

Biology concepts and Pictorial Fiction Books. Do early years children comprehend?

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Children start learning biology long before they encounter formal educators, the requirements of the curriculum and the knowledge assessed on for school tests. The biology of the area where they live form most first experiences of the biology. The child is part of this biological world and various depictions of it are in many of the early years pictorial fiction books read to them and which they may choose to look at themselves

Preschool children are young learners meeting with biological topics in their own lives, members themselves in the biological domain, and in biological topics in stories in fictional picture books they are often mythical and objects and problems depicted in anthropomorphic terms. None the less many stories do have a biological basis and present a problem, with which children are familiar and have already noticed at home and their everyday environments. Story telling is an essential human need. It uses narrative, possibility thinking and imagination, and possibility thinking, but do children comprehend the possibilities of the situations depicted in reality and concise the actuality situations presented by these illustrated stories. In this paper we report on one story, *Fish is Fish* (Lionni, L. 1970) of which we firstly identified the biology concepts. Secondly, we wanted to explore whether the listeners understood an anatomical description and related to their existing knowledge (mental model, Buckley et al. 2007) through drawing their expressed model whose content we analysed by inspection. Lastly, we listened to the class response of 4 year olds as the story was read. We analysed by identifying categories, which emerged through a reiterative reading process, both the out loud spontaneous comments of the listeners and the manner in which the teacher scaffolded the content of the reading for them. Our findings are that whilst children had a basic idea of change as an organism develops, did not spontaneously identify problems such as the transition for obtaining oxygen from water or from air on land, they could literally interpret a description but add other elements from previous knowledge and could relate some of the story events to previous experiences. Our study highlighted the lack of biological knowledge above that of everyday in early years professionals and the opportunities that could be made to discuss basic biology such as and anatomical adaptations to habitat as well as critically identifying problems and solutions.

KEY WORDS

FICTIONAL PICTORIAL STORIES, BIOLOGY CONCEPTS, EARLY YEARS

Proposal

Introduction

The use of stories with early learners, at home or in early learning centres, is one of the factors in such development of an emerging biology capital. Another crucial area is that of observations at first hand by the child. Do these match the concepts met in these pictorial fiction books which they encounter? Furthermore the structure of a story has a beginning where characters and the scenario are set and a problem or issue is introduced. There is a middle where the problem is explored and end when there is a resolution to the problem. This is similar to the scientific process, the nature of Science. The majority of nursery officers, assistants and teachers working with these age groups do not feel comfortable with science and do not possess and identify as a teacher of science (Avraamidou 2017). Hence, they do not recognise the biological content of the stories other than in an everyday manner.

We looked at such use of books, and focus on one such in this talk, with English and French early years children in formal school and used 3 different techniques to find children's understanding.

This presentation will illustrate using a particular fictional picture book and the response of young children in England and France. We use one popular book (*Fish is Fish*, Lionni, 1970) as an exemplar. We identified the biological concepts and the problem and how the story developed the problem and its reduction. We asked children to interpret the text by constructing a drawing at one crucial point in the narrative before they had seen the illustrations to find if children could form a mental model from the narrative but also link it with existing understanding.

We captured the reading of the story out loud to a class and the unscripted comments of the adult reader and the listeners as they made connections with their existing knowledge with the story narrative.

Subject/Problem

Even though we are biology educators we felt that first it necessary to understand more about the reading of pictorial fictional stories with young children. Words and pictures are symbols, a unique symbolic medium as are numbers or music notations. Such play a vital part in children acquiring language, using books as well as everyday observations play a part in their growing awareness and understanding of their world. As well as in the child's acquisition of language and young children in their 2d year can hear a word and related to the relevant picture. This genre of children's books, colourful stylised illustrations but with some text, which matches these illustrations, which usually feature anthropomorphic characters (Ganea and Canfield. p. 38) and world. Ganea et al (2011) considered pictorial realism and found no difference between the type pictures (photos, lined drawn, painting, cartoons. Richert and Smith (2012) for example found if the story is closed to real situation the most likely the children are able to link cause and effect causal information.

Learning through reading pictorial fictional books is influenced by the type of interaction with the adults during the picture reading (Mol and Bus, 2011). To date we have found no information about the effect of the way of the teacher read science picture books with their pupils. A number of pictorial fictional storybooks contains scientific information but are not written to convey such information. Fantastical nature is a characteristic of many children's books. How does anthropomorphism affect how children interpret living world? Anthropomorphism picture books have an affect on children's learning; however, anthropomorphic pictures play a part in

children's learning if they hear it. Seeing anthropomorphic picture and language together 4 to 5 year old children can transfer fantastical characteristic to real animals if they hear an anthropomorphism story, (Ganea et al (2004).

These picture books about realistic situation can develop some of understanding of conceptual categories (Waxman and Gelman 2009). Goldenberg and Sandhofer (2013) suggest that the ability of a child to generalise what they have learnt from a book to a new situations or a category member may come from the context and cues in a story. Biological concepts are often inherent these book such as, *The Very Hungry Caterpillar*, (Carle, 1972). These stories were not written as books from which to learn biology in terms of science and accepted knowledge but as an enjoyable story introducing children to illustrated literature and its conventions.

Design

We wanted to find out whether the children understood the basic concepts and whether they were able to relate such to any of their own experiences and existing understanding.

We used the book *Fish is Fish* (Lionni, 1970).

The questions. We sought to start answering are:

- a) the biological concepts in these stories
- b) if children were interested such, combining the imaginary with their existing knowledge
- c) whether hearing the stories elicited mental models (Buckley et al. 2007) the children possess based previous experiences and knowledge.
- d) whether listening to class reading indicated and recognised of the development of nature of science.

Methodology

We conducted the work in England and in France in elementary and preschools. The basic story in *Fish is Fish* is:

A tadpole (young stage of a frog) and minnow live together in water in a ponds but disagree as the fish claims that they are both the same. However the tadpole develops one after the other, two pairs of limbs. The gills of the tadpole become internal (originally external but become covered by a flap, the operculum with one lout let) which lets water taken in via mouth to exit after exchanging oxygen and collected body was excretory gas) and the tail is absorbed. He turns into a young adult frog. (Which actually begins using lungs solution in a water film in lung thus, taking in air via their mouth and it gong to lungs), hence need to leave the water. He jumps out of the water onto the bank and discovers the terrestrial world. He promises he will return to his fish friend and tell him what he sees.

When the frog comes back, he describes to the fish, whose anatomy and physiology remains unchanged, the extraordinary things that he has seen: a bird, a cow and people. The fish imagines the different animals as bird-fish, cow -fish and people - fish. Eventually he goes onto the land but can not breathe but the frog pushes him back into the water. Fish agrees that they are different.

Method

We identified the main biological concepts: the concept of complete and incomplete metamorphosis, the function of gills and lungs in obtaining oxygen appropriately for an animal's body needs, and the biological structures for these and the way different habitats could provide such hence adaptations to habitat.

We explored the responses of children in two ways: using drawings and recorded transcripts of teacher-class dialogue as the story was read out loud. Drawings are the expressed model of a person's mental model, regarded as a representation of a mental model (Buckley and Boulter, 2000).

There is a body of research on both the use of drawings, e.g. Reiss and Tunnicliffe, (2001) and we recognise the limitations of the technique. But is not dependent on language ability. Capturing and analysis of transcripts is also a proven research methodology particularly in children's responses to exhibits (e.g. Tunnicliffe, 1996) on exhibits in museums of all kinds or in biological field work.

We used drawings and recorded transcripts of teacher-class dialogue. One method is to focus on one part of the plot. We read a story until a point where an idea was introduced and stop the story asking the children to draw a visual image of how they interpreted the word before being shown the illustrations. We then asked them to draw again after seeing the illustrations.

The second technique is based on reading the whole story to listen to a teacher reading a story to the class and transcribing the dialogues identifying and often classifying the responses of the teacher and the children through their words which we collected

Findings and analysis

Drawings.

Each researcher scrutinized the drawings and identified features that were represented by each child. Our findings were discussed and consensus reached. The first five features were those given by the frog, the others features were inserted by the children from their existing mental model. The children 1) put on their drawings the characteristics depicted by the frog : the characteristic bag of milk can be portrayed as bag or as udder and 2) Beyond these characteristics, the children added characteristics as ear, hoof, tail, spots, with which they were familiar

Table

Anatomical characteristics/environment	Cow's drawings (French Class, Year 1: 6-7 yrs N=7)	Cow's drawings (English Class, Year 1: 5-6 yrs, N = 6)
4 legs	7	6
Horns	5	4
Bag of milk	0	3
Udder	6	4
Grass	6	4
Cow's shape	6	4
Ear	4	1
Hoof	3	1
Tail	6	5
Spot	5	4

Udders were drawn but 3 English children drew bags of milk, one carried in the cow's mouth, two drew pink bags on the animal's back. No drawing depicted cows with attributes from other groups of animals.



Figure 2 a drawing before listening the story and after before seeing the illustrations/

water. He returns to tell his fish friend and returns to land. The fish decides to go onto land too but finds he cannot breathe, (because he only has gills and can not obtain oxygen directly via the air) the frog pushes him back into the water where the fish agrees (frog is frog) and fish is fish. They are adapted to differing environments now after a complete anatomical (and physiology and habitat).

In method 2 Transcripts, obtained from a class session when the whole story was read these 4-5 year old London based children of various ethnicities, showed that the lostersners understood the basic concept of metamorphosis, i.e. The tadpole changes into a small frog and leaves the water habitat for anland and ar one.

Reading aloud:

The transcripts were analysed using a read- reread iterative process. Categories of teacher/pupil interactions and comments emerged and were named.

This is analysis of the transcript enabled us to establish children used their own experiences of which the teacher reminded them were relevant. Behaviours, attributes and habitats and similar organisms were mentioned

General interest

The narrative form is a basic tool of humans. The use of stories in teaching is efficient if it takes the form of 'lively processes of science making' (Bruner, 1992, p.10). The fiction functions as a metaphorical reference to the real world and contributes to the child's developing an interpretation of the possible worlds by contrast with the real world.

The genre of books from which our example used in this research is a member are books with text and pictures in picture books intimately depend on each other in contrast to « illustrated book », in which the illustrations, the pictures play a subordinate role.

The presence of dialogues in the story and intrecation with an adult, who can explain for children, knowing the children and their shared experiencers, but also thj basic biology occepts, is also essential. Some of these dialogues express conflict and generate emergent argumentation between the characters as well as conainig basic biological phenomena.

The first potentiality is that the presence of dialogues can engage the reader to understand the nature of the epistemic conflict between the characters, between belief and knowledge. The use of such books generates 'explanation-seeking curiosity' and raises questions and generates hypotheses, which is basis of the nature of science, but

they do not provide directly scientific explanations. Such requires a knowledgeable teacher to develop. We do suggest that the majority of early years personnel do not have the depth of biological knowledge to effectively develop the child's foundations of biological literacy. Reading 'realistic fiction' storybooks does not mean to stand by its own. It is intended to be integrated with other scientific activities in order to promote significant pupils learning of biology through reading 'realistic fiction' storybooks and generate 'explanation-seeking curiosity' but do not provide directly scientific explanations or scientific resolution of the scientific problem underlying the story.

The work of interpretation of the story allows the pupils to built the scientific problem, to spot the issue of the problem but not to resolve it. We can identify though this story with the biological problems portrayed through the story and how the characters resolve them.

The children have to consider, in the light their understanding of the story during the reading, the reality of the events in the story and to construct valid explanations. Afterwards, the children can return to the story with their teacher to try to understand the scientific interpretation of the realistic fiction storybooks.

Educational aspects

ERIDOB members are biologists and far too a few work with elementary and preschool teachers. Thus, our work should be of interest to them. Whilst Pictorial Fiction Books are frequently used in classes in the USA and the UK, they are rarely used to develop the science aspects. We suggest that popular books be analysed for their science content and guidance provided to these teachers who rarely haven identity as 'a teacher of science'. (Avraamidou, 2017)

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