

Growing Scientific Thinking with Fictional Picture Books: Questioning and Imagination in Early Years

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Abstract. Reading fictional picture books is a feature of early childhoods, with an adult or they look alone. In preschool and early years education such highly coloured illustrations are a feature of the story. These stories, such as *The Very Hungry Caterpillar*, *Fish is fish*, or *Tadpole* promise, were not written and illustrated by their authors-illustrators / and authors and illustrators to inform about science but to tell an engaging story. However, they do introduce information related to the authentic science but inaccurate, and such are remembered by these early learners. Our innovatory work is about taking a more integrated science teaching approach with literature by using fictional storybooks in science classroom. We are exploring for the cultural trend of how primary curriculae can evolve with a development of a real scientific literacy through reading such books. The issue in scientific literacy is to ensure that the pupils acquire more than knowledge about the basic concepts in science but also a vision of how such knowledge relates to other events, why it is important and how this particular view of the world came to be. Scientific literacy involves a meaningful understanding of knowledge about the nature of science, scientific inquiry such as hypothesising and the major conceptual themes. It also enhances cognitive abilities, critical thinking to understand the big ideas of science and to be able to inform and persuade the others about these ideas. The essence of such an approach is in the form of the teaching, how the books are used and the contribution (or intervention) by the adult and their own knowledge of the science portrayed. We consider the way in which the science information is elaborated from the point of view of the method being used to transmit such. The modes of language (reading, writing, talking) used in this process are also crucial. The potential that reading in an interactive manner

of these colourfully illustrated fictional texts, with young pupils can offer in their scientific literacy development. While information books are often used in the science classrooms of older pupils, this is less the case with young pupils. However, the use of fictional texts and the reading of them is a feature. We are interested to ascertain in what conditions reading specific fictional storybooks that we called 'realistic fiction' storybooks might stimulate young children to engage in a scientific thinking manner of observations, evidence hypothesising as well as learning the form and usage of books. To what extent the teacher interventions during the reading allow the pupils to think for themselves about science aspects underlying these stories? How are the pupils able to put the sense of the story into their own words? How do their interpretation and their prediction about the story allow them to develop scientific thinking and imagination? We consider how we can attribute an epistemic aim to the reading of these 'realistic fiction'. We show examples of a realistic fiction picture book *Fish is Fish* that reading with young children (4 - 5 years old) at nursery school. We present a taxonomy of the interventions of the teacher related with the development of children thinking. The issue is to allow the teachers to read realistic fiction storybooks with young children in order to develop a real scientific literacy and not only a merry image of the science (often inaccurate).

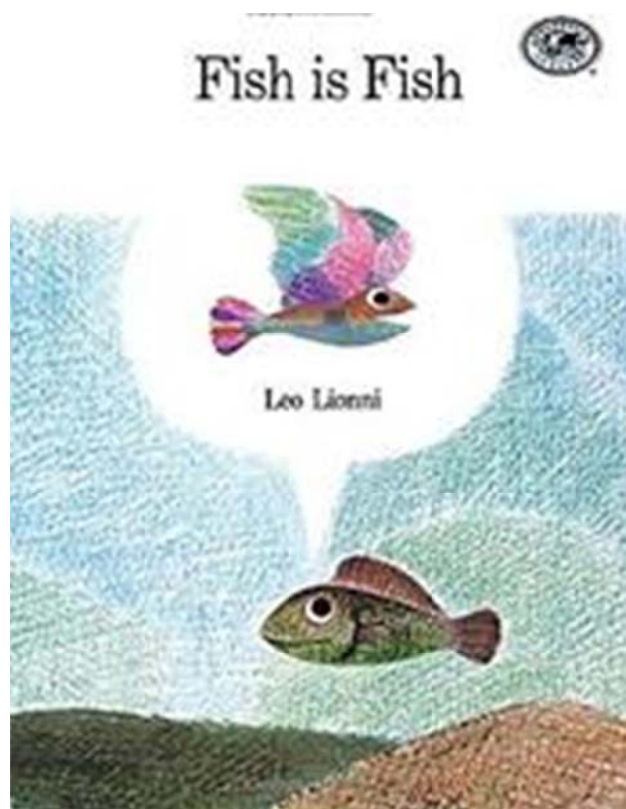
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1. Introduction

Conversational analysis has a history [1,2,3] verbalised what a number of primary teachers had been advocating [4] of developing dialogue with learners, cuing them into thinking for themselves and problem solving, rather than doggedly following instructions in repeating a science investigations, referred to as 'experiments', for which the expected outcome was known, and often given at the start of the exercise. In effect this type of science work in school was a practising of skills and the ability to follow a recipe. What has become called Inquiry or Enquiry science advocated such an approach.

The reading of stories, pictorial fiction for very early learners and mostly text for older

children is a feature of early years and primary school life, hitherto the role of such narrative telling has not been related to the learning of science.



We are referring to effectively illustrated children's stories that were not probably written to convey science information but it is embedded in the story, not always accurately. Such as *Fish is Fish* [5] and not like for example, Robert Well's book *How to Lift A lion* which sets out to help children investigate pulleys [6]. Nor in the work we report here are we disusing the use of stories specifically in a science focused classes The use of fictional stories in the learning of science in the preschool and early years has been advocated and employed as a start of some investigations such as the reading of a fairy story such as *Jack and the Beanstalk* [7]. We propose that such stories should be used with the children to critically evaluated based on their first hand observations, the outcomes after they have investigated for themselves a similar issue so the first hand knowledge can feed into their critique.

A characteristic of these popular books read by parents and others with young children as well as early years teachers and other staff with children are brightly coloured illustrations

illustrating the text. Another key feature is that anthropomorphism of the characters, in for example the popular, *The Very Hungry Caterpillar*, and the caterpillar eats cakes, food familiar to the readers. Frequently characters talk and act as humans do. The animals are frequently portrayed in an anthropomorphic manner with their natural facial characterises modified to resemble more human features. The minnow (small fish) for example in *Fish is fish* had human eyes and mouth, not resembling a real fish it a very great extent except the basic body shape.

Characters are sometimes endowed with understanding of human characteristics, which in the real world they would be unlikely to know. The minnow for example in *Fish is Fish* when imagining humans walking on land envisages, according to the illustrations a fish upright, as frog has told him, but also one fish wearing a bowler hat, a tie and carrying a brief case, information not provided in the text. He appears to understand the position and action of wings. An aspect of the reading of this genre of stories is the science concepts, which are being introduced or reinforced by the text. Such may be new to children or have some familiarity. It is the skill of the reader and the response of the child. Which varies and can contribute to the concept development of the individual and possibly other children listening although we did not seek to establish such in this study. The understanding of an individual, indeed adult and child, depends on the mental models held by the build of the issue being told. It is preferable for a child's development of science concepts and the nature if science that the reader is familiar with activities with which the child has been involved so they can refer to shared or knows experiences.

We are biologists. We are exploring the role of fictional storybooks in the very early stages of the learning of science. The way in which the adult uses the book is, we consider, of extreme importance in this foundation of learning. Our rationale was to establish the comprehension of the listeners through drawings and nothing their out loud commends or their responses to a question form the adult.

2. Methodology

We had no intervention ourselves with children, we were observers. However, we had

permission off the heads of the schools and had given then the disclosure certificates that confirm that we had no criminal record. The unit we are considering various but there is always one reader and from one to a larger number of listeners, the children. An adult and child is one unit for such reading, particularly in a family or in a nursery or other formal educational setting with a dedicated adult. More often in a class one adult reads to a group of children.

We report here the results of having observed teachers reading such pictorial fiction books to young children and identified the manner in which they do this. We recorded the dialogues and transcribed the recording. We focus in this paper on the use of the story Fish is fish (1970). We read and re read the raw data and categories of action emerged. From these observations we propose a categorisation of the way narrative are used to identify which narrative category(ies) foster(s) science children thinking.

3. Results

The taxonomy identified from our observations and initial reading transcripts is:

- 1) Story just read, (R)
- 2) Read and Show, (RS): story read but illustrations shown as appropriate intervals.
- 3) Read Stop Draw, (RSD): story read to a point and children asked to draw their interpretation of a description for so that their mental model stimulated by the text but also their revise experiences may be revealed
- 4) Read and a break, (RB): narrative interpreted by teacher why translates the text into everyday words for the reader if the language/terminology is unfamiliar
- 5) Read and Break, (RBA): adult interrupts and explains relating to a shared memory within the group such as a relevant class/family activity.
- 6) Read and Break, (RBC): child interrupts. Adult and others listen to a child comments and suggestions exploring the relation to the story
- 7) Read, Break, Invite (RBI): adult invites the children's suggestions, predictions as to what the outcome of a situation may be and why or why something has already occurred.

- 8) Break at Child's comment and Explore, (RCE): using a child's out loud comments to explore issues relevant to the story e.g. in Fish is Fish a girl says 'crabs because crabs like in water too', whereas her out loud comment 'shark' reflects the child connecting in her mental model of fish like animals that live in water.

We identified exemplars of these categories in the transcripts, which we show below to illustrate our analysis. In the work reported here there was introduction of read break and draw. Such is reported elsewhere [8]. The next stage was to illustrate examples of such in a transcript. Not all reading occasions contained all the categories, particularly for example, the READ BERA KDRA.

An example of one of the categories is shown in Table 1. The full table can be sent on application. The emailed here is of Read Stop and Draw, RSD. The story is read to a point when stopped and the children asked to draw their interpretation of the image which they have formed (a mental model) which aches been simulate by hearing the text. Their previous experience may be revealed in the exemplars.

<p>T: 'In the week that followed the tadpole grew two front legs' / so now he's got how many legs he's got now E: two T: two in the back and two at the front. E: that is that is his hands. T: it's like his hands you are right the front/</p>	<p>The teacher Conversation strategy : extension, recasting Science learning/ teaching: - identify two pairs of legs - match front leg/ hand</p>
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Table 1. RSD

The above examples show that by employing one of the techniques children can be actively involved in the group listening to a story. A practising teacher of 5year olds in England recognised or analysis in her work.

"The children were directing the conversation (focused on a pictorial fiction book she was reading with them) rather than me, so it was much more of a child led interaction with them making the comparisons and myself only coming in to support and extend the

discussions" [9].

4. Discussion and conclusion

Allowing children to break the reading of a story reveals their interest, how they can relate these effectively second hand instances, accessed through the words and illustrations provided by the book which are given to them by adults, teacher or parent who are reading the book and the author who created the story amplified by the artist illustrating the author's text. Moreover, the spontaneous words of children stimulated by the story (word or pictures) provides access to the way in which children make concretions from the fiction to their own world, their actual experiences and indeed being able to relate this fiction to related stories. Furthermore, through listening, capturing and then analysing such comments their understanding of the science presented is accessed. They are thinking as emergent scientists by recognising salient features which define a class member. Key instances presented in a story, in this story the two different environments, air on land and water in the pond, such was differing habitats, associated animals that live in such, and understanding that physiological needs shared by all animals such as need for oxygen are provided by systems appropriate to the habitats and its features in which an animal lives and such are not the same for all.

Fleer [10] reminds us that constructivism places importance on determining the learners existing ideas. Interactive experiences have a value in the construction and consolidation of an individual's learning. Indeed, Inhelder et al. [11] observed that the more activities in which a learner is involved the more they learn [12] that these young children have the skills of evaluation, which the reading of pictorial fiction books can enhance their application of these skills. This approach is mind-on science as well as enhancing the skills of reading, essential for developing hands on science

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