phenomena in the world, resulting in a deeper understanding of, for example, why students’ learning outcomes vary despite participating in the same education.

Multiple phenomenographical studies have revealed the importance of diachronic (earlier) experiences as well as synchronic (situated in a specific occurrence) experiences and the directed attention in the learning act (Marton and Booth 1997). These studies also raise the question of how one can facilitate learning and find powerful teaching strategies. Such inquiries commenced in designed teaching situations and in classrooms in which different subjects were taught (Marton and Tsui 2004). Results of these classroom studies show it is not only important *that* the learner gains multiple experiences of a phenomenon, but another important question is *how* these experiences are offered for exploration to the learner. The variation theory of learning is the theorisation of these empirical results; a pedagogical theory that may both explain how learning occurs while providing a theoretical foundation for how to conduct powerful teaching (Marton 2015). This theory brings a unique opportunity to study, develop and conduct a practice where the teacher’s pedagogical content knowledge and children’s perspectives are plaited together. Content knowledge is important in pedagogical work, as is pedagogical knowledge of how the conceptions of a specific content develop generally among children, along with how learning this content may be facilitated with the available resources (Ball, Thames and Phelps 2008).
Analytical concepts for studying learning and teaching

The development of understanding (learning) is considered to be based on an ability to simultaneously discern several and different features or aspects of a phenomenon. Teaching then implies offering such experiences that will challenge the learner’s conception such that a new way of ‘seeing’ the phenomenon will commence (Marton 2015; Marton and Tsui 2004). This has a great impact on educational settings as teaching and learning can be described and analysed in terms of discernment, learning objects, critical aspects and patterns of variation (Runesson 2005). These concepts constitute the foundation of the variation theory of learning and will be discussed in the following paragraphs.

The learning object is the conceptual understanding or ability the learner is intended to develop knowledge about. Learning about geometrical shapes, for example, means in accordance with this theory to become able to differentiate what constitutes a specific geometrical figure from any other spatial figure. The learning object could then be to discern what constitutes a specific shape, where for instance aspects such as the number of sides, vertexes, angles and length of the sides are prominent. These aspects and how they relate to each other must be discerned by the learner in order for the concept of geometrical shape to bear meaning. In other words, aspects that the learner has to ‘see’ so as to describe what makes a triangle different from a square and further generalise that the triangle shape may take a different gestalt but still meet the criteria for that particular shape (there are, for example, equilateral triangles and right triangles). Which aspects the learner discerns in a specific situation builds on his or her experiences of the said learning object and which aspects that are made possible to discern and explore in a learning situation. Critical aspects (such as an equal number of vertexes in geometrical shapes of the same kind) are made possible to discern through carefully orchestrated patterns of variation (Marton 2015). Variation is a necessary condition when adopting this theoretical perspective since the theory conjectures that a person cannot discern the complex meaning of ‘triangle’ if only triangles are present, not even if the triangles vary in colour or size. It is only by contrasting a triangle with another shape that the aspects which constitute the triangle can be discerned (and possible to learn). Differentiation of the aspects and features of the triangle shape (there are, for instance, always three sides, three vertexes and three angles in a triangle, but the size of the angles may vary) enables the learner to discern how the size of the angles depends on the length of the sides, meaning these aspects are explored as they are fused together and act simultaneously. Thereafter, other patterns of variation, by comparing triangles of different sizes, colours or applied to different objects, will generalise and deepen the meaning of the learning object. Variation theory concepts are used for both the analysis and organisation of teaching since they support understanding of what the learner has to discern in order to develop their understanding and how this is made possible within the teaching act.
The positive effects seen in empirical research support the conjecture that variation theory builds a framework for both understanding the meaning of a learning object and how children learn specific contents (Lo and Marton 2012; Marton and Tsui 2004). The learners’ perspectives are considered to be utmost important within this theory, recalling the foundation in phenomenography. Pedagogical content knowledge is said to be enhanced when the teacher learns more about the construction of a concept or skill, what facilitates learning of the concept or skill, and how children interpret the same (Shulman 1986; Ball et al. 2008). In other words, powerful teaching builds upon both pedagogical knowledge of the content and awareness of the learners’ conception of the same content, which variation theory may contribute with.

**Developmental pedagogy**

Successful attempts to develop a goal-oriented preschool pedagogy have previously been made by Pramling Samuelsson and colleagues in terms of developmental pedagogy (Pramling and Pramling Samuelsson 2011). Developmental pedagogy derives from the phenomenographical approach and emphasises the learning act and learning object in ECE. The pedagogy builds on children’s experiences, communication and contrasting perspectives as the basis for the development of understanding, performed through meta-cognitive dialogues and learning integrated with play. It raises the question of what the learning object may become in the preschool practice and how through play and reflective communication children expand their horizon of understanding of both thematic objectives and specific learning objects (for example, mathematics in general and number sense in particular). Developmental pedagogy further focuses on acting mainly upon the children’s interests and learning objects as they appear spontaneously during the course of the day (Pramling Samuelsson and Asplund Carlsson 2008). The learning act is characterised by elucidating different ways of understanding the same phenomenon both within an individual child and between children. Expressing one’s own conception thereby becomes a prerequisite for meta-cognitive dialogues in which reflection and learning is facilitated. Phenomenography is thus a familiar approach in Swedish ECE practices, for example expressed in the interest in and asking for the child’s perspective on a common phenomenon as the basis for planned pedagogical work. In contemporary ECE, this is a well-established strategy and point of departure for developing children’s conceptions.

A variation theory approach to ECE and developmental pedagogy may at first glance seem similar, and they do have similarities not least concerning the theoretical foundation of how to understand human experiences and learning. However, developmental pedagogy intends to be a pedagogy suitable for the play-based context of preschool in a general sense, with an emphasis on communication. Variation theory implemented in preschool practice may on the other hand contribute with a more
explicit focus on what it takes to learn a specific content and the conceptual tools enable teachers to better understand children’s conceptions of specific phenomena and how to organise for learning through communication.

**The complexity of everyday concepts**

Existing knowledge on how children in a more general sense acquire knowledge may give a hint at the complexity of concept development. Many notions used on a daily basis are relational in character (see Björklund 2014b for a study on the concept of size with toddlers), making them complex in their nature and whose meaning is often taken for granted in communication between an adult and child. Knowledge of this complexity as well as awareness of the possible different ways of interpreting notions are important as a background and a pre-conception of potential difficulties in conceptualising notions and everyday phenomena in the early years. Yet, even if teachers understand the possible critical aspects of a learning object, the aspects that become critical will derive from the children’s conceptions emerging in a particular group of children at a certain time and in a given setting.

This is shown, for example, in a study of four- and five-year-olds’ exploration of the numerical notion ‘half’ (Björklund 2016) where it becomes evident that certain basic aspects of that specific case had to be discerned before other aspects could be explored and the meaning of the notion generalised. The numerical dimension of the notion (that the original quantity is divided into equal sets but these sets are composed of and relative to the original whole quantity) has to be discerned and compared to an idea of the irrelevant impact of the features of the objects that are to be divided. This means it does not matter how the subsets are composed (camels and tomatoes may very well constitute parts of one group even though they visually appear very different) as long as the subsets are equal in number. Teachers’ awareness of such dimensions and the aspects that seem critical for concept development generates more powerful ways of offering children in the early years opportunities to learn. Children who experience ‘half’ as a cutting act where action is directed towards physical objects (cutting a banana in half) will benefit from teachers’ support in discerning the numerical meaning of dividing in half before they are able to explore the relative meaning of the same notion. By introducing the idea of ‘equally many’, the teacher directs attention to one of the critical aspects, helping the children to ‘see’ the phenomenon from a new perspective when numerical aspects are brought to the fore and contrasted with ‘what is not half’ or rather ‘un-equal’ in number.

Even though the teacher knows how children in general learn within a specific knowledge area, this has to be considered as a loose framework for interpreting children’s expressions with great respect to the other qualitatively different conceptions that may emerge through a phenomenographical investigation of the participating children’s experiences.
Challenges and virtues of phenomenography and variation theory in ECE

This study is a meta-study of earlier empirical studies of teaching in authentic practices that formed part of a larger research project (funded by the National Research Council grant no. 724-2011-751). All of the studies are conducted in authentic early childhood practices with 1- to 6-year-old children and their teachers, with the intention of orchestrating learning of a specific learning object through designed patterns of variation implemented in preschool activities. Observations of the teaching situations are made by the researcher with a video-camera, without interfering in the teaching act that is conducted exclusively by the teachers. These observations give extensive data for the original studies and the meta-study.

Research based on observations of children raise a sensitive question regarding the individual child’s integrity and ethical considerations of how the data are handled and stored. All studies are conducted in line with scientific ethical guidelines (National Research Council 2011), meaning that every participating child’s legal guardians were informed about the purpose and the data to be collected and gave their written consent.

The sample for this meta-study has an empirical base consisting of observations of 24 teaching situations conducted by 11 teachers. The observations are between 3 and 60 minutes long and form empirical parts of projects designed as learning studies (Marton and Tsui 2004). Learning study is a design for theory-driven development projects where teachers and researcher together explore and extend their knowledge about a common content for learning through an iterative and interrogative process. These projects included two or three teachers in the same study group, sharing the same learning object of interest and working collaboratively with the same content (but carried out individually through different activities) with their respective child groups. These studies have previously been analysed and reported, focusing on how teachers and children explore the meaning of mathematical concepts and principles. A criterion for inclusion in the meta-study was observations of a teaching situation that was planned in accordance with the variation theory of learning and executed in an authentic setting of early childhood education. The earlier analyses provide in-depth knowledge of how the learning (and teaching) of specific content are realised in ECE practice. A meta-study of the same observations will, however, provide an extensive view of the particular challenges and virtues entailed by the specific theoretical framework and pedagogical practice.

The analysis of the observed teaching situations that form the basis for this re-analysis specifically emphasise: 1) the learning opportunities the theoretical framework contributes with; and 2) the challenges of implementing the pedagogical theory that teachers must address. A meta-study may be described as a systematic review and examination of reoccurring features or attributes that help answer specific
research questions. The aim is to explore and in particular synthesise findings for the purpose of producing new knowledge (Major and Savin-Baden 2010). Tensions and connections between the original data that were not visible when studying individual reports or items are important results of a meta-study (Paterson, Thorne, Canam and Jillings 2001). This particular study is constituted by a systematic review of the realisation and outcome of the teaching situations, focusing on successful teaching acts but an equally important value is given to acts and activities which challenge the teacher's intentions. Challenges and virtues are detected and interpreted through the theoretical lens of phenomenography and variation theory. This process revealed a pattern of similar challenges and virtues and teachers’ acts to understand and deal with them as part of their teaching. This is presented as results of the analysis. The analysis thereby ends up with an integrated body of knowledge about the pedagogical potential of the theoretical approach and the challenges it implies. This is of interest to the contemporary discussion on learning and not least teaching in the early years and in non-mandatory education.

The virtues and challenges of adopting a phenomenographical approach and the variation theory of learning in ECE are centred on the interpretation of the children’s experiences; discerning which aspects become critical for learning and offering patterns of variation that encompass these experiences and aspects within a teaching act that follows the children’s interests, and respects their flow of ideas. Challenges and virtues emerge in the analysis as two sides of the same coin, metaphorically speaking. Challenges in the goal-oriented ECE practice, such as the flexible nature of ECE practice, turn out to be powerful resources for orchestrating patterns of variation in ways relevant to the children’s lived experiences. However, these resources also prove to be challenging to master for pedagogical purposes, not least due to the practice’s flexible nature. In the following analysis, it will further be discussed how some prominent challenges are met and the virtues imposed in empirical studies of practical work in ECE.

The consolidation of phenomenography and the variation theory with ECE practices entails virtues that can be seen in published and forthcoming studies. However, the approach is not unproblematic since theory implemented in a dynamic practice such as ECE causes recurring challenges the practitioner has to deal with. Some of these challenges that stand out in the re-analysis of the empirical studies are:

- to enable critical aspects to be discerned in a dynamic child-centred practice. This challenge emerges when the teacher’s intended object of learning is not shared by the children, who directs their attention to another learning object, causing a conflict between the intended and the lived object of learning;

- to offer theoretically driven patterns of variation in meaningful activities, whereas the intended learning object may interfere with the children’s own intentions; and
- to direct and sustain attention towards a specific learning object throughout a learning session in which children’s initiatives are supposed to be encouraged and developed.

Recognising these challenges, in the empirical studies we can also discern strategies for dealing with these that respect the traditions, policies and pedagogical values which constitute Swedish ECE. Such strategies can be concluded as **play and participation enabling aspects to be discerned, patterns of variation situated in the child’s everyday context and children’s initiatives as variations of experiences**. The challenges and the responses to them we see in the teachers’ pedagogical strategies are closely related to the outspoken virtues of the key issues in phenomenography and the variation theory, which will be discussed in detail below.

### Play and participation enabling aspects to be discerned

Young children explore phenomena, both new and familiar, with several senses and the bodily experiences are often as powerful as any intellectual ones (Öhberg 2004). Many teachers recognise group activities as powerful ways of integrating different perspectives or even enabling children to experience variation of the same learning object. The idea is that children take part in each other’s suggestions and solutions to similar problems, gaining multiple experiences from the situation (Pramling Samuelsson and Asplund Carlsson 2014). Recent studies from early childhood practices, however, give no single credence to this assumption, meaning that children participating in group activities do not necessarily take advantage of the different perspectives emerging in an activity, unless the teacher carefully orchestrates this activity (Björklund 2014a).

The active participation and play-orientation seems to be more important the younger the children are, as this facilitates the necessary focus and directed attention to a specific learning object and the critical aspects of the same. Many traditional activities, such as games, play and routines in preschool practice, include elements that may be developed purposefully in line with a variation theory framework, allowing critical aspects to emerge in meaningful activities. The following example is taken from a study on the concept of ‘weekdays’ where the teacher uses a game/play with a general idea the children are familiar with. The play brings forth the aspect she wants the children to discern in ways that demand the children’s attention and invite them to take part in the activity. The pedagogical idea is thus not to merely repeat the weekday rhyme, the aspect in need of discernment is that there is a repetitive and circular feature of the phenomenon weekdays (Björklund 2013).

A common procedure in preschools is to recite the days of the week from Monday to Sunday or to stop at the current day of the week. But if the children are to understand the structure of the calendar week is repetitive, it is necessary to recognise the verbal list as an ongoing rhyme.
First all 20 children stand on a line, reciting with some help the weekdays, one day per child with specific attention to what happens when Sunday is presented and the following child will be Monday. When the last child in the line says ‘Saturday’, the teacher steps in to represent ‘Sunday’. She then asks what to do, as ‘Sunday’ also wants a ‘Monday’ by her side. They figure out together that the first child ‘Monday’ also lacks a second partner by her side. The problem is solved as the last person ‘Sunday’ takes hold of the first person ‘Monday’s’ hand and they all form a circle. Here they check the order again and decide that the circle of weekdays is complete. They continue playing a game while singing a song where children switch places and the week-rhyme is repeated several times (Björklund 2013).

As we can see in the above episode, a powerful strategy turned out to be visualising the transition of the end of the week-rhyme with the beginning in a playful activity where the circular idea was a natural component of the activity. When implemented in an activity that by tradition is common in pedagogical practice, it becomes possible to discern the learning object and critical aspects as meaningful to the children.

Teaching in the early years is, according to Pramling Samuelsson and Asplund Carlsson (2008), in many respects about making what seems to be invisible visible to the children. Play offers a very powerful pedagogical tool in early childhood settings. Play may be defined in many ways (Sutton-Smith 1997), but in general terms one can say that play includes both creative aspects and boundaries. How these are established is in many regards a negotiation act where participants interact and re-negotiate when necessary to enable the play to go on. The teacher may use this flexibility in powerful ways when, for example, creating a play milieu in which the children are invited, yet certain limitations and tasks bring attention to specific objectives. A carefully designed play may in this sense enable particular aspects to be discerned by the children. However, it seems crucial that the children are truly active participants, rather than given individual tasks, which instead interferes with the children’s focus and motivation (Björklund 2014a).

Patterns of variation situated in the child’s everyday context

Teachers in ECE are generally familiar with the idea of following children’s interests and ideas, and communicating about everyday phenomena that come to attention during the day as resources for learning. Many teachers describe this pedagogical strategy as ‘catching the moment for learning’ (e.g. Jonsson 2011). To be able to do this in powerful ways, the teacher needs a thorough understanding of, for example, mathematics as it appears in young children’s daily activities, what challenges there may lie in the acquisition of mathematical principles and not least how mathematics may be defined, differentiated and understood as both a problem-solving tool and as a domain of knowledge.

Everyday activities may very well offer good opportunities to explore specific learning objects through carefully designed patterns of variations. Children in preschool often participate in preparations or projects in which they encounter
different problems or tasks to solve. Making play-dough (a mixture of salt, flour, oil and water that is easy to shape and use by children for ‘baking’ and play) is one example of authentic activities in which a teacher uses a recipe modified for her pedagogical purposes (Björklund 2015). The children are familiar with measures and how to follow a recipe. However, the learning object is the numerical aspect of the notion ‘double’, given that they have to double the recipe. This can easily turn into a teaching session concerning measures or mixing ingredients, but the recipe is transformed into numbers of blocks, leaving the different measures, such as teaspoons, decilitres and others, irrelevant to solving the problem. The task is about doubling a number of items, not doubling the quantities. This transformation gives the teacher an opportunity to enable exploration of the multiplicative structure in a visual way — numbers of blocks are probably easier to count and check than volumes which depend on three-dimensional properties. In this way, the teacher brings in a contrast concerning quantities, keeping the features of the items that are to be doubled constant. This pattern is then expanded and the idea generalised when the number of items that are to be doubled varies.

The example described above is one of many designed activities in which the teacher makes use of activities occurring naturally in early childhood settings, activities that children are familiar with and can easily relate to. The challenge is to share the focus on the same learning object (Björklund 2014a). The problem-solving task may become a frustration if the children’s attention is directed towards baking with the finished dough. It seems like board games and rule-governed play, with which children are familiar and where they easily accept that there are boundaries on what is possible to do and the goal is clear to every participant, provides good opportunities for keeping the focus on the intended learning object and critical aspects. Sorting games and tasks are other activities in which children daily engage that bring excellent opportunities to explore specific learning objects in deliberate ways by offering patterns of variation (Björklund 2014b; Björklund and Pramling 2014).

Children’s initiatives as variations of experiences

One of the key features of the ECE curriculum in the Nordic countries is the appreciation of children’s own ideas and interests. Children’s initiatives are supposed to form the basis for practice and thematic work, yet this poses a challenge in performing goal-oriented education. The challenge is directed to the teacher’s pedagogical content knowledge, in other words, how the teacher is able to make use of the available resources and present learning opportunities to a specific child group. In phenomenographical manners, the children’s expressions represent their understanding. These expressions may be bright contrasts with other children’s expressions of understanding, challenging the own way of ‘seeing’ the world, but may in the same
sense also be considered a virtue, meaning that children’s different expressions and initiatives for solving a problem can be used for reflecting children’s experiences and enabling meta-reflection.

In a study where teachers are working with the concept of weekdays (Björklund 2013), they find representations of the weekdays as a whole to be an important conception to establish. Every part (weekday) has its own place in the sequence but is constantly related to the other parts and subgroups of this whole, for instance which days are preschool-days and which days are weekend. Their own experiences are present to a large extent and build the foundation for the discussion. This approach seems to support children’s attention to the temporal aspect, that days go by in a stable order and tempo. This is discerned in an activity where one teacher introduces an arrow to mark which day it is. An opportunity to extend the meaning of the weekdays emerges when the children discuss various strategies for moving the arrow representing Saturday and Sunday, when the children say that they are not in preschool, not being able to move the arrow every morning as they do on schooldays. The variations in expressions give the teacher an excellent opportunity to discern how the children experience the duration of time in relation to the temporal representation, and which aspects the children have not yet discerned. The children further seem to take into account what their peers are expressing, elaborating the previous ideas into more advanced ones.

However, not all of the expressions and alternatives are necessarily of use for further development and discernment if they lead to a ‘dead-end’ or focus on another objective. In other words, some initiatives are not possible to follow in order to facilitate a more developed understanding (Björklund and Pramling Samuelsson 2013). This has to be dealt with in-action. This is the case for any teacher at any school level, but in ECE this is explicit in the curriculum as the framework for education – children’s perspectives and intentions are to be accounted for as points of departure in educational practice. If the teacher possesses deeper knowledge of the learning object and different ways of seeing it, they are better prepared to act on the alternatives given by the children.

Yet children’s initiatives are not easily integrated into the teaching act. As shown by Björklund and Pramling Samuelsson (2013), young children are ingenious and find many unforeseen ways to solve problems. The teacher’s intention to problematise the notion of ‘half’ in a story with props is, for example, challenged by a child’s suggestion to bring in more and other props, which would have changed the original set of carefully chosen props intended to bring the numerical dimension of the notion half to the fore. The perceptive teacher, however, manages to give encouraging support to every child’s intentions at the same time as she reflects on the value of the aspect in relation to the intended object of learning. A suggestion by the children may very well solve the problem, but the teacher who wants the children to explore a specific meaning or strategy must consider which strategies are useful.
for the pedagogical purpose. This is a legitimate challenge to early childhood teachers in Swedish ECE who up until now in most practices have lived and worked according to the idea that every utterance is equally valuable. By bringing the variation theory of learning into the teaching act, some aspects are nonetheless considered more critical to discern than others.

**Conclusion**

The meta-study of phenomenography and variation theory in empirical studies in ECE bring forth ontological and epistemological conjectures that, when put into the context of preschool practice, reveal both virtues for the theoretical framework for developing practice, and the challenges such a consolidation entails. The virtues this discussion brings forth are the emphasis on the learners’ perspective and the content – what is to be learnt and how this may be facilitated through use of conceptual tools for analysing the teaching act. This, however, also brings up the issue of the pedagogical skills required by the teacher in order to create a space for learning in which children’s initiatives are welcomed contributions to the teaching process, and where the goal-orientation is solid throughout the session and not least where play works as the holistic framework that demands the children’s interest, motivation and directed attention.

The contribution of this discussion is the extension of the variation theory of learning and phenomenography to a practice that is heavily influenced by a social-pedagogical framework and traditions. Such traditions prioritise social and emotional development towards a future democratic citizen (Bennett 2005). Even though today’s pedagogical practice is goal-oriented with outspoken knowledge areas to work with and strive for, there is a strong emphasis on holistic learning where education and care are integrated and teachers are responsible for developing children’s cognitive, emotional, psychological and social abilities. The complexity of the pedagogical commission is obvious. Even so, the scrutiny of demarcated learning objects may contribute to practice and professional work. The thorough investigation and broader understanding of a learning object facilitates the interpretation of how children experience phenomena and, more specifically, why some phenomena seem difficult to grasp. For teachers who work with the youngest children, the conceptual tools of the variation theory enable them to discern the complexity of notions used in everyday interaction and communication. In this respect, variation theory will contribute to the developmental pedagogy that emphasises communication and expressing different ways of understanding phenomena. Variation theory supports teachers in realising why children perceive phenomena in different ways and also how to make the invisible visible.

The variation theory of learning is in fact a theory, whereas preschool is a complex practice. A theory may include several dimensions but here theory is understood in Mason and Waywood’s (1996) terms, namely that theory is an organised system of
accepted knowledge which can be applied to several circumstances and specific phenomena. Further, a theory guides behaviour and is used to explain events and causes. The theorising of phenomena is a human drive to make sense and generalise meaning, which in itself is the subject of theorising. One could argue that a theory is legitimate if it works in practice, even though there might be other criteria for the quality of a theory, such as positivistic proof or falsification. According to Marton (2015), the variation theory is a pedagogical theory and its legitimacy should thereby be valued in accordance with its pedagogical applicability. When the theory is placed in the foreground for a study of a specific pedagogical context, aspects may emerge that question the theory and even develop its applicability. This is problematised in this article through the discussion on the challenges that emerge in the empirical studies, which concerns both finding and sustaining the learning object and how to organise for meaningful learning in a dynamic practice. When finding strategies to overcome these challenges, for example through play and participation, situated learning in the child’s everyday context and accepting children’s initiatives as variations of experiences, it becomes clear that the virtues of the variation theory and phenomenography are in particular an opportunity for professional development in contexts where content and the learners’ perspective are emphasised and in need of thorough investigation. Content knowledge and pedagogical content knowledge (Ball et al. 2008) are equally important in ECE as in any other pedagogical practice. Theory-driven pedagogy should thereby be desirable, but this is not easily accomplished in the dynamic practice of ECE. The meta-study presented in this article is an attempt to contribute to this topical discussion.
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