



When the Sun is Out of the Picture: Exploring a Variation Theory Key to Children's Imagination in a Picturebook Reading Activity

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Abstract

The purpose of this study is to explore a theoretical idea in relation to a body of empirical material from a reading activity involving a picturebook on shadow. The theoretical idea, sprung from variation theory, entails children's discernment through synchronic simultaneity as a key to their ability to imagine. To explore this idea, an analysis has been conducted on how 5-year-olds, in words and actions, express themselves in a reading activity involving *The Black Rabbit* (Leathers, 2014) in regard to discerning and imagining about shadow as a light phenomenon. Vygotsky describes children's previous experiences as a key to their ability to imagine. The results of this study imply that children's discernment in the moment, with synchronic simultaneity, appears to be another key that unlocks their ability to imagine explicit depictions in a picturebook. The results also show that when children's discernment with both synchronic and diachronic simultaneity (i.e., discernment in the moment and before the moment) is missing, their ability to imagine remains untapped, as none of the keys to their imagination, which might unlock their ability to imagine implicit depictions in a picturebook, are used.

Keywords Variation theory · Imagination · Picturebook · Preschool

When the Sun is Out of the Picture: Exploring a Variation Theory Key to Children's Imagination in a Picturebook Reading Activity

The purpose of this study is to explore a theoretical idea in relation to a body of empirical material from a reading activity about a picturebook on shadow. The theoretical idea, sprung from variation theory (Marton, 2015), is about two keys to children's imagination. The empirical material derives from a reading activity with a group of 5-year-olds in preschool, in which a picturebook about shadows, *The Black Rabbit* by Leathers (2014) was read.

Based on a picture in the picturebook showing a little rabbit and its long shadow (Fig. 1), the teacher said 'I think this is a bit exciting when he has such long and thin legs and

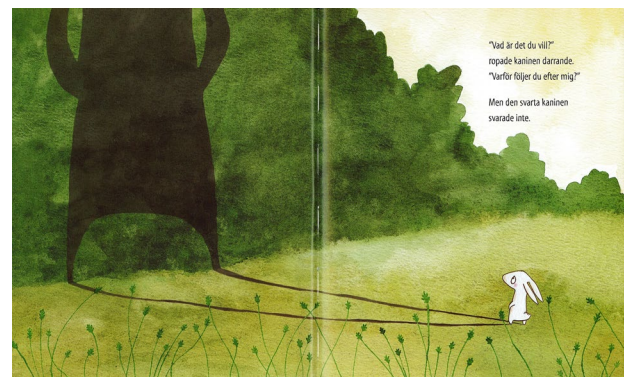


Fig. 1 In English, the text for this picture reads: “What do you want?” cried Rabbit, trembling. “Why are you following me?” But the Black Rabbit did not reply. Picture from *The Black Rabbit* (Leathers, 2014), used with permission from Swedish publisher Berghs förlag

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that one has such short ones. Do you think the sun's risen so high in the sky or is the sun still just as far down?'

Whether children do or do not have the ability to imagine¹ the position of the sun when it is out of the picture can be explained as being related to their previous experiences of the relationship between the sun and shadows. If children are novice readers with limited real-life experience (Nikolajeva, 2014) of shadows, and have thus not previously noticed the relationship between the length of shadows and the placement of the sun, it will not be possible for them to imagine where the sun is positioned when a shadow looks like it does in the picture (Fig. 1). This way of describing imagination has previously been presented in terms of previous experiences serving as the basis for being able to imagine something (Vygotsky, 1930/2004), for example depictions in picturebooks.

In *Imagination and Creativity in Childhood* (1930/2004), Vygotsky states that "everything the imagination creates is always based on elements taken from reality, from a person's previous experience" (p. 13). According to Vygotsky, it is the children's previous experiences that constitute the material that makes imagination possible:

"[T]he creative activity of the imagination depends directly on the richness and variety of a person's previous experience because this experience provides the material from which the products of fantasy are constructed. The richer a person's experience, the richer is the material his imagination has access to. This is why a child has a less rich imagination than an adult, because his experience has not been as rich" (pp. 15–16).

According to this reasoning, children's possibilities to imagine something, for example the sun being out of the picture, depend on their previous experiences.

Vygotsky further suggests that the ability when reading a book to create an image of something that we ourselves have not experienced has to do with new combinations of previous experiences. He exemplifies how one can imagine a desert in Africa without having previous experience of a single desert. Previous experiences of the desert's components are used to imagine it: 'If I did not have a concept of lack of water, sand, enormous spaces, animals that live in deserts, and so forth, I, of course, could not generate the concept of this desert' (p. 16). Imaginary constructs are thus built on things that we already know and have had previous experiences with (Vygotsky, 1930/2004).

When children's previous experiences are not sufficient for them to be able to verify how things are (for example, how the sun is positioned when a shadow becomes long and thin), they trust what other people tell them (Harris, 2012): "[C]hildren use their imagination to construct a mental picture not just of the fictional entities that they hear about in a story, but also of real, albeit unobserved entities that they learn about from the claims and attestations of other people" (Harris, 2012, p. 6). Unobservable phenomena that children nevertheless imagine, despite their limited previous experience of them or their components, can be of various kinds. Children can imagine invisible scientific phenomena such as germs and oxygen, spiritual phenomena such as a god and the afterlife, historical figures and events such as Rosa Parks and the extinction of the dinosaurs, as well as invisible fictional phenomena and figures such as ghosts and the Tooth Fairy. Despite the differences between these phenomena, children's testimony about them always derives from what others have told them (Harris, 2012). Scientific phenomena such as germs and oxygen are not observable, but the light phenomenon of shadow is. However, in the picture from *The Black Rabbit* (Leathers, 2014) (Fig. 1), the sun is not observable. Therefore, the children must rely on their own previous experience of the relationship between the position of the sun and the length of shadows, or on where the teacher says the sun is positioned when the shadow is as long and thin as it is in the picture.

The above explanations of children's imagination (Harris, 2012; Vygotsky, 1930/2004) do not provide answers as to whether what is perceived by children in the moment means anything for what becomes possible for them to imagine about this. Therefore, this study, with the support of the variation theory of learning (Marton, 2015), will provide a complementary explanation of children's imagination with a starting point in what they are offered opportunities to discern from a phenomenon in the moment they encounter it. In this study, a theoretical conjecture is made that aspects of a phenomenon that children have discerned previously, together with aspects of it that they are discerning in the moment, are two keys that may open up for them to imagine things about the phenomenon.

There are similarities and differences between this study's variation theory-informed reasoning about children's imagination and how, for example, Vygotsky presents this. The description that children's previous discernments, with diachronic simultaneity, open up what they are offered opportunities to imagine about a phenomenon seems to concern the same key to children's imagination that Vygotsky previously presented in terms of connections between their previous experiences and their ability to imagine. But the second key to children's imagination, described and suggested in this study, is different. This key describes that children's discernment in the present, with synchronous simultaneity,

¹ The term *to imagine* is used frequently in this study. Here, imagining something is synonymous with envisioning something, making a mental picture of something, imagining seeing something. Thus, imagining does not mean fantasising, pretending, or making up something that is not true, that does not correspond to reality (cf. Backman, 2020; Vygotsky 1930/2004).

can also open up opportunities for them to imagine about a phenomenon. A variation-theoretic explanation of children's discernment of aspects with synchronic simultaneity as a key to their ability to imagine something may be useful in analysis; for example, in analyses of children's opportunities to imagine explicit and implicit depicted phenomena in and outside of picture books.

Purpose and Research Questions

The purpose of this study is to explore a theoretical idea in relation to a body of empirical material from a reading activity about a picturebook on shadow. The theoretical idea entails children's discernment through synchronic simultaneity as a key to their ability to imagine. To explore this idea, an analysis has been conducted on a reading activity with *The Black Rabbit* (Leathers, 2014), to answer the research questions: What, in regard to shadow as a light phenomenon, is possible for children to discern when the sun is out of the picture? and What does this discernment open up for children to imagine about shadow as a light phenomenon? These questions are answered in an analysis of how 5-year-olds, in words and actions, express themselves in a reading activity with *The Black Rabbit* (Leathers, 2014) in regard to discerning and imagining about shadow as a light phenomenon.

Previous Research

According to picturebook researchers such as Arizpe and Styles (2015), Sipe (2008), Solstad (2015), Solstad and Österlund (2020) and others, it has long been unusual in children's literature research to take an interest in children's responses to picturebooks and what they discern from the depictions in them. Picturebook research has traditionally focused on the children in the texts and pictures, but little on the children outside these (Solstad & Österlund, 2020). However, in 2016, Arizpe and Styles noted that studies focusing on what children have to say about picturebooks are becoming increasingly common in the research field. Variation theory (Marton, 2015), in which an important point of departure involves what is possible for children to discern and what can be made possible for them to discern (for example from a picturebook) has not, however, been commonly used in research on children's literature.

Still, some studies have used variation theory to analyse children's and students' ways of experiencing different kinds of phenomena in children's literature (Backman, 2020) and how their ways of experiencing these can be developed in teaching (Asplund Carlsson, 1998; Backman, 2022, 2023; Björklund & Palmér, 2020; 2022; Holmqvist et al., 2010;

Rosenbaum, 2019; Rosenbaum et al., 2021). Common to all these studies (except for the one by Backman, 2020) is that the teaching has been designed with the intention that learning about something that has been selected should be able to take place.

Early on, Asplund Carlsson (1998) used phenomenography, the method that formed the basis for the development of variation theory (Marton, 2015), in her doctoral thesis on young readers' responses to narrative texts. The thesis consists of four empirical studies with children aged 3 to 20 years. The fourth empirical study from the project, *Children, Narratives and Books in Preschool* (1993–1995), dealt with preschool children's responses to children's literature. The project tried out a preschool pedagogy for reading literature with the aim of studying preschool children's ways of experiencing stories, what the stories are about, and what their message might be (Asplund Carlsson, 1998).

Recently, variation theory studies have been carried out with a focus on reading activities with different kinds of picturebooks in preschool (Backman, 2022, 2023). One study (Backman, 2023) deals with how children distinguish and experience different kinds of picturebooks (fiction and non-fiction) when they are introduced to differences between them. Another study (Backman, 2022) deals with the interpretive possibilities opened up for children when combined depictions of fact and fiction in fictionalised non-fiction picturebooks are separated for them. The teaching in these two studies was designed in accordance with variation theory principles, with the objects of learning being to distinguish non-fiction picturebooks from fiction picturebooks (Backman, 2023) and to separate combined depictions in fictionalised non-fiction picturebooks (Backman, 2022).

There are also variation theory studies on reading comprehension with older children. In a learning study (Marton, 2015) with 9-year-olds in Sweden and Hong Kong, differences were studied between how the multidimensional learning of reading comprehension was taught in different cultures (Holmqvist et al., 2010). Another learning study on reading comprehension focused on 10 to 12-year-old students' inferential knowledge. The teaching was designed in accordance with variation theory principles, with the object of learning being to develop an ability to draw conclusions about a protagonist's character traits in a fictional text (Rosenbaum, 2019; Rosenbaum et al., 2021).

However, the most common area of research using variation theory is mathematics education. In preschool, studies have been carried out with picturebooks specially designed in accordance with variation theory principles in order to make mathematical concepts visible for 1 to 3-year-olds (Björklund & Palmér, 2022) and 3 to 5-year-olds (Björklund & Palmér, 2020). The objectives of learning in these studies concerned basic aspects of numbers.

This background of previous variation theory studies on teaching about children's literature shows that the present study differs from the previous ones. The previous studies have had at the centre of their analysis (more or less) defined learning objects about an ability to be developed in teaching with the support of the selected children's books. This does not apply in this variation theory study, in which a theoretical idea, involving children's discernment through synchronic simultaneity as a key to their ability to imagine, is instead explored in an analysis of a reading activity with a picturebook in which there is no predetermined learning objective. The exploratory approach of this study is described in the [Methods](#) section.

A Study on Ways of Experiencing Shadows in Picturebooks

The interest in studying children's discernment as a key to their imagination was sparked by a previous study of 5-year-olds' ways of experiencing the ambiguous phenomenon of shadow in four picturebooks about shadow (Backman, 2020). The results of that study showed that the children's ways of experiencing shadow could be linked not only to aspects of the phenomenon that they had discerned before the reading activity but also to aspects that they discerned during the activity. The aspects of shadow that the children discerned, with the support of either diachronic or synchronic simultaneities, were related to the ways of experiencing shadow that were foregrounded in the reading activities.

The children's statements in the reading activities showed several different ways of experiencing shadow, one of which was shadow as a light phenomenon. Their way of experiencing shadow as a light phenomenon was particularly common in the reading activity involving *The Black Rabbit* (Leathers, 2014), even though the sun is repeatedly out of the picture in this picturebook. Despite the absence of the sun, the children discerned and imagined some aspects of shadow as a light phenomenon, while other aspects seemed difficult to discern.

When the analysis showed that the children discerned and imagined aspects of the light phenomenon in the moment, seemingly without referring to previous experiences (Backman, 2020), this aroused an interest in being able to theoretically explain children's imagination using variation theory (Marton, 2015). Others, for example Vygotsky (1930/2004), have described that children's imagination is based on their previous experiences. The key to children's imagination that Vygotsky describes explains that when their previous experiences with the light phenomenon of shadow are limited, it becomes difficult for them to imagine aspects of the phenomenon, such

as the position of the sun (Fig. 1). However, this key does not explain what enabled the children during the reading activity to imagine other aspects of shadow as a light phenomenon. Hence, a theoretical idea concerning children's discernment through synchronic simultaneity as a key to their ability to imagine will be explored in this study.

Theoretical Framework

This study's theoretical idea has its origins in variation theory. According to variation theory (Marton, 2015), a phenomenon such as shadow becomes possible for children to experience as a light phenomenon when one or more aspects of shadow as a light phenomenon are discerned by them in the present or have been discerned by them in the past. One or another way of experiencing shadow (such as shadow as a light phenomenon or as a fantasy phenomenon, or as some other kind of phenomenon) coming to the fore for children in a reading activity has to do with the variation in the aspects of the shadow phenomenon presented to them. If they are to experience shadow as a light phenomenon, one or more aspects of shadow need to be made possible to discern through a carefully designed pattern of variation and invariance, such as contrast. Discernment of the aspects occurs when variation is offered against a background of invariance. The aspects that the children discern constitute their way of experiencing the phenomenon. Based on the depictions in *The Black Rabbit* (Leathers, 2014), the following aspects appear necessary to discern in order for the children's experience of shadow as a light phenomenon to take place:

- The *visibility* of the shadow varies depending on the sunlight and whether a projection surface is present or absent,
- the *length* of the shadow varies depending on the positioning of the sun, and,
- the *placement* of the shadow varies depending on the positioning of the sun.

To experience shadow as a light phenomenon (rather than as a fantasy phenomenon or any other phenomenon that it can be experienced as), aspects of shadow as a light phenomenon must be simultaneously discerned.

There are two kinds of simultaneity, *diachronic* and *synchronic* (Marton et al., 2004; Marton, 2015), and differences between the two involve the time aspect of simultaneity. Aspects that children discern in the present moment are discerned with synchronic simultaneity, while those that they have discerned previously are discerned in subsequent encounters with diachronic simultaneity. The picturebook *Rabbit or Hare?* by Rice (2022) can be used

to exemplify these two kinds of simultaneity. Rabbits and hares, both lagomorphs, are different species within the same group. These animals are similar in many aspects, but rabbits and hares can be experienced as different species if the focus is directed at their characteristics. In order for a rabbit in a picturebook to be experienced as a rabbit and not as a hare, a discernment of differences between rabbits and hares can take place at the same time. When the book *Rabbit or Hare?* shows a rabbit next to a hare (Fig. 2), it is possible to synchronically compare their appearances, based on aspects such as *body shape* (rabbits are smaller while hares are larger), *leg length* (rabbits' legs are shorter and hares' legs are longer) and more.

When a child has discerned some distinguishing aspects of rabbits and hares, such as body shape and leg length,



Fig. 2 Picture from *Rabbit or Hare?* (Rice, 2022), used with permission from publisher Bullfrog Books



Fig. 3 Picture from *Rabbit or Hare?* (Rice, 2022), used with permission from publisher Bullfrog Books

and then encounters a hare in the picturebook without a rabbit being there for comparison (Fig. 3), the child can, with diachronic simultaneity, use what he or she has already discerned about leg length to determine whether the depicted animal is a rabbit or a hare. But without previous experience of how long rabbits' legs are compared to how long hares' legs are, it is difficult to determine, based on leg length, whether the animal in the picture is a rabbit or a hare. It is not possible to compare the leg length of rabbits and hares through synchronic simultaneity when only one of them is visible in the picture, as in Fig. 3.

Consequently, imagining something that is not present but has previously been discerned through contrasting one or more necessary aspects (e.g., a rabbit's leg length contrasted with a hare's leg length in the same picture) makes it possible to recognise the kind of lagomorph that appears alone (such as in Fig. 3), through diachronic simultaneity (e.g., a past discernment of the leg lengths of rabbits and hares contrasted with the leg length of a hare in the present). This explains how the child can imagine something that is not present, and also why certain phenomena are not possible to imagine. For example, if previous comparisons between the leg lengths of hares and rabbits have not been made, discernment of the leg length aspect from before is missing. If, then, comparisons between the leg lengths of the hare and the rabbit are also not made in the moment, when only one of the animals is visible in the picture (as in Fig. 3), discernment of the leg length aspect is also missing. Whether children can imagine aspects (such as leg length and body shape) of a phenomenon (such as lagomorphs) is therefore related to what they discern in the present or have discerned in the past. The present study intends to shed particular light on children's discernment through synchronic simultaneity as a key to their ability to imagine.

Methods

The purpose of this study, as mentioned, is to explore a theoretical idea in relation to a body of empirical material from a reading activity involving *The Black Rabbit* (Leathers, 2014), a picturebook about shadow. Since an idea in the making is being studied, an exploratory approach will be applied. Such an approach may be useful when creating an overview that indicates a direction for continued research (Pramling, 2010). "Besides helping us to obtain an overview of a new field of inquiry, an exploratory study thus holds the promise of clarifying more specific questions to pursue in subsequent studies, questions that are grounded in and hence inherently relevant to the practice studied" (Pramling, 2010, p. 162). The theoretical idea

explored in this study concerns children's discernment through synchronic simultaneity as a key for their ability to imagine. If this theoretical idea turns out to be useful for analysis in this small-scale empirical material, it could be used for analysis in more, and larger, studies on children's ability to imagine depictions in picturebooks.

The Reading Activity and Its Participants

In 2015, when the selection of books about shadow for the previous study on children's ways of experiencing the multifaceted phenomenon of shadows took place (Backman, 2020), according to database searches and email contacts with the Swedish Institute for Children's Books (SBI) and libraries, in the past 10 years there had only been four picturebooks about shadow published in Swedish for 3 to 6-year-olds. Among these four picturebooks, which were read to the children (Backman, 2020), *The Black Rabbit* by Leathers (2014) stood out; not only as the picturebook that the children appreciated the most, but also as the one from which the most conversations about shadow as a light phenomenon arose. Therefore, the empirical material from the reading activity with *The Black Rabbit* (Leathers, 2014) was selected for this study. The picturebook, *The Black Rabbit* (*Den svarta kaninen* in Swedish) by Leathers (2014), was originally written in English, and has since been translated into several languages. In the reading activity included in this study, the Swedish translation of the picturebook was read. The original English text that belongs to each picture can be found in the captions.

The video material consists of a transcribed 27 min video recording of this reading activity, carried out in spring 2016. The total video material from 2015, previously used in the study of 5-year-olds' ways of experiencing the ambiguous phenomenon of shadow (Backman, 2020), consists of 93 min of video, divided into four reading activities carried out on four occasions (27 + 27 + 19 + 20 min = 93 min). *The Black Rabbit* (Leathers, 2014) was read and discussed at the first of these reading activities. In the empirical examples from this reading activity, what the children and teacher say and do is shown in normal text, and when something is read from the children's books it is shown in italics. Actions are shown in parentheses.

An experienced teacher and five 5-year-olds at a Swedish preschool participated in the reading activity involving *The Black Rabbit* (Leathers, 2014). The participating children's legal guardians as well as the teacher gave written consent to participate in the study. To ensure that the children participated voluntarily, they were verbally informed about the study before the reading activities were carried out and were told that their participation was optional. The study follows the four research ethics principles stated by the Swedish

Research Council (2017): secrecy, professional secrecy, anonymity, and confidentiality.

The teacher and the children at this preschool were well acquainted with reading activities, as reading aloud and talking about picturebooks was a daily activity there. The teacher was informed that the picturebook was about shadow and that she could interact with the children in the way she usually did when reading books with them. She was also informed that from the researcher's perspective there was no predetermined learning object of or goal for the reading activity. Nor did the teacher state any pre-selected and planned learning objects or goals for the reading activity. This created openings for the teacher and the children to choose learning objects or goals while reading *The Black Rabbit* (Leathers, 2014). Based on what the teacher and children focused on and talked about in the reading activity, different objects of learning arose. A prominent learning objective, chosen during the performance of the reading activity, entailed reasoning about the relationship between light and shadow in the picturebook.

Analysis Procedure

The study's analysis examines what in regard to shadow as a light phenomenon is possible for children to discern when the sun is out of the picture in *The Black Rabbit* (Leathers, 2014), as well as what is opened up for them to imagine about shadow as a light phenomenon through this discernment. Answers to these questions are explored based on what the children express in words and actions, discerning with synchronic simultaneity. Relationships between the necessary aspects of shadow as a light phenomenon, *visibility*, *length* and *placement*, are sought in relation to what the children might imagine about these aspects. For example, when the children talk about what is needed for the shadow to be seen while relating this to what they see and hear in the reading activity involving the picturebook (and not to their previous experiences), visibility is identified as an aspect of shadow as a light phenomenon that is possible to discern when different aspects of visibility are contrasted with synchronic simultaneity. Then, a connection is sought between what the children express that they discern regarding the visibility of the shadow and what they express that they imagine regarding the same. For example, if the children say that it is darker in one picture and brighter in another, this is an expression of discerning the light in two contrasting pictures. This contrast makes possible a discernment of the visibility of shadow dependent on the light. At the same time, the contrast enables the children to imagine the sunlight in the picturebook. In this way, the children's discernment of aspects in a picturebook becomes a key that unlocks their ability to imagine depictions from the picturebook.

Results

The purpose of this study, as mentioned, is to explore a theoretical idea in relation to a body of empirical material from a reading activity involving *The Black Rabbit* (Leathers, 2014), a picturebook about shadow. To explore this idea, an analysis has been conducted on a reading activity involving this picturebook to answer the research questions: What in regard to shadow as a light phenomenon is possible for children to discern when the sun is out of the picture? and What does this discernment open up for children to imagine about shadow as a light phenomenon?

The analysis shows that it was possible for the children to discern how the sunlight as well as the absence and presence of projection surface in the pictures make the visibility of the shadow vary. Variation with synchronic simultaneity, in the form of contrast between brighter and darker pictures, and of the presence and absence of projection surfaces in the pictures, made possible the discernment of the shadow's visibility. This also opened up for the children to imagine in the pictures both the sun's light and different kinds of surfaces. Children's discernment through synchronic simultaneity thus appears to be a key that unlocks their ability to imagine explicit depictions in a picturebook.

The analysis also shows that it was not possible for the children to discern how the position of the sun makes the length and placement of the shadow vary, as the sun is consistently out of the picture. When looking at a depiction lacking variation with diachronic and synchronic simultaneity of the sun's position in relation to the shadow's length and placement, it was difficult for the children to discern the length and placement of the shadow. When discernment with diachronic or synchronic simultaneity does not occur, neither of the two keys to children's imagination is used that

could unlock children's ability to imagine implicit depictions in the picturebook.

Based on the analysis of this study's empirical material, children's discernment through synchronic simultaneity may be a key to their ability to imagine. This will be exemplified in the following:

Imagining the Sunlight Based on the Visibility of the Shadow

It was possible for the children to discern how the sunlight makes the visibility of the shadow vary. Their discernment of the shadow's visibility opened up for them to imagine the light of the sun in the picturebook. In the beginning of the reading activity about *The Black Rabbit* (Leathers, 2014), the children compared pictures in which the shadow of the little rabbit is visible with pictures in which it is not (Fig. 4).

The pictures showed that when the little rabbit is in bright light in the meadow its shadow is visible, but when the rabbit is in the forest where it is darker, no shadow is visible. The children said that whether or not the shadow is visible in a picture had to do with the light, whether it is brighter or darker in the picture. The visible and non-visible shadow in the pictures made the visibility aspect discernible to the children. Thus, it seemed that the book's depictions of lighter and darker pictures were contrasted with synchronic simultaneity, offering the children an opportunity to discern visibility and to imagine the sunlight in the book. The children's discernment of how the sunlight makes the visibility of the shadow vary, seemed to be a key to their ability to imagine the depiction of the sun's light in the picturebook.



Fig. 4 In English, the text for the picture on the left reads: *But something was wrong. He was alone. Rabbit was scared. "Go away, Black Rabbit!" he cried. But the Black Rabbit did not move.* The English text for the picture on the right reads: *The forest was dark and quiet.*

The Black Rabbit was nowhere to be seen. Picture from *The Black Rabbit* (Leathers, 2014), used with permission from Swedish publisher Berghs förlag

Imagining Surfaces Based on the Visibility of the Shadow

It was possible for the children to discern how the presence and absence of the projection surface makes the visibility of the shadow vary. The children's discernment of the shadow's visibility opened up for them to imagine surfaces on which the shadow may or may not be projected in the picturebook. Excerpt 1 exemplifies this: In conversations about the visibility of the shadow, the projectable and non-projectable shadow in the picturebook made the aspect of visibility discernible for one of the children, Jenny.

Excerpt 1: The Visibility of the Shadow

The teacher has read *The Black Rabbit* (Leathers, 2014) to the children. Now, they are browsing through the book and talking about some pictures they find particularly interesting. The teacher points out that the shadow of the rabbit's ears is not completely visible between the reeds in the picture (Fig. 5).

Teacher: I actually see something exciting here on the shadow. If you think, look here, the rabbit has whole ears, but the ears aren't whole there (points to the rabbit's shadow in the book). It's like pieces chopped out of the ears.

Albin: Maybe somebody cut them? (shows his fingers as scissors).

Teacher: Hmm ... (looks at Jenny).

Jenny: Or it's grass ... or you don't see ... or you don't see it when it's light there.



Fig. 5 In English, the text for this picture reads: *The Black Rabbit climbed out of the water too!* Picture from *The Black Rabbit* (Leathers, 2014), used with permission from Swedish publisher Berghs förlag

Teacher: You think you only see, only where it's shining ... or where the shadow's on the grass. Because over there maybe it's just air? That was an ingenious thought (turns the page in the book).

The picture shows that when the little rabbit's shadow falls on a patch of reeds it becomes visible on the reeds, but when its shadow falls between the reeds parts of the ears are not visible in the shadow. The teacher directed the children's attention to the parts of the ears in the shadow that are not visible, thus contrasting the visibility of the shadow with and without a projection surface. At this, Jenny expressed that the difference that makes the shadow visible or not has to do with the fact that it is not possible to see the shadow of the ears between the blades of grass where the shadow has no projection surface. The contrast between the presence and absence of the projection surface made the visibility aspect discernible for Jenny. The depiction of projectable and non-projectable shadow, contrasted through synchronic simultaneity, offered Jenny an opportunity to discern how the shadow varies in visibility and to imagine surfaces in the picturebook on which the shadow may or may not be projected. Jenny's discernment of how the presence and absence of the projection surface makes the visibility of the shadow vary, seemed to be a key to her ability to imagine projection surfaces that exist (the reeds) and projection surfaces that do not exist (the spaces between the reeds).

Not Imagining the Sun's Position Based on the Length of the Shadow

It was not possible for the children to discern how the position of the sun makes the length of the shadow vary. When their previous experiences of the position of the sun in relation to the length of shadows are limited, and when the sun is out of the picture, opportunities to imagine the position of the sun are never opened up. Excerpt 2 exemplifies this: In conversations about the length of the shadow, the children said nothing about how the position of the sun makes the length of the shadow vary.

Excerpt 2: The Length of the Shadow

After reading *The Black Rabbit* (Leathers, 2014), in conversations about pictures they find particularly interesting in the book, the teacher and children discuss the shadow's long thin legs in relation to the rabbit's short legs (Fig. 6).

Teacher: Now let's see here (browsing through the book). I think this is a bit exciting when he has such long and thin legs and that one has such short ones. Do you think the sun's risen so high in the sky or is the sun still just as far down?

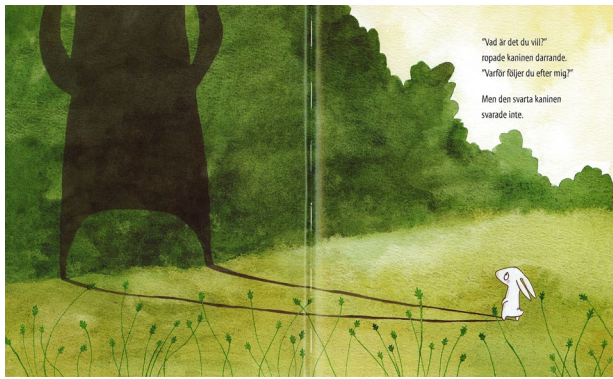


Fig. 6 In English, the text for this picture reads: “What do you want?” cried Rabbit, trembling. “Why are you following me?” But the Black Rabbit did not reply. Picture from *The Black Rabbit* (Leathers, 2014), used with permission from Swedish publisher Berghs förlag

Edvin: It’s this big! (walks over and stands in front of the sofa)

Albin: Not so far down.

Teacher: (repeating what Albin said) Not so far down...

Albin: I think it’s there! (points to the yellow sky in the upper right corner of the picture).

The picture shows the little rabbit’s shadow as long. The teacher directed the children’s attention to the relationship between the shadow’s length and the sun’s position. However, the positioning of the sun, an important aspect for the length of the shadow to be discernible, cannot be seen in the picture. The children expressed different ideas about where the sun can be positioned. For example, apparently based on what he could discern from the picture through synchronic simultaneity, Albin said that the yellow sky in the upper right corner of the picture represents where the sun is. Since the relationship between the length of the shadow and the position of the sun cannot be perceived in the picture, and as the children seemed to have limited previous experience of how the positions of light sources affect the shadows’ lengths, it was not possible for them to discern how the position of the sun varies the length of the shadow. Thus, it did not become possible for the children to discern length as an aspect of shadow as a light phenomenon. For children with limited previous experience of the relationship between shadow length and the position of the sun, both keys (diachronic and synchronic discernment) to the ability to imagine where the sun is positioned in the sky were missing.

Not Imagining the Sun’s Position Based on the Placement of the Shadow

It was not possible for the children to discern how the position of the sun makes the placement of the shadow vary. When the children’s previous experiences of the position of the sun in relation to the placement of shadows were limited, and when the sun is out of the picture, opportunities to imagine the position of the sun are never opened. Excerpt 2 exemplifies this: In conversations about the placement of the shadow, the children said nothing about how the position of the sun makes the placement of the shadow vary.

Excerpt 3: The Placement of the Shadow

After reading *The Black Rabbit* (Leathers, 2014), in conversations about pictures in the book they find particularly interesting, the teacher and children discuss the placement of a bird’s shadow (Fig. 7).

Teacher: The bird has no shadow here.

Edvin: (Points to the rabbit in the book) He has a shadow.

Teacher: Why does the bird have no shadow then?

Jenny: That’s because he’s behind a tree.

Teacher: Aha! Exactly, where must the sun be then? Unless it has a shadow?

Jenny: Then the sun’s on the other side.



Fig. 7 The original English text for the picture reads: “...there was the Black Rabbit right in front of him!!” Picture from *The Black Rabbit* (Leathers, 2014), used with permission from Swedish publisher Berghs förlag.

Teacher: Is it? There should have been a small shadow on the tree.

The picture shows the little rabbit's shadow falling on the tree on the left, while the little bird's shadow is not visible. The teacher directed the children's attention to the relationship between the shadow's placement and the sun's position. However, the picture does not show the positioning of the sun, which is a necessary aspect for the placement of shadows to become discernible. Jenny argued that the bird is behind the tree and that 'the sun's on the other side'. However, it is unclear which side she meant by 'the other side', and the teacher seemed to question her statement about where the sun is positioned. Since the relationship between the shadow's placement and the sun's position cannot be perceived in the picture, and as the children seemed to have limited previous experience of how the positions of light sources affects shadow placement, it was not possible for them to discern how the position of the sun varies the placement of the shadow. Thus, it did not become possible for the children to discern placement as an aspect of shadow as a light phenomenon. For the children with limited previous experience of the relationship between the placement of shadows and the position of the sun, both keys (diachronic and synchronic discernment) to the ability to imagine where the sun is positioned in the sky were missing.

Discussion

The purpose of this study was to explore a theoretical idea in relation to a body of empirical material from a reading activity about a picturebook on shadow. In the analysis of the empirical material from the reading activity involving *The Black Rabbit* (Leathers, 2014), children's discernment through synchronic simultaneity appeared to be a key that unlocked their ability to imagine explicit depictions from the picturebook (such as the sunlight and the surfaces of the objects depicted); see [Imagining the Sunlight Based on the Visibility of the Shadow](#) and [Imagining Surfaces Based on the Visibility of the Shadow](#) sections in the results. However, the analysis also showed that when the children did not discern through diachronic or synchronic simultaneity, neither of the two keys to children's imagination was used to unlock their ability to imagine implicit depictions in the picturebook (such as where the sun is placed out of the picture); see [Not Imagining the Sun's Position Based on the Length of the Shadow](#) and [Not Imagining the Sun's Position Based on the Placement of the Shadow](#) sections in the results. The present study is an exploratory study which, in accordance with Pramling's (2010) descriptions, has had an ambition to create an overview of what was explored in order to outline

what can be investigated in subsequent studies. The results obtained in this study can serve as inspiration to conduct further and more extensive studies that challenge the limits of this study's variation theory explanation of children's imagination. This discussion is, therefore, mainly about further studies that might need to be carried out based on the findings of this study, but some didactic implications will also be discussed.

In this study's results, the second key to children's imagination (discernment through synchronic simultaneity) only unlocks their ability to imagine explicit depictions. If this second key to children's imagination can only open up for them to imagine explicit depictions in picturebooks but not implicit ones, this would mean that they cannot imagine implicit depictions without access to the first key (discernment through diachronic simultaneity). After all, Vygotsky (1930/2004) described the key to children's imagination to be their previous experiences. If this is the case, children need to be presented with many kinds of experiences before encountering picturebooks in order to be able to imagine their implicit depictions. More research is needed, however, as this study's findings were based solely on a theoretical idea explored based on empirical material from one reading activity involving one picturebook. A follow-up study could continue the exploration of discernment through synchronic simultaneity as the second key to children's ability to imagine implicit depictions in picturebooks.

When both keys to children's imagination, synchronic and diachronic simultaneity discernment, are missing, such as when the children cannot discern the sun's position (Excerpts 2 and 3), synchronic simultaneity discernment could possibly be created by the teacher telling them where the sun might be. Children trust what teachers tell them (Harris, 2012), which means that if the teacher in the reading activity involving *The Black Rabbit* (Leathers, 2014) had told the children where the sun might be placed out of the picture, they might have trusted what she told them and imagined the position of the sun. However, this teacher was told by the researcher to carry out the reading activity in the way she usually does, which seemed to be to refrain from making implicit depictions in the picturebook explicit to the children. In further research, it would be interesting to study reading activities in which a teacher is instructed to make implicit depictions in picturebooks explicit to the children.

This study has used an exploratory approach, which is why the teacher was informed that from the researcher's perspective there was nothing specific she should direct the children's attention to when reading *The Black Rabbit* (Leathers, 2014). This offered opportunities for spontaneous objects of learning to arise in the reading activity, such as reasoning about the relationship between light and shadow in the picturebook. Studies subsequent to this one could be

planned and executed differently, possibly more like how variation theory studies are usually designed, with an intentional object of learning at their centre (Asplund Carlsson, 1998; Backman, 2022, 2023; Björklund & Palmér, 2020, 2022; Holmqvist et al., 2010; Rosenbaum, 2019; Rosenbaum et al., 2021). A future study's object of learning may be involve developing children's ability to imagine implicit depictions in picturebooks.

As mentioned, the children imagined depictions that are explicitly depicted in *The Black Rabbit* (Leathers, 2014), but not those that are implicitly depicted in the picturebook. This is interesting, given that children's picturebooks often contain fictional phenomena with obscure implicit depictions (Backman, 2020), which could be more difficult to discern and imagine than depictions of shadow as a light phenomenon, which children may have experienced in everyday life. In subsequent studies on children's discernment through diachronic and synchronic simultaneity as keys to their imagination, it would be of interest to focus on fictional phenomena in picturebooks and their implicit depictions.

If synchronic simultaneity is a key that only unlocks children's ability to imagine explicit depictions in a picturebook but not the implicit ones, this may have didactic implications. Teachers cannot assume that children can imagine implicit depictions in picturebooks if they have not previously discerned their aspects. Instead, they could listen to what the children express that they discern from the depictions. After this, they can try to make it possible for the children to discern the critical aspects, that is, those that they have not yet discerned, but need to discern in order to imagine the depictions.

The theoretical explanation presented in this study should be of interest to teachers and researchers, as well as others with an interest in children's encounters with picturebooks, who want them to be provided the conditions for being able to imagine picturebook depictions.

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