University of Groningen

Problem-solving during shared reading at kindergarten

Gosen, Myrte; Berenst, Jan; de Glopper, Kees

Published in:
Classroom Discourse

DOI:
[10.1080/19463014.2014.991339](https://doi.org/10.1080/19463014.2014.991339)

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2015

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Gosen, M., Berenst, J., & de Glopper, K. (2015). Problem-solving during shared reading at kindergarten. *Classroom Discourse*, 6(3), 175-197. <https://doi.org/10.1080/19463014.2014.991339>

Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

Problem-solving during shared reading at kindergarten

Myrte N. Gosen, Jan Berenst & Kees de Gloppe

To cite this article: Myrte N. Gosen, Jan Berenst & Kees de Gloppe (2015) Problem-solving during shared reading at kindergarten, Classroom Discourse, 6:3, 175-197, DOI: [10.1080/19463014.2014.991339](https://doi.org/10.1080/19463014.2014.991339)

To link to this article: <https://doi.org/10.1080/19463014.2014.991339>

Published online: 22 May 2015.

Submit your article to this journal [↗](#)

Article views: 301

View Crossmark data [↗](#)

Citing articles: 1 View citing articles [↗](#)

Problem-solving during shared reading at kindergarten

Myrte N. Gosen^{a*}, Jan Berenst^b and Kees de Glopper^a

^a*University of Groningen, Center for Language and Cognition Groningen (CLCG), The Netherlands;* ^b*NHL University of Applied Sciences, Leeuwarden, The Netherlands*

This paper reports on a conversation analytic study of problem-solving interactions during shared reading at three kindergartens in the Netherlands. It illustrates how teachers and pupils discuss book characters' problems that arise in the events in the picture books. A close analysis of the data demonstrates that problem-solving interactions do not only occur when directly asked for by the teacher; more importantly, pupils are found to be oriented to problem-solving without being explicitly invited to do so. Our analyses show that shared reading offers pupils room for hypothesising where teachers and pupils can discuss possible solutions for the problems experienced by the book characters. By using problem-solving to talk and think about problematic book-related events, pupils from 4 to 6 years old practise basic elements of problem-solving that are important from a developmental perspective.

Keywords: classroom discourse; young children; problem-solving; shared reading; conversation analysis

1. Introduction

This study investigates the shared reading interactions of three kindergarten teachers and their pupils who participated in a shared reading programme in which talking about books played a central role. The teachers and pupils are found to use shared reading interactions for problem-solving. The events central to the picture books read to the children and, more specifically, the (problematic) experiences of the book characters occasion classroom interactions that are centred on solutions. Studying these interactions is of value since there is a paucity of research into problem-solving interactions, especially when it comes to young children solving real-world problems.

2. Shared reading interactions

Shared reading is a common practice in the home environment as well as in educational settings. The effects of shared reading on language and literacy development are well documented. Shared reading teaches children how to interact with books (Snow and Ninio 1986), provides insight into the properties of written language and letter–sound relations (Sulzby 1985) and enables children to become familiar with language with a higher linguistic complexity (Crain-Thoreson, Dahlin, and Powell

*Corresponding author. Email: m.n.gosen@rug.nl

2001; Hayes and Ahrens 1988; Hoff-Ginsberg 1991; Van Elsäcker and Verhoeven 1997).

So-called dialogic or interactive shared reading is a special form of shared reading that supplements the reading experience with opportunities for children to participate in complex discourse that further stimulates the language and communicative development of the child (Berenst 2006; Crain-Thoreson and Dale 1992; Massey 2004). Interactive shared reading is not a uniform practice. How much room is offered for children to actively participate, and the kinds of contributions they are invited to make, depends on the shared reading styles of adults. These styles differ with regard to the placement of commentary before, during or after shared reading and the demand level of the interactions (Dickinson and Smith 1994; Greene Brabham and Lynch-Brown 2002; Reese and Cox 1999).

The demand level ranges from a lower-demanding *describer style* (Reese and Cox 1999) that focuses on describing and labelling pictures to a higher-demanding *comprehender* or *performance/performance-oriented style* (Greene Brabham and Lynch-Brown 2002; Reese and Cox 1999). These higher-demanding styles 'require that the child goes beyond the immediate context of the text to understand why an event happened or to evaluate what that event might mean for the character or the reader' (Reese and Cox 1999, 21) and are characterised by the analytical nature of the talk (Dickinson and Smith 1994).

Practising these sorts of analytical talk in the school environment assists children in vocabulary development, but also in deriving meaning from texts. Additionally, it contributes to the construction of knowledge. The influence of participation in interactive shared reading has been shown not only for language and literacy development (e.g. Mol et al. 2008; What Works Clearinghouse 2007), but also for topical or conceptual development in the literary, emotional and mathematical domains (Kwant 2011; Van den Heuvel-Panhuizen, Van den Boogaard, and Doig 2009; Van der Pol 2010).

Shared reading offers opportunities to orient to situations, events and concepts that children may not have encountered in real life, such as other cultures, different people or problems they have not experienced themselves. Literary narratives offer models or simulations of the social world (Mar and Oatley 2008). From the moment children enter school, books may be used to evoke compassion and thus to stimulate children's development of empathy (Cress and Holm 1998). Through the indirect or vicarious experiences that shared reading offers, children develop scripts, such as a 'birth of a sibling-script' or a 'hospitalisation-script' (Leseman 1998). While children distinguish reality from fiction (Flavell, Flavell, and Green 1987; Woolley and Cox 2007), books invite children to generalise information from fictitious situations to real-life situations (Ganea, Ma, and DeLoache 2011; Walker, Ganea, and Gopnik 2012).

That children are actively engaged with story characters is for instance shown by a study by Sipe (2002), who distinguished several ways in which children express their engagement with a book: they dramatise, talk back to the characters, try to critique or control the story, insert themselves in the story or take over the text to manipulate it in their own way (Sipe 2002). This shows that children's involvement with story characters becomes visible in interaction.

Concerning this engagement with books, one would expect children to respond to possible problems encountered by characters in books. That children are indeed able to recognise problematic events and book characters' attempts to solve

problems has already been shown by Stein and Glenn (1979), who analysed children's recollections of stories. However, as far as we know, shared reading interactions about problematic book events have not been studied before. This is surprising, since both shared reading and problem-solving have been related to knowledge development and learning (in interaction) for a long time.

3. Problem-solving in interaction

'A problem arises when a living creature has a goal but does not know how this goal is to be reached', according to a classical definition by Duncker (1945, 1). Attempts to achieve a goal by finding, choosing or constructing a solution are commonly referred to as 'problem-solving'. Problem-solving is crucial for everyday life and for the development of tools and technologies (Jonassen 2000; Lave 1988; Siegler and Alibali 2005). Education should therefore prepare children for the problem-solving tasks they will encounter in adult life. According to Gagné, 'practice in solving problems of many kinds is bound to be helpful in producing good human thinkers' (1985, 196). As Gagné (1985) stresses repeatedly, problem-solving yields new learning. By solving a problem, a learner acquires 'higher-order rules' that will help to solve similar problems and develops cognitive strategies that may assist in solving problems in a more general sense (Gagné, 1985). Thinking and reasoning about problems involves a variety of cognitive processes such as perception, language, memory and conceptual understanding (Siegler and Alibali 2005). On account of its practical and cultural importance, problem-solving is widely studied, primarily from an individual psychological perspective (Mayer 2013).

Research into problem-solving tends to focus on individuals' cognitive processing and addresses problem representations, planning, execution and monitoring. Classic issues are transfer (the effect of prior on new problem-solving), insight (mental breakthroughs that bring about knowledge of problem solutions) and heuristics (general approaches to problem-solving such as trial and error, hill climbing and means-ends analysis; Newell and Simon 1972). Classic distinctions are those between routine and non-routine problems and well-defined and ill-defined problems. While non-routine problems of an ill-defined nature are the most interesting, much research has focused on routine situations that are well-defined: the problem-solver has knowledge of solution methods and the given state, the goal state and the allowable operations for problem-solving are specified (Mayer 2013). Problem-solving is often studied in educational contexts where students grapple with mathematical and scientific problems, while everyday problems that occur outside school life are underexposed (Mayer 2013).

Problem-solving need not be an individual activity, as help can be asked for or offered. The role of tutoring in problem-solving has been studied in a variety of situations, starting with Wood, Bruner, and Ross's (1976) seminal analysis of the way adult tutors teach 3- to 5-year-old children how to build a three-dimensional structure. In a similar vein, Wertsch et al. (1980) and Wertsch, Minick, and Arns (1984) have studied how adult-child dyads consisting of mothers and their pre-school children function as problem-solving systems while making a puzzle in accordance with a model. Dyads consisting of mothers and their young children were studied while working on constructions or tying knots in a series of studies that were published together in the mid-nineties (González 1996; Hoogsteder, Maier, and Elbers 1996; Leseman and Sijlsing 1996; Nilhoml and Säljö 1996). Recent work by

Sun and Rao (2012) addresses 6-year-old children tying a knot using a picture as a resource and solving arithmetic problems on a worksheet with their mothers and teachers, respectively. Eagle (2012) analyses problem-solving interactions between a two and a half-year-old girl and her father and a two and a half-year-old boy and his mother while using digital technologies. These studies of adults tutoring young children demonstrate that interaction is determined by a range of factors: the nature and difficulty of the problem at hand, the ability level of the child, adults' and children's conceptions of the nature of the situation and the roles and responsibilities of participants.

Problem-solving interactions have also been studied in dyads or bigger groups that consist of peers. Peers in primary or high school are observed while talking about tasks including a mathematical or scientific concept. These tasks are more or less based on realistic problems, ranging from talking about a Raven's Test Puzzle (Mercer and Littleton 2007), exploring objects floating in water (Howe 2009) and discussing the mathematical concept of scale (Elbers and Streefland 2000) to more complex problems discussed by older students such as protein synthesis (Furberg and Arnseth 2009) or gas solubility in water (Karlsson, Ivarsson, and Lindström 2013). These peer interactions are most often analysed in terms of the nature of students' reasoning that becomes visible in their interactions. Mercer and Littleton (2007) have, for instance, distinguished *disputational*, *cumulative* and *exploratory talk*. The latter type of talk, in which pupils engage critically but constructively with each other's ideas, is found to be related to the development of joint and individual problem-solving skills.

In most studies, adult-child and peer groups have to deal with well-defined problems. Ill-defined problems are underexposed. This can be considered a serious bias, since 'most problems in daily life are ill-defined' (Eshach 2006, 34). This does not mean, however, that ill-defined problems are not studied at all. Real-world problems are, for instance, represented in classrooms by forms of anchored instruction (Cognition and Technology Group at Vanderbilt 1990), case-based teaching (Schank et al. 1994) and problem-based learning (Barrows and Tamblyn 1980). In these instructional models, stories confront learners with problems that are often ill-defined and of a complex nature. The stories are explicitly designed for educational purposes and carry problem cases that need to be solved by students.

Young children's fiction is another source of ill-defined problems. The previous section has argued that shared reading offers young children opportunities for empathy with book characters and familiarity with topics they have not yet met in real life. Picture books and other reading material therefore appear to be suitable vehicles for introducing ill-defined problems in the classroom. Book-related problems, however, are hardly present in studies of problem-solving. A study by Rodgers (2004-5) comes close, but addresses technical problems in the act of word reading. González (1996) studied mother-child interactions in three kinds of activities, one of them being the reading of a picture book, but she only reports on problem-solving interactions that concern the activity of constructing a figure.

Zhang et al.'s (2011) case study of a kindergarten teacher who succeeded in increasing her pupils' understanding of earth materials by means of adaptation of the problem-based approach starting with a book-related problem is the only exception we could identify. Their interesting analysis of classroom interactions focuses on the teacher's strategies and they describe, in very general terms, how she acknowledges and paraphrases students' responses without evaluating them. This

type of global analysis – of adult tutoring or of peer interaction – is very common in the problem-solving literature.

In another common approach to analysis, participants' contributions are coded as separate actions by means of pre-determined categories, thereby ignoring the sequential nature of interaction and precluding *discoveries* of the ways in which participants organise their joint activities (Pomerantz and Fehr 1997; Sacks 1992; Sacks, Schegloff, and Jefferson 1974). Consequently, the joint nature of problem-solving interactions is seldom acknowledged. Hoogsteder, Maier, and Elbers (1996), Elbers and Streefland (2000), Furberg and Arnseth (2009) and Karlsson, Ivarsson, and Lindström (2013) are positive exceptions, since these studies do use sequential analyses to describe how participants interact around problem-solving. Their analyses do not, however, reveal *how* problems are *launched* and *reacted on* in a detailed manner. Going one step further, we are convinced that an analysis of how problem-solving discourse actually unfolds, by close analysis of sequences of participants' contributions, can add to our understanding of problem-solving interactions. This calls for a conversation analytic approach, since this may help reveal *how* problem-solving is *done in* interaction.

That studying problem-solving interactions in such a detailed way indeed reveals the interesting details of these forms of interaction is proven by studies focusing on problem-solving by adults. Studies of adults solving problems in interaction are mostly done in work settings. At work, one regularly encounters problems that have to be solved in collaboration with co-workers. The moments of problem-solving, in workplace meetings for example, become explicitly visible *in* interaction. Studies investigating problem-solving in this context have shown that problem-solving interactions are not constituted in a straightforward, linear manner. Instead, problems and solutions are not always made explicit, problems are discussed in more depth before and while talking about possible solutions and a discussion of one problem and its possible solutions may be (temporarily) left aside for discussions on different (related) problems or for interactions of a different kind (Atkinson 1999; Button and Sharrock 2000; Huisman 2001; Koole and Ten Thije 1994; Middleton 1998; Van Kruiningen 2013). A global analysis of these interactions would not have revealed all the problem-solving details.

More insight into problem-solving discourse in a shared-reading setting around ill-defined problems contained in picture books is thus the aim of our conversation analytic study.

4. Data and methodology

Initial observations showed that during shared reading activities, the teachers and pupils comment upon problems that occur in the events in the picture books and discuss the protagonist's attempts to solve these. All these instances of problem-solving interactions during shared reading are gathered in a collection that has been studied from a conversation analytic perspective.

The collection of problem-solving interactions is drawn from 36 shared reading sessions of three kindergarten teachers and their classes from the northern part of the Netherlands. In the Netherlands, the first two grades of school are referred to as kindergarten (Dutch: *kleuterschool*). The age of the children in these two grades ranges from 4 to 6 years old. The three participating schools were comparable in several respects: all three schools were smaller-scale rural schools of around 90–200

pupils in total; all three teachers had significant teaching experience, ranging from 10 to 40 years; and all three classes consisted of around 20 children. In total, 59 children (35 boys and 24 girls) participated in the whole programme. During the programme some of these children were occasionally absent. These children, who were only occasionally present because they had just entered or changed school, are not taken into account. We got some additional information on 54 of the participating children from a questionnaire distributed among the parents (non-response: 5). Except for one dialect-speaker, all these children spoke Dutch with their parents. However, it should be noted that two of the five non-response questionnaires were probably not returned because of the other language spoken by the parents. Our question about parental educational levels revealed that a substantive percentage of all the parents (43.4%) had gone through higher education (were in possession of a Bachelor's or Master's Degree).

The participating teachers volunteered to participate in a shared reading programme spanning 12 weeks. They were asked to read two picture books a week, chosen by a team of experts and selected on the basis of their topical orientation within either a literary, social-emotional or mathematical domain.¹ The focus on these domains originated in the interest in conceptual development alongside children's language and literacy development.

The programme was set up to stimulate cognitively challenging interactions since, as described above, these have been found to contribute to conceptual development. Therefore, shared reading instructions supplemented the books in stimulating challenging discussions about their content. These instructions were designed to focus teachers and pupils on the most important concepts and events in the books that fit the conceptual domains and included suggestions to start talking about these concepts and events. It should be noted that the reading instructions did not have a specific focus on problem-solving. The current study should therefore not be characterised as a programme with a problem-based approach per se; however, as will be shown, teachers and pupils enter into a considerable amount of problem-solving.

The database consists of half of the total number of 72 shared reading sessions within the programme. The 36 sessions were videotaped using two cameras that registered the interaction from two different angles. The teachers wore external microphones. All the recorded sessions, of around 18 hours in total, were transcribed in accordance with transcription conventions in conversation analysis (Appendix 1) by means of the computer program *Transana* (Fassnacht and Woods 2004). Conversation analysis also formed the basis of investigation of the transcribed data (e.g. Ten Have 2007).

In conversation analytic research, a reliable collection gets established by repeatedly examining the data (Freebody 2003). Following the emic approach that plays a central role in conversation analysis, we identified problem-solving interactions as they were constituted in the data, instead of coding problems and/or solutions. We therefore focused on participants' interactional moves in order 'to discover how participants understand and respond to one another in their turns at talk, with a central focus being on how "sequences of actions" are generated' (Hutchby and Wooffit 1998, 14). The sequential moves of the participants were studied to gain insight into their contributions to and understanding of the problem-solving activities.

The collection of problem-solving interactions was established by selecting the instances where pupils' contributions were to be defined as solutions. Solutions can

be described as suggestions that are thought to assist a book character in reaching a goal (cf. the classical definition of Duncker 1945). The interactions around these instances where a solution could be identified are further investigated. These surrounding interactions were singled out from the complete transcriptions of shared reading sessions by determining if and how the solutions got elicited and how they were responded to by the teacher and/or by peers. The collection therefore consists of 43 fragments originating from 21 different shared reading sessions. All these problem-solving fragments are analysed in detail to gain insight into how participants constitute problem-solving interactions. The results will be described in terms of patterns, explicated and illustrated by examples from the data (Freebody 2003; Ten Have 2007).

5. Results

In the following, it will be shown how problem-solving interactions are constituted and continued during shared reading. At first, the focus lies on the start of problem-solving interactions as to see how the teachers and the pupils bring the problems of the book characters to their joint attention. In the study of Zhang and others (2011), the problem under discussion was explicitly launched by a story as a whole. In our study, it can be seen that problems may also become an interactional topic in more implicit manners during the reading of a story.

The complete collection of 43 fragments shows that problem-solving interactions are launched in more or less explicit ways. The most obvious start of problem-solving interactions is when teachers explicitly initiate such an interaction by raising a question (nine fragments). More interestingly, the other 34 fragments of the collection show that pupils may also be oriented to problem-solving without being explicitly asked to do so, and that this leads to comparable interactions. It will be shown that in these cases the usual starting point of a problem-solving episode consists of a *description* or *assessment* of a current state of affairs relevant to the book. Surprisingly, the start of these problem-solving interactions shares characteristics with the decision-making episodes in management meetings in which ‘participants recursively (1) formulate states of affairs, which can consist of events, situations, and actions, and (2) assess those states of affairs’ (Huisman 2001, 72).

Assessments explicitly evaluate a state of affairs. Regularly, *first assessments* are followed by a *second assessment* (Pomerantz 1984) or by some sort of a *reciprocal affect display* (Goodwin and Goodwin 1987). A first assessment is thus followed by an affiliation of some sort with the first speaker’s assessment. However, in this setting, evaluating something as unexpected or undesired also elicits solutions for the evaluated state of affairs which is interpreted as problematic. When speakers only formulate or describe a state of affairs, this is found to elicit solutions in the same sense. These *descriptions* entail an implicit assessment (Huisman 2001), since by formulating it participants make a state of affairs the topic of attention. Co-participants are expected to search for a reason for the description, supposedly find something problematic in the state of affairs and continue to address this with one or more possible solutions positioned right after a description is given.

Within the activity of shared reading, teachers and pupils are found to use descriptions and assessments that address a certain state of affairs presented in the books. Due to the presence of picture books, all *participants* have access to events, situations and actions that are offered as ‘assessable’ (Goodwin and Goodwin 1987)

and they are therefore able to talk about this. Participants most regularly produce descriptions or assessments right after a page of the book has been read and/or the accompanying picture has been shown, since the states of affairs have become assessable just before this point.

The following two paragraphs will demonstrate how problem-solving interactions are established around sets of circumstances brought up by means of a *description* (12 fragments) or an *assessment* (22 fragments). The first paragraph will describe how participants start a problem-solving interaction on the basis of a description or assessment of a state of affairs in the book. The second paragraph will illustrate the special role of picture books at the start of the problem-solving interactions. As will be shown, problem-solving interactions are also launched when a description or an assessment *performed by a book character* has been made the topic of attention.

After the two sections on the start of problem-solving interactions, the third and final section will illustrate what the continuation of problem-solving interactions looks like. The continuations are investigated since the problem-solving interactions as a whole give insight into the *joint* problem-solving in which pupils participate. As will be illustrated, problem-solving during shared reading interactions can be characterised as *tentative*.

5.1. Participants' descriptions and assessments as the start of problem-solving interactions

In 18 fragments, either teachers or pupils describe or assess a state of affairs from their own point of view. By doing so, they reflect on the book text and/or on the pictures in the book. This launches one or more solutions.

The descriptions function as first-pair parts in the form of a statement made by either the teacher or a pupil. In fragment 1 for instance, the teacher is reading the book *Ik wil groot zijn* (in English: *I want to be big*), about a little princess who wants to be taller than she is right now. On every page she asks someone else how she may become taller and on every page someone gives her advice that she has to keep track of. Here, she has just been given the sixth piece of advice and is recollecting the earlier ones by naming them. The accompanying picture shows the princess counting on her fingers. The teacher copies this by explicitly counting on her own fingers, while summing up the book text. When she calls out the fifth piece of advice, she looks at her hand and describes a current state of affairs (in lines 582–3). As can be seen, pupils offer a solution in the second position (line 585–8). The description thus seems to imply that the teacher evaluates ‘the rest not fitting in’ as something problematic.

Extract 1. (Haas, *Ik wil groot zijn*, 567–88).²

	Speaker	Transcript	Dutch Original
567	Teacher (reading)	•hh oh dear [the little	•hh oh lieve help [dacht de
568	Mitch	[she sits on a ↑pot	[ze zit op een ↑pot

(Continued)

Extract 1. (Continued).

	Speaker	Transcript	Dutch Original
569	Teacher	princess thought ((counts on	kleine prinses ((telt op handen)) i-
570	(reading)	hands)) I- I have to be nice and	ik moet aardig zijn en [lief en schoon
571		[sweet and clean	
572	Steve	[be sweet and clean	[lief zijn en schoon
573	Lydia	((counting on hands))	((telt mee op handen))
574	Teacher	and bra[ve and good in swi- ((looks	en dap[er en goed in zwe-
575	(reading)	at hand))	((kijkt naar hand))
576	Steve	[brave	[dapper
577		(1,0)	(1,0)
578	Steve	swim[ming	zwem[men
579	Teacher	[oh ((looks at hand where she	[oh ((kijkt naar hand waarop ze de
580		is counting on))	dingen aan het tellen is))
581		(0,8)	(0,8)
582	d→ ³ Teacher	the rest absolutely does not fit any	de rest kan d'r helemaal niet meer ↑bij
583		↑more	
584		(1,6)	(1,6)
585	s→ Mandy	[it does with your other hand	[wel je andere hand ((steekt hand naar
586		((moves hand forwards))	voren))
587	s→ Steve	[(sure with the other) ((moves hand	[(echt met de andere) ((steekt hand naar
588		forwards))	voren))

²All extracts are characterised by a fictional kindergarten name (Kikker, Eend, Haas), the picture book and the line numbers of the original transcripts. Because of the readability and length of the paper, we decided not to provide a literal word-by-word translation in the transcripts. We consider this legitimate since Dutch does not differ that much from English and this is not needed for the conclusions reached in this paper.

³d stands for *description*, s for *solution*, a for *assessment* and e for *evaluation*. Numbers indicate that the assessments consist of two parts.

This arithmetic problem could be characterised as an ill-defined problem. Although the most obvious solution would be, as the pupils indeed suggest, to use the other hand, one could think of other solutions that may help as well (writing it down; using your feet, as a pupil in another class suggested; and so on). Pupils are likely to come across problems like these, concerning remembering things, in everyday life.

In extract 2, it is a pupil who describes a state of affairs in a statement (line 201). When the teacher reads the book text of *Kleine Muis zoekt een huis* (in English: *A new house for Mouse*), at the point at which the protagonist has found an apple that she wants to take into her hole, Tim supposes that accomplishing this might be problematic, as suggested by the picture of the hole and the apple. Other pupils respond to his description by elaborating on it and by offering a solution to the implied problem.

Extract 2. (Eend, *Kleine muis zoekt een huis*, 195–213).

	Speaker	Transcript	Dutch original
195	Teacher	mmm how nice said little mouse I	mmm wat lekker zei kleine muis die
196	(reading)	will take the apple into my hole	appel neem ik mee naar mijn holletje
197		(0,4)	(0,4)
198	Daniel	home	huis

(Continued)

Extract 2. (*Continued*).

	Speaker	Transcript	Dutch original
199		(1,3)	(1,3)
200	Teacher	((looks in book))	((kijkt in boek))
201	d→ Tim	but I think that the apple does not fit	maar ik denk dat die appel niet in z- ze
202		in h- his little ↑hole through the	↑gaatje past door de deur
203		door	
204	Walter	yeh [for sure pretty big ((indicates	jah [vast wel erg dik ((duidt grootte aan
205		size with his hands))	met handen))
206	Kyra	[I think that (.) I think [that	[ik denk dat (.) ik denk [dat
207	Teacher	[(points	[(wijst naar
208		at Kyra)) kyra=	Kyra)) kyra=
209	Kyra	=I think that the apple is too big and	=ik denk dat die appel te dik is en ik denk
210		I think that •h the mouse cannot	dat •h de muis de appel ook niet vast kan
211		hold the apple	houden
212	s→ Simon	((looks at teacher)) BU:T he	((kijkt naar leerkracht)) MAA:R hij moet 'm
213		should eat it () ((looks at Kyra))	opeten () ((kijkt naar Kyra))

Tim's description is confirmed by Walter, and Kyra elaborates on it by describing a related state of affairs. Hereafter, Simon offers a first solution (lines 212–13). This shows that a description offered by one pupil might elicit a solution from another pupil. This is shown clearly in Simon's use of the conjunction word *maar* (*but*) which shows his orientation to the earlier contributions. With this he connects the description to his contribution, which offers a solution.

The foregoing extracts show that a solution follows a *description* given by either a teacher or a pupil. Assessments are established in a comparable way. An example of a pupil's assessment can be seen in the following extract. Here, the teacher reads the book text that reveals the problematic initiating event of the book *Wie is de liefste* (English: *Second Best*). The pupils are told that Bear is a soft toy belonging to Else, who is allowed to take her favourite cuddly toy to school the next day. Bear is really excited, since he is convinced that he will accompany Else to school. However, here the book text communicates that it is actually Dog that Else chose to take to school with her. Having heard this, Jack shows his empathy with Bear in an assessment (line 53).

Extract 3. (Kikker, *Wie is de liefste*, 45–76).

	Speaker	Transcript	Dutch original
45	Teacher	in the morning else always says	s ochtends zegt else altijd dag beer dag
46	(reading)	bye bear bye dog before she leaves	hond voor ze naar school gaat vandaag
47		for school today she will only say	zegt ze alleen dag hond denkt beer blij
48		bye dog bear thinks happily but	maar als else weggaat neemt ze hond mee
49		when else leaves she takes dog	dag beer zegt ze en dan holt ze naar
50		bye bear she says and then she	beneden de voordeur slaat dicht
51		runs downstairs the front door	
		closes with a bang	
52		(2,4)	(2,4)
53	a→ Jack	how sad	wat zielig

(Continued)

Extract 3. (Continued).

	Speaker	Transcript	Dutch original
54		(1,5)	(1,5)
55	Teacher	yes	ja
56		(0,7)	(0,7)
57	Jack	he really [wanted to go with her	hij wou [net zo graag mee
58	Samuel	[h o o ((looks at Jack))	[h o o ((kijkt naar Jack))
59	Teacher	((looks at Jack)) ((nods))	((kijkt naar Jack)) ((knikt))
60		(1,0)	(1,0)
61	Samuel	but ACTUALlly (.) >(cause the)< •h	maar EIGENlijk (.) >(want die)< •h
62		(1,0) but ↑ACTUALlly (no) the do-	(1,0) maar ↑EIGENlijk (ne) kan die ho-
63		dog cannot () alone	hondje () niet alleen
64		(1,3)	(1,3)
65	Teacher	no (.) but [it does happen	nee (.) maar [t gebeurt wel
66	s→ Tobias	[or together take both the	[of samen allebei de knuffels
67		soft toys	nemen
68	Teacher	yes	ja
69		(0,7)	(0,7)
70	e→ Jack	yes but that is not possible anymore	ja maar dat kan nu niet meer want nu is ze
71		cause she is already on her way	al onderweg
		now	
72	Teacher	((looks at Jack)) ((holds hands up	((kijkt naar Jack)) ((houdt handen op en
73		and hits with papers on her lap))	slaat met papieren op schoot))
74		(1,5)	(1,5)
75	Teacher	((looks in book)) I think it's really	((kijkt in boek)) ik vind t ook wel heel erg
76		sad too	zielig

In an assessment in line 53, Jack expresses that he feels sorry for Bear. Here, he negatively evaluates the situation in the book. Prior to Tobias offering a solution in lines 66–7, the assessment is taken up by the teacher, elaborated on by Jack and reacted upon by other pupils. Jack aligns with Tobias' solution to the problem but indicates *that is not possible anymore* (lines 70–1). The teacher then ends the problem-solving interaction by producing a delayed second assessment (*I think it's really sad too*) in lines 75–6. This indicates that an assessment might elicit *solutions* as well as *second assessments* as commonly found in everyday interactions (Pomerantz 1984).

Besides assessing a certain state of affairs in a statement, teachers also *ask* for assessments. This establishes problem-solving interactions in a comparable manner. An example of this can be seen in the following extract from a shared reading session of the book *Kikker is bang* (in English: *Frog is frightened*). The protagonist, Kikker (*Frog*), is frightened by noises he hears while lying in bed, so he runs to his other animal friends for help. They, in turn, become influenced by each other's fear. Here, the first friend, Eend (*Duck*), is infected by Kikker's fear, as becomes apparent in the book text. The teacher then asks a yes–no interrogative addressing an assessment of a protagonist's behaviour. Once completed, the collaboratively established assessment is followed by a solution.

Extract 4. (Kikker, *Kikker is bang*, 181–91).

	Speaker Transcript	Dutch original
181 a-1→	Teacher [hey samuel would it be necessary	he: samuel zou 't wel nodig zijn dat eend
182	that now duck is afraid as well	nu ook bang is
183	(0,4)	(0,4)
184	Teacher what do you think	wat denk jij
185 a-2→	Samuel ye:s	ja:
186	Teacher you think [so	jij denkt [van wel
187	Mike [yes	[ja
188 s→	Samuel bu- bu- bu- but may ↑be (.) (you	ma- ma- ma- maar mis ↑schien (.) (weet
189	know) maybe not afraid but they	je) misschien niet bang maar ze moeten,
190	should, (0,3) have a light if the	(0,3) een lamp hebben als die spook d'r
191	ghost is not coming and a uh flash	niet aankomt en eenu:h zaklamp
	light	

In this extract, Samuel is asked to indicate whether Eend should be afraid or not (lines 181–2). He answers the question (line 185) and then follows up with a reformulation of his response linked to a possible solution (lines 188–92). He suggests chasing away the earlier mentioned possible cause of the fear (a ghost). The collaboratively established assessment thus seems to orient him to Eend's fear, for which he offers a solution. Just as descriptions do, assessments thus also clearly project one or more solutions, either by a statement or by such a collaboratively established assessment.

5.2. Book characters' descriptions and assessments as the start of problem-solving interactions

Besides describing and assessing the actions, situations and events that occur in the book as *readers of the book*, teacher and pupils also discuss descriptions and assessments *of the protagonist* that become apparent in the picture book. As will be shown, these kinds of descriptions and assessments also trigger problem-solving interaction in 16 cases.

The descriptions by a book character differ from pupil or teacher descriptions illustrated in paragraph 5.1, since pupils launch solutions on the basis of the book text that includes a description instead of on the basis of descriptions that are provided by the interactants themselves. In extract 5, this concerns a description of Butterfly, one of the characters of the book *Bear is op vlinder* (English: *Bear loves Butterfly*). The initiating event in this book is that Bear is in love with Butterfly, but is too shy to tell her right away. Bear's goal is thus to demonstrate Butterfly his love for her. The whole book is centred on several attempts to do so. Here, Bear has just picked all the flowers he could find and given them to Butterfly in a bouquet. Butterfly then describes in the book text (lines 655–6) how she does not know how to get through winter without the honey from these flowers. This description implicitly displays Butterfly's negative stance towards Bear's action. This description is strengthened by a description given by the teacher in line 658, where she stresses Bear's ignorance. However, Rebecca offers a solution in overlap with the teacher in lines 659–60 and line 662.

Extract 5. (Eend, *Beer is op vlinder*, 651–64).

	Speaker	Transcript	Dutch original
651	Teacher	but bear (.) why did you pick all the	maar beer (.) waarom heb je alle
652	(reading)	flowers (.) you have to leave them	bloemen geplukt (.) je moet ze laten
653		there otherwise they do not give	staan anders geven ze geen
654		honey anymore (.)	honing meer (.)
655	<i>d</i> →	and how do I have to get through	en hoe moet ik nu de winter
656		winter now butterfly asks	doorkomen vraagt vlinder
657		(0,9)	(0,9)
658	Teacher	↑o:↓:h bear did not think about [that	↑o:↓:h daar had beer niet aan ge[dacht
659	<i>s</i> → Rebecca	[but then she can still get that at	[maar
660		home from the ehm	dan kan ze thuis toch wel dat uit dat ehm
661		(0,4)	(0,4)
662	<i>s</i> → Rebecca	nectar=	bloemenhoning halen=
663	Teacher	=yes but you know- ↑yes that	=ja maar weet je wat- ↑ja dat zou ook
664		would be a possibility ((turns page))	nog kunnen ((slaat bladzijde om))

The assessments of a protagonist display a response by the protagonist to a situation, action or event in the book. This becomes a topic of conversation through either a statement or a question–answer pair establishing an assessment. In the latter cases, the teacher invites the pupils to fill in the assessment of a book character that became apparent in the preceding book text and/or picture, as for instance in extract 6.

This extract originates from a shared reading session of the book *Van Mij!* (English: *Mine!*). In this book, an egocentric ghost suddenly shows up at a little girl's house and takes everything by saying *van mij (mine)*! The girl, Merel, reacts calmly to all the incidences in which the ghost is not sharing something, then teaches the ghost to share and play together. The story ends with the ghost changing for the better and even being able to say *voor jou (yours)*. In this extract, the teacher reads out the ghost's second attempt to take everything from Merel. In the interaction that follows, the assessment of the ghost's behaviour that is contained in Merel's response is made the topic of conversation.

Extract 6. (Eend, *Van mij!*, 137–59).

	Speaker	Transcript	Dutch original
137	Teacher	he quickly took all the bathing	hij pakte vlug alle badspulletjes van mij
138	(reading)	things mine merel shrugged her	merel haalde haar schouders op
139		shoulders and got into bath with a splash	en met een plons stapte ze in bad
140		(0,8)	(0,8)
141	Dries	pedoem=	pedoem=
142	Teacher	=hee[:	=hee[:
143	Dries	[poe	[poe
144		(.)	(.)
145	Teacher	merel shrugged her shoulders	merel haalde haar schouders op
146		(0,3)	(0,3)
147	Simon	((laughs))	((lacht))

(Continued)

Extract 6. (Continued).

	Speaker	Transcript	Dutch original
148 a-1→	Teacher	what is it merel wants to say with this	wat wil merel daarmee zeggen
149		(.)	(.)
150 a-2→	Rick	well that she	nou dat ze
151		(.)	(.)
152	Teacher	[°ri°	[°ri°
153 a-2→	Rick	[kind of likes it that he is in bath but	[het wel leuk vindt dat-ie in bad is maar
154		he-	hij-
155		(0,3)	(0,3)
156 s→		I think- (.) if I like it when a ghost	ik denk- (.) als ik het leuk vind als er
157		gets into bath (0,3) then I <u>just</u> get	een spook in bad ga (0,3) dan ga ik er
158		out then (0,3) I will climb on the	gewoon uit dan (0,3) klim ik even op de
159		toilet then I will open the <u>window</u>	wc dan doe ik dat <u>raam</u> open <u>p:oins</u>
		<u>p:oins</u>	

Rick gives a response that displays that he knows what shrugging your shoulders means (lines 150 and 153–4). Therewith, he also indicates that he understands Merel's assessment of the ghost's behaviour. Rick then immediately illustrates the unexpectedness of Merel's assessment by describing how he himself would assess and respond to the ghost's behaviour should there have been a ghost in his bath (lines 156–9). So, by addressing the assessment of Merel, a solution is launched in a comparable interactional way to when teacher and pupils themselves assess the behaviour or events in the books.

The two previous extracts show that pupils treat the descriptions or assessments by their teacher and/or peers and descriptions or assessments of book characters in a similar way. Both sorts launch similar problem-solving interactions. The following will show how these problem-solving interactions continue after the first solution is offered and how teacher and pupils explore possible solutions in longer problem-solving interactions.

5.3. Exploring a book character's possible solutions

The first solution that follows a description or assessment confirms that pupils recognise a set of circumstances as potentially problematic. In 35 of the collection of 43 fragments, the first solution forms the start of a longer problem-solving interaction. Either other pupils or the teacher react to the first solution. This indicates that the problem under discussion is not a straight-forward, well-defined problem with one correct solution. Instead, these ill-defined problems, like real-life problems, are treated as having more possible solutions that may be considered.

In interaction, teacher and pupils explore the possibilities a book character has to overcome an undesired or unexpected situation, action or event. Pupils do so by evaluating the earlier given solutions and/or by bringing up several possible solutions within the boundaries of the book that is being read. Teachers express their awareness of the problematic state of affairs in the light of the storyline in their feedback on the offered solutions and in the way they end the problem-solving interaction and link it to the reading of the following page. The problem-solving interactions during shared reading never end with a decision about the best possible solution.

In the following extract from the book *Bear is op vlinder* (*Bear loves Butterfly*), we see how pupils come up with a list of possible solutions without deciding what the best possible solution would be. Here, a picture is shown of Bear is demolishing the product of his final attempt, a house he built for Butterfly as a labour of love, but which she did not like because of her fear of heights. Walter suggests in a first solution to ‘build the house smaller’ to solve Butterfly’s fear (lines 1034–5).

Hereafter, pupils subsequently propose other possible solutions (lines 1038, 1042, 1045–6, 1051, 1053–6). This is done quite explicitly by a series of *or*-prefaced possible solutions. Conjunctions such as *or* mark the relation of the solutions they preface to earlier proposed solutions and underline them as potential alternatives. In this way, a list is constructed with several possible solutions that all syntactically and intrinsically follow Walter’s contribution. Comparable to the *and*-prefaced contributions Mazeland describes in his analysis of *position expansions* (Mazeland 2009), these *or*-prefaced contributions also illustrate that pupils relied on Walter’s first contribution and elaborated it.

Extract 7. (Eend, *Bear is op vlinder*, 1034–60).

Speaker	Transcript	Dutch Original
1034 s→ Walter	he has to build the HOUSE	hij moet t huis KLEINER BOUWEN
1035	SMALLER	
1036 e→ Teacher	yes ((nods)) that was ↑also a	ja ((knikt)) dat was ↑ook wel een goed
1037	good idea of yours.	idee van jou.
1038 s→ Kris	or [closer to the grou:nd	of [dichter bij de gro:nd
1039 Teacher	[yes	[ja
1040 Dries	[OR- ((stands up from chair))	[OF- ((staat op))
1041 e→ Teacher	yes exa:ctly ((nods))	ja precie:s ((knikt))
1042 s→ Kris	or totally <u>at</u> the ground	of heemaal <u>op</u> de grond
1043 e→ Teacher	yes that would also be a good idea	ja dat zou ook een goed idee zijn [heh als
1044	[heh if he would do that	ie dat zou doen
1045 s→ Rick	[O:R as high as the flowers	[O::F
1046		zo hoog als de bloemen
1047 e→ Teacher	((points at Rick)) <u>ex</u> ↑actly	((wijst naar Rick)) <u>pre</u> ↑cies
1048	(0,4)	(0,4)
1049 Teacher	[well-	[nou-
1050 Rick	[°then° [then she can-	[°dan° [dan kan ze-
1051 s→ Tim	[or <u>close</u> by the flowers	[of <u>bij</u> de bloemen
1052 e→ Teacher	yehes ((nods)) right	jaha ((knikt)) klopt
1053 s→ Kris	or building a small house far away	of een huisje bouwen ver van de
1054	from the flowers but then build a	bloemen maar dan een tuintje met
1055	little garden with a lot of flowers	allemaal bloemen bouwen
1056 e→ Teacher	yes	ja
1057	(0,4)	(0,4)
1058 Teacher	well we will have a ↑look	nou we zullen es even ↑kijken
1059 Walter	yehes	jaha
1060 Teacher	what bear will do ((turns page))	wat beer gaat doen ((slaat bladzijde om))

The contributions illustrate that pupils have interpreted Butterfly’s fear of heights as a problem, although this is a minor problem compared to the predominant problem: that Bear repeatedly fails in his attempts to convince her of his love. Still, pupils display their orientation to ‘assist Bear’ in succeeding. Walter is the first to come up with a possible solution. He is quite confirmative in his suggestion by

using *he has to* (line 1034). The other pupils align with this by linking their solutions to the first one. This displays that pupils indeed think along with book characters' actions and talk about the characters' possibilities to overcome their problems.

By evaluating the solutions as *good ideas* (lines 1036–7 and 1043–4), the teacher also shows her orientation to the solutions offered as possible suggestions for Bear. In particular, her use of *als ie dat zou doen* (*if he would do that*) illustrates her consideration of a given solution in the light of the storyline. Her use of a conditional clause (*als/if*) also underlines the tentative nature of the interaction. Moreover, this is reflected in her ending of the problem-solving interaction: she concludes it by explicit reference to the solution that the protagonist, Bear, will eventually choose (lines 1058 and 1060). This explicates that pupils might explore possible solutions together but that the decision is left to the book, since it is the protagonist who will decide how to solve this problematic situation. By reading along, they will find out what Bear will do next. This thus orients pupils to the continuation of the story in general and to Bear's attempts to achieve his goal in particular.

That pupils consider possible solutions in the light of the story so far can also be seen in their evaluations of solutions offered by others. In the shared reading activity, they seem to be well aware of their dependency on the story line, as shown for instance in extract 3. Here, Jack rejects a possible solution by reference to the story in lines 70–1 (*that is not possible anymore*). By use of the adverbs of time *nu* (*now*) and (*niet*) *meer* (*not anymore*), he is pointing back to what happened earlier in the book, and uses this to reject the solution offered by another pupil. This illustrates that he thinks along with the book character and the remaining possibilities to overcome the problem. This is another illustration of the situational context of shared reading influencing the problem-solving interaction.

In the following extract, Daniel also evaluates solutions given previously. Extract 8 shows the continuation of extract 6. Here pupils suggested getting rid of the egocentric ghost by throwing him out of the window, followed by several other quite cruel attempts to chase away the ghost. Daniel then reacts to this by suggesting a 'considerate' solution.

Extract 8. (Eend, *van mij!*, 179–94).

	Speaker	Transcript	Dutch original
179	Daniel	no I will tell something [that is	nee ik zou ook iets vertellen [wat pas lief
180		really [sweet	[is
181	Teacher	[merel	[merel
182		[what did you want to say	[wat wou je nog zeggen
183		(0,3)	(0,3)
184	s→ Daniel	well ehm (0,3) if there is a ghost	nou ehm (0,3) als er een spook bij je is
185		with you you should not (0,6) you	moet je 'm niet (0,6) moet je 'm niet in de
186		should not put him in the toilet but	wc doen maar gewoon weer naar het
187		just bring him back to the <u>haunting</u>	<u>spookh</u> ↑uis terugbrengen
		↑house	
188		(.)	(.)
189	Robert	[yes	[ja
190	e→ Teacher	[((nods)) that's also possible heh	[((knikt)) dat kan ook heh ((slaat bladzijde
191		((turns page))	om))
192		(.)	(.)
193	Dries?	the ghost=	het spook=
194	Teacher	=that is also possible	=dat kan ook

In lines 184–7, Daniel offers his alternative solution. He generalises the solution by the use of a conditional subordinate clause *als ... dan* (if ... then) and by the use of *je* (generic *you*). This shows that pupils are also able to move beyond the book context and may offer general solutions that may be used by anyone in a comparable situation. This is not surprising since this problem-solving interaction started (extract 6) by addressing Merel's unexpected assessment of the ghost's behaviour as 'normal', where one would expect her to assess this behaviour negatively. This therefore elicits an interaction about how one would in general react upon such an event. Daniel's contribution is accepted as a possibility by the teacher in lines 190 and 194 saying *that's also possible*, which again underscores the tentative character of the interaction.

Pupils may also express their alignment with a solution earlier provided by elaborating on it. An example (extract 9) is the continuation of extract 4. Here, Samuel suggests using a flashlight to scare the ghost that is frightening Eend. Ruth explicitly aligns with this by confirming with *ja* (*yes*) and by expanding on the possible solution (lines 192–3) with an argumentation. Jack and Mike display their agreement too, by an agreement token (line 196) and by partial repetition of the offered solution (lines 194–5).

Extract 9. (Kikker, *Kikker is bang*, 192–204).

	Speaker	Transcript	Dutch original
192 e→	Ruth	yes cause uh [cause uh ghosts cannot stand the light	ja wantuh [want uh spoken kunnen niet tegen licht
193			
194 e→	Mike	[when he is coming	[als die eraan komt dan kan je
195		you can just [()	gewoon [()
196 e→	Jack	[no	[nee
197	Ruth	[ghosts cannot stand [that	[spoken kunnen daar niet [tegen
198		((shakes head))	((schudt hoofd))
199	Teacher	[well	[nou
200		[I am curious	[ik ben benieuwd
201	Samuel	[()	[()
202		(0,6)	(0,6)
203	Teacher	everywhere [were ↑ghosts (.) ↑	overal [waren ↑spoken (.) ↑en enge monsters
204	(reading)	and scary monsters	

Again, this extract shows that the teacher orients pupils during their discussion on the chosen alternative to their dependency on the book, by saying *I am curious* in line 200. Just as with her explicit reference to the solution Bear will choose in the continuation of the book (extract 7), she here indicates in a more implicit way that they have to wait and see what the protagonist will do next. The teacher's references indicate that solutions are treated in the light of the story and that problem-solving does not progress beyond the exploration of possible solutions for the protagonist.

The continuation of the initiated interactions shows that pupils are oriented towards problem-solving as a tentative activity. They think along with the book characters by offering possible solutions that he/she *could* use in the continuation of the book. In the design of the problem-solving interactions it can be seen that they do not search for one correct solution, as would be the case if they were concerned with

more well-defined problems. The page-by-page unfolding of the story offers opportunities to discuss possible future solutions, taking into consideration what has happened in the story so far. As the story continues, pupils can compare their proposed solutions with the protagonist's solutions. As such, pupils may learn from a protagonist's experiences without having experienced these themselves. Shared reading thus offers possibilities to talk and think about potential problems and to consider possible solutions in the light of the book. Because of this tentative character, these problem-solving interactions are well interwoven with the moments of shared reading.

6. Conclusion and discussion

As has been shown, problem-solving during shared reading takes place on a regular basis. Problem-solving interactions are not only launched when directly asked for by the teacher; pupils are also oriented to problem-solving without being explicitly invited to do so. In these cases, it is the problem implied in a description or an assessment that launches one or more solutions by drawing attention to an unexpected or undesired state of affairs in the book. Teacher and pupils recognise these state of affairs as potentially problematic in the light of the storyline so far. Interestingly, these descriptions and assessments may take two distinguishable forms leading to a comparable problem-solving interaction: both descriptions and assessments *by participants* (in this case teacher and pupils) and descriptions and assessments *by book characters* elicit similar problem-solving interactions.

The foregoing illustrates that problem-solving interactions during shared reading get started more or less spontaneously. The problems under discussion are not made into a topic explicitly, but pupils get the chance to talk about problems that are noticed and made into a topic by themselves. This indicates that the problem-solving appears to stay close to their interest and perception, even though pupils do not experience the problems themselves.

Because the problems are experienced by book characters, pupils are not in the position to decide what the solution should be, as is the case in problem-solving interactions in real life – in work settings, for example (Huisman 2001). During shared reading, pupils only discuss possible solutions. This gives the interactions a tentative nature, where participants offer and critically consider one or more alternative solutions without deciding on the best possible option themselves. This shows that children between 4 and 6 are capable of hypothesising, arguing against the recent study by Zhang and others (2011) which suggested that this might be too advanced for kindergarteners. Our analyses suggest that the shared reading context in which solutions become visible in the continuation of the book provides children with a platform for playful generation of hypotheses. By exploring a range of possible solutions, children practice how to develop a solution strategy, which is seen as a main component of problem-solving (Pretz, Naples, and Sternberg 2003). Formulating hypotheses and verifying the hypothesis are important steps in achieving new learning (Gagné, 1985). Exercising problem-solving thus contributes to children's development and prepares children for adult life (Jonassen 2000; Lave 1988; Siegler and Alibali 2005).

Teachers play a role during the problem-solving interactions by treating the solutions as possibilities and by ending the interactions with reference to the continuation of the book. That teacher and pupils are both dependent on the book content to find out how the protagonist's problem will be solved enables all the participants

(teacher *and* pupils) in problem-solving interactions to explore possibilities from an equal epistemic position. This is in contrast to instructive classroom interactions in which teachers show epistemic authority by bringing something up in interaction and proceeding to test the pupil's knowledge on the subject by means of so-called *Known Information Questions* (Mehan 1979). Interactions with room for extended participation on an equal epistemic level with the teacher are also encouraged, because the problems under discussion are ill-defined: they do not have one single correct solution.

Our detailed analyses of the problem-solving interactions show that problem-solving in kindergarten is occasioned by means of stories. This is in line with the study by Zhang and others (2011) which describes a successful attempt to bring real-world problems into the classroom by means of a book. While their study into problem-based learning deals with a complete story that is used as a problem carrier, the current study shows how (local) problems in picture books become the topic of attention within the natural environment of shared reading.

Because the problems become the topic of attention without a preconceived plan, it is no surprise that the amount of problem-solving interactions differed among the three participating classes. The total collection of 43 problem-solving fragments was distributed fairly equally among two of the teachers (16 and 21 fragments). The third class only solved problems in six fragments. This may also be explained by the fact that all the teachers only read books on topics within two topical domains. The third teacher read literary and mathematical books but problem-solving interactions deriving from social-emotional books prevailed (25 fragments), followed by mathematical books (12 fragments) and literary books (six fragments). This was in line with our expectations, since ill-defined real-life problems were expected to play a bigger role in books with a social-emotional theme. Therefore, a practical implementation of our findings concerns the selection of picture books; it could be beneficial to select books with a social-emotional theme to encourage problem-solving interactions.

The unequal distribution of problem-solving interactions among the three teachers does not affect the outcomes of this study, however, because of its descriptive nature. Through a detailed investigation of problem-solving discourse during shared reading, this study has extended insights into interactional characteristics regarding problem-solving and has moved beyond the existing global analyses of adult tutoring or peer interactions most often based on well-defined problems.

Through a close conversational analysis of the data, we have demonstrated how problem-solving discourse actually unfolds and how the context of shared reading influences the commencement and nature of the interactions. In the future, it would be insightful to have a similar, closer look at problem-solving interactions in other settings.

Disclosure statement

No potential conflict of interest was reported by the authors.

Note

1. The picture books and instructions used in this study were respectively selected and developed within the Picture Books and COnccept Development (PICO) project, a co-

operation between the Freudenthal Institute Utrecht, the University of Tilburg and the University of Groningen.

References

- Atkinson, P. 1999. "Medical Discourse, Evidentiality and the Construction of Professional Responsibility." In *Talk, Work and Institutional Order*, edited by S. Sarangi and C. Roberts, 75–108. Den Haag: Mouton de Gruyter.
- Barrows, H. S., and R. M. Tamblyn. 1980. *Problem-based Learning: An Approach to Medical Education*. New York: Springer.
- Berenst, J. 2006. "Metacommunicatieve praktijken van ouders in voorleesinteracties met kinderen." [Parents' metacommunicative practices in shared reading interactions with children]. In *Studies in taalbeheersing, deel 2*, edited by H. Hoeken, B. Hendriks, and P. J. Schellens, 20–31. Assen: Van Gorcum.
- Button, G., and W. Sharrock. 2000. "Design by Problem Solving." In *Workplace Studies. Recovering Work Practice and Informing System Design*, edited by P. Luft, J. Hindmarsh, and C. Heath, 46–67. Cambridge: Cambridge University Press.
- Cognition and Technology Group at Vanderbilt. 1990. "Anchored Instruction and Its Relationship to Situated Cognition." *Educational Researcher* 19 (6): 2–10.
- Crain-Thoreson, C., M. P. Dahlin, and T. A. Powell. 2001. "Parent–Child Interaction in Three Conversational Contexts: Variations in Style and Strategy." *New Directions for Child & Adolescent Development* 92: 23–38.
- Crain-Thoreson, C., and P. S. Dale. 1992. "Do Early Talkers Become Early Readers? Linguistic Precocity, Preschool Language, and Emergent Literacy." *Developmental Psychology* 28: 421–429.
- Cress, S. W., and D. T. Holm. 1998. "Developing Empathy Through Children's Literature." *Education* 120 (3): 593–597.
- Dickinson, D. K., and M. W. Smith. 1994. "Long-term Effects of Preschool Teachers' Book Readings on Low-income Children's Vocabulary and Story Comprehension." *Reading Research Quarterly* 29 (2): 105–122.
- Dunker, K. 1945. "On Problem Solving." *Psychological Monographs* 58 (5): Whole No. 270.
- Eagle, S. 2012. "Learning in the Early Years: Social Interactions around Picture Books, Puzzles and Digital Technologies." *Computers & Education* 59 (1): 38–49.
- Eshach, H. 2006. *Science Literacy in Primary Schools and Pre-schools*. Springer: Dordrecht.
- Fassnacht, C., and D. K. Woods. 2004. "Transana." [Computer software].
- Flavell, J. H., E. R. Flavell, and F. L. Green. 1987. "Young Children's Knowledge about the Apparent-real and Pretend-real Distinctions." *Developmental Psychology* 23 (6): 816–822.
- Freebody, P. 2003. *Qualitative Research in Education. Interaction and Practice*. London: SAGE.
- Furberg, A., and H. C. Arnseth. 2009. "Reconsidering Conceptual Change from a Socio-cultural Perspective: Analyzing Students' Meaning Making in Genetics in Collaborative Learning Activities." *Cultural Studies of Science Education* 4: 157–191.
- Gagné, R. M. 1985. *The Conditions of Learning and Theory of Instruction*. New York: Holt, Rinehart and Winston.
- Ganea, P. A., L. Ma, and J. S. DeLoache. 2011. "Young Children's Learning and Transfer of Biological Information from Picture Books to Real Animals." *Child Development* 82: 1421–1433.
- González, M. C. 1996. "Task and Activities. A Parent–Child Interaction Analysis." *Learning and Instruction* 6 (4): 287–306.
- Goodwin, C., and M. H. Goodwin. 1987. "Concurrent Operations on Talk: Notes on the Interactive Organization of Assessments." *IPRA Papers in Pragmatics* 1 (1): 1–54.
- Greene Brabham, E., and C. Lynch-Brown. 2002. "Effects of Teachers' Reading-aloud Styles on Vocabulary Acquisition and Comprehension of Students in the Early Elementary Grades." *Journal of Educational Psychology* 94 (3): 465–473.
- Hayes, D. P., and M. G. Ahrens. 1988. "Vocabulary Simplification for Children: A Special Case of 'Motherese'?" *Journal of Child Language* 15 (2): 395–410.

- Hoogsteder, M., R. Maier, and E. Elbers. 1996. "The Architecture of Adult-Child Interaction. Joint Problem Solving and the Structure of Cooperation." *Learning and Instruction* 6 (4): 345–358.
- Hoff-Ginsberg, E. 1991. "Mother-Child Conversation in Different Social Classes and Communicative Settings." *Child Development* 62 (4): 782–796.
- Howe, C. 2009. "Collaborative Group Work in Middle Childhood." *Human Development* 52 (4): 215–239.
- Huisman, M. 2001. "Decision-making in Meetings as Talk-in-Interaction." *International Studies of Management & Organization* 31 (3): 69–90.
- Hutchby, I., and R. Wooffitt. 1998. *Conversation Analysis*. Cambridge: Polity Press.
- Jefferson, G. 1984. "Transcript Notation." In *Structures of Social Action Studies in Conversation Analysis*, edited by J. M. Atkinson and J. Heritage, ix–xvi. Cambridge: Cambridge University Press.
- Jonassen, D. H. 2000. "Toward a Design Theory of Problem Solving." *Educational Technology Research and Development* 48 (4): 63–85.
- Karlsson, G., J. Ivarsson, and B. Lindström. 2013. "Agreed Discoveries: Students' Negotiations in a Virtual Laboratory Experiment." *Instructional Science* 41 (3): 455–480.
- Koole, T., and J. D. Ten Thije. 1994. *The Construction of Intercultural Discourse. Team Discussions of Educational Advisors*. Amsterdam, Atlanta: Rodopi.
- Kwant, A. 2011. *Geraakt door prentenboeken. Effecten van het gebruik van prentenboeken op de sociaal-emotionele ontwikkeling van kleuters*. [Moved by picture books. Effects of the use of picture books on the social-emotional development of kindergartners]. PhD diss., University of Groningen, The Netherlands.
- Lave, J. 1988. *Cognition in Practice: Mind, Mathematics and Culture in Everyday Life*. Cambridge: Cambridge University Press.
- Leseman, P. P. M. 1998. Ontluikende geletterdheid: Tekstbegrip in mondelinge en geletterde taal-interacties. [Emerging literacy: understanding of texts in oral and written interactions]. In *Praten, denken, doen. Taal- en denkstimulering van 0- tot 6-jarigen*, edited by A. Harpman, H. Veenker, and G. Pol, 147–165. Alphen aan den Rijn: Samsom.
- Leseman, P. P. M., and F. F. Sijsling. 1996. "Cooperation and Instruction in Practical Problem Solving: Differences in Interaction Styles of Mother-Child Dyads as Related to Socio-economic Background and Cognitive Development." *Learning and Instruction* 6 (4): 307–323.
- Mar, R. A., and K. Oatley. 2008. "The Function of Fiction is the Abstraction and Simulation of Social Experience." *Perspectives on Psychological Science* 3 (3): 173–192.
- Massey, S. L. 2004. "Teacher-Child Conversation in the Preschool Classroom." *Early Childhood Education Journal* 31 (4): 227–231.
- Mayer, R. E. 2013. "Problem Solving." In *The Oxford Handbook of Cognitive Psychology*, edited by D. Reisberg, 769–778. New York: Oxford University Press.
- Mazeland, H. 2009. "Positionsexpansionen: Die interaktive Konstruktion von Stellungnahme-Erweiterungen in Arbeitsbesprechungen." [Position expansions: the interactive construction of position elaborations in work meetings]. In *Grammatik im Gespräch. Konstruktionen der Selbst- und Fremdpositionierung*, ed. S. Günthner and J. Bücker, 185–214. Berlin: De Gruyter.
- Mehan, H. 1979. "'What time is it, Denise?': Asking Known Information Questions in Classroom Discourse." *Theory into Practice* 18 (4): 285–294.
- Mercer, N., and K. Littleton. 2007. *Dialogue and the Development of Children's Thinking. A Sociocultural Approach*. London: Routledge.
- Middleton, D. 1998. "Talking Work: Argument, Common Knowledge, and Improvisation in Teamwork." In *Cognition and Communication at Work*, edited by Y. Engeström and D. Middleton, 233–256. Cambridge: Cambridge University Press.
- Mol, S. E., A. G. Bus, M. T. de Jong, and D. J. H. Smeets. 2008. "Added Value of Dialogic Parent-Child Book Readings: A Meta-Analysis." *Early Education & Development* 19 (1): 7–26.
- Newell, A., and H. Simon. 1972. *Human Problem Solving*. Englewood Hills, NJ: Prentice-Hall.

- Nilholm, C., and R. Säljö. 1996. "Co-action, Situation Definitions and Sociocultural Experience: An Empirical Study of Problem-solving in Mother-Child Interaction." *Learning and Instruction* 6 (4): 325-344.
- Pomerantz, A. 1984. "Agreeing and Disagreeing with Assessments: Some Features of Preferred/Dispreferred Turn Shapes." In *Structures of Social Action. Studies in Conversation Analysis*, edited by J. M. Atkinson and J. Heritage, 57-101. Cambridge: Cambridge University Press.
- Pomerantz, A., and B. J. Fehr. 1997. "Conversation Analysis: An Approach to the Study of Social Action as Sense Making Practices." In *Discourse Studies: A Multidisciplinary Introduction*, vol. 2, edited by T. A. van Dijk, 64-91. London: Sage Publications.
- Pretz, J. E., A. J. Naples, and R. J. Sternberg. 2003. "Recognizing, Defining, and Representing Problems." In *The Psychology of Problem Solving*, edited by J. E. Davidson and R. J. Sternberg, 3-30. New York: Cambridge University Press.
- Reese, E., and A. Cox. 1999. "Quality of Adult Book Reading Affects Children's Emergent Literacy." *Developmental Psychology* 35 (1): 20-28.
- Rodgers, E. M. 2004-5. "Interactions that Scaffold Reading Performance." *Journal of Literacy Research* 36 (4): 501-532.
- Sacks, H. 1992. *Lectures on Conversation*, Vols. I and II, ed. G. Jefferson. Oxford: Blackwell.
- Sacks, H., E. A. Schegloff, and G. Jefferson. 1974. "A Simplest Systematics for the Organization of Turn-taking for Conversation." *Language* 50 (4): 696-735.
- Schank, R. C., A. Fano, B. Bell, and M. Jona. 1994. "The Design of Goal-based Scenarios." *Journal of the Learning Sciences* 3 (4): 305-346.
- Siegler, R. S., and M. W. Alibali. 2005. *Children's Thinking*. New Jersey: Prentice-Hall.
- Sipe, L. R. 2002. "Talking Back and Taking Over: Young Children's Expressive Engagement during Storybook Read-alouds." *Reading Teacher* 55 (5): 476-483.
- Snow, C. E., and A. Ninio. 1986. "The Contracts of Literacy: What Children Learn from Learning to Read Books." In *Emergent Literacy: Writing and Reading*, edited by W. H. Teale and E. Sulzby, 116-138. Norwood, NJ: Ablex.
- Stein, N. L., and C. G. Glenn. 1979. "An Analysis of Story Comprehension in Elementary School Children." In *New Directions in Discourse Processing*, edited by R. O. Freedle, 53-120. Norwood, NJ: ABLEX Publishing Corporation.
- Sulzby, E. 1985. "Children's Emergent Reading of Favorite Storybooks: A Developmental Study." *Reading Research Quarterly* 20 (4): 458-481.
- Sun, J., and N. Rao. 2012. "Scaffolding Interactions with Preschool Children: Comparisons between Chinese Mothers and Teachers across Different Tasks." *Merrill-Palmer Quarterly* 58 (1): 110-140.
- Ten Have, P. 2007. *Doing Conversation Analysis. A Practical Guide*. London: SAGE.
- Van den Heuvel-Panhuizen, M., S. Van den Boogaard, and B. Doig. 2009. "Picture Books Stimulate the Learning of Mathematics." *Australian Journal of Early Childhood* 34 (3): 30-39.
- Van der Pol, J. A. 2010. *Prentenboeken lezen als literatuur: een structuralistische benadering van het concept 'litteraire competentie' voor kleuters*. [Reading picture books as literature: a structuralist approach to the concept 'literary competence' for kindergartners]. PhD diss., Tilburg University, The Netherlands.
- Van Elsäcker, W., and L. Verhoeven 1997. "Kleuters leren meer van voorlezen in kleine groepjes." [Kindergartners learn more from shared reading in small groups]. *Pedagogische Studiën* 74 (2): 117-129.

- Van Kruiningen, J. F. 2013. "Educational Design as Conversation: A Conversation Analytical Perspective on Teacher Dialogue." *Teaching and Teacher Education* 29: 110–121.
- Walker, C. M., P. A. Ganea, and A. Gopnik. 2012. "Children's Causal Learning from Fiction: Assessing the Proximity Between Real and Fictional Worlds." In *Proceedings of the 34th Annual Conference of the Cognitive Science Society*, edited by N. Miyake, D. Peebles, and R. P. Cooper, 1108–1113. Austin, TX: Cognitive Science Society.
- Wertsch, J. V., G. D. McNamee, J. B. McLane, and N. A. Budwig. 1980. "The Adult–Child Dyad as a Problem-solving System." *Child Development* 51 (4): 1215–1221.
- Wertsch, J. V., N. Minick, and F. J. Arns. 1984. "The Creation of Context in Joint Problem-solving." In *Everyday Cognition: Its Development in Social Context*, edited by B. Rogoff and J. Lave, 151–171. Cambridge, MA: Harvard University Press.
- What Works Clearinghouse. 2007. *WWC Intervention Report: Dialogic reading*. U.S. Department of Education: Institute of Education Sciences.
- Wood, D., J. S. Bruner, and G. Ross. 1976. "The Role of Tutoring in Problem Solving." *Journal of Child Psychology and Psychiatry* 17 (2): 89–100.
- Zhang, M., J. Parker, J. Eberhardt, and S. Passalacqua. 2011. "What's So Terrible About Swallowing an Apple Seed? Problem-based Learning in Kindergarten." *Journal of Science Education and Technology* 20 (5): 468–481.

Appendix 1. Transcription symbols (based on Jefferson 1984).

[text	overlapping speech; point at which an ongoing utterance is joined by another utterance
=	break and subsequent continuation of contiguous utterances
(0,4)	pause (in seconds)
(.)	micro pause (less than 0.2 seconds)
.	stopping fall in tone (not necessarily at the end of a sentence)
,	continuing intonation (not necessarily between clauses of sentences)
?	rising inflection (not necessarily a question)
!	animated tone (not necessarily an exclamation)
-	halting, abrupt cutoff
↓	marked falling shift in intonation
↑	marked rising shift in intonation
○	talk that is quieter than surrounding talk
TEXT	talk that is louder than surrounding talk
<u>text</u>	emphasis
:	extension of the sound that follows (0.2 seconds for every colon)
>text<	speech is delivered at a quicker pace than surrounding talk
<text>	speech is delivered at a slower pace than surrounding talk
hhh	audible aspiration
·hhh	audible inhalation
(text)	transcriber is in doubt about the accuracy of the transcribed stretch of talk
()	transcriber could not achieve a hearing for the stretch of talk
((text))	description of a phenomenon, of details of the conversational scene or other characterisations of talk
[...]	deletion of part of original transcript

Appendix 2. Titles of picture books.

- Eagland, J. and T. Milne. 2005. *Wie is de liefste*. [Second Best]. Rotterdam: C. de Vries-Brouwers.
- Haeringen, A. van. 2005. *Beer is op vlinder*. [Bear loves Butterfly]. Amsterdam: Leopold.
- Horáček, P. 2006. *Kleine Muis zoekt een huis*. [A new house for Mouse]. Haarlem: Gottmer.
- Stein, M. and M. van Hout. 2006. *Van mij!* [Mine!]. Rotterdam: Lemniscaat.