Part 16
Strand 16
Science in the primary school

Co-editors: Petros Kariotoglou & Terry Russell

CONTENTS

CLASSIFYING IN PRIMARY SCHOOL: IS IT EXCLUDED? THE CASE OF THE PLATYPUS

Catherine BRUGUIÈRE[1], Frédéric CHARLES[1] and Sue Dale TUNNICLIFFE[2]

[1] S2HEP (EA 4148) University Claude Bernard Lyon 1, FRANCE

[2] UCL, Institute of Education, London, ENGLAND

Abstract: Our paper propose to understand how the reading of the French storybook *Mais où est donc Ornicar?* (Glasauer and Stehr, 2000) allows taking in consideration the problematic question of classification in scientific and social ways with pupils from 9 to 11 years old. The particularity of this storybook is to bring in a "strange" animal Ornicar, the Platypus, which is hard to classify for the teacher the main character of the story. Ornicar is the new one of the class in which the pupils are all animals. The learning situation studied originates in the complication to which the characters of the story are confronted: what group can Ornicar, the new one of the class, belong to? Data are made up of 21 narratives produced by the pupils from three classes. These narratives, which develop possible solutions for the inclusion of the Platypus, work as exploratory tools to find whether these pupils from disadvantaged districts the problematic tensions between inclusion and exclusion but also between group and criterion of classification. We conclude that the commitment of the pupils in a complex scientific thought on classification suppose: On the one hand to go beyond certain prejudice in the observation of a new animal and to consider it in the same way that any other animal: what features share this animal with the others? On the other hand, to take into account the social dimension of classification in order to distinguish with the pupils the subjective and objective features.

Keywords: classification, primary school, narrative, storybook, exclusion

INTRODUCTION

Suring the last ten years, the teaching programmes on classification have been renewed in France. They prescribe the model of phylogenetic classification at every level of compulsory schooling. In the current curriculum at the end stage of primary school (8-11 years old) classification is presented as interpretation of similarities and differences in terms of relationship. The idea is to enable the pupils to identify the characteristics of living beings which form groups which share the same physical and behavioral characteristics and then grouping them with justification laying the foundations for later learning of the more detailed hierarchical classification. The interpretation in terms of relationship of these interlocked groups introduces the idea of an evolutionary history of living beings, the mechanisms of which will be studied in higher levels. This work of interpretation includes a questioning on the relations of inclusion/exclusion between the living beings and to a greater extent a civic reflection on everybody’s place in the world in which we live together.

Our paper propose to understand how the reading of the French storybook *Mais où est donc Ornicar?* (Glasauer and Stehr, 2000) allows taking in consideration the problematic question of classification in scientific and social ways with pupils from 9 to 11 years old. The particularity of this storybook is to bring in a "strange" animal Ornicar, the Platypus, which is hard to classify for the teacher the main character of the story. Ornicar is the new one of the class in which the pupils are all animals.

CONCEPTUAL FRAMEWORK

Tomkins and Tunnicliffe (2015) consider that recognizing animals (knowing their essence) is a complex procedure but young children use the appearance of an animal to group it and readily use exemplars. To make sure that pupils can change their own categorizations on the scientific plan, which is not the scientific one, the authors question what is the wider significance of "classifying" for science education? Tomkins and *al*. (2015) remind that early years primary school children encounter very many organisms or representations of organisms in their daily lives. Moreover, in their recent comparative study between 6 countries, Patrick and *al*. (2013) show that the mammals were by far the most frequently mentioned class of animal in all countries, followed by birds.

To move the understanding of learners to the accepted scientific classification, two didactic ways for primary school teachers are essentially proposed by researchers:

- By providing the criteria for classification (Lecointre, 2008). Lecointre's works may be considered as secondary prescriptions in France.
- By justifying the criteria chosen for classification (Orange-Ravachol and Ribault, 2007).

In the two cases, the criteria are based on anatomical characteristics, which are observable.

Our work is situated in the second way. This means that the criteria of classification are not a priori provided to the pupils. It focuses not only on observable features but also on problem of the criteria selection and the consequences in terms of inclusion/exclusion. Problematic tensions exist between inclusion and exclusion and between the criteria of classification. In reference to the epistemologist Bachelard's (1884-1962) works, our research gives a central place to the sense of the problem, as well as in the questioning of the knowledge that can seem – *a priori* – obvious, as criteria of classification.

In our research, we have shown that the work of problematization can be applied through the reading of storybooks of realistic fiction which present the opportunity to question the reality to which the story refers as soon as we induce a confrontation between the worlds produced by these fictions and the world built from the knowledge and experience of the pupils (Bruguière and Triquet, 2014). Furthermore, the scientific contents of classification, based on historical knowledge (Orange-Ravachol, 2012), their approach, as Costa da Silva et *al*. (2009) show it, can be worked on by resorting to narratives. Although there seems to be a growing consensus among researchers that children's literature can be used as instructional tools, there is a limited number of research studies that investigated effect of using children's literature.

In these realistic-fiction storybooks, narratives both prove a fictional base released from the constraints of the fictional world and an insertion of the concept into reality, with its own rules and logics. One of these realistic-fiction storybooks characteristics is also to use the reality, not as an illustrative framework, but as a way to supply the scenario of the events of the plot. In reference to the narrative structure of Larivaille (1973) we distinguishes five steps:

1. Initial step.
2. The step of provocation.
3. The step of action.
4. The step of sanction.
5. Final step.

The plot corresponds to the transformation from an initial step to a final step. In the case of realistic fiction, we have shown that the different steps of transformation (2, 3 et 4) are based of scientific logic. The reader (or listener) has to infer these scientific constraints in order to understand the signification of the plot. This interpretative part is not directly accessible. In the storybook *Mais où est donc Ornicar?* We will see that classification approach underlies. The logic of classification plays here the functions of transformation.

RESEARCH QUESTION

Our research aims at identifying how pupils aged from 9 to 11 years old understand animal classification using the realistic fiction storybook Mais où est donc Ornicar? This storybook introduces a "strange" animal probably unfamiliar to the learners, Ornicar, the Platypus.

We study more precisely:

- What is their knowledge in terms of group and criteria?
- What are the children's reasonings in terms of inclusion and exclusion used?
- To what extend the social dimension of inclusion and exclusion appears in the reasonings?
- To what extend is the appearance of an unfamiliar animal appropriate to question the grouping of the animals, the criteria or the decision?

PREVIOUS ANALYSIS

In order to propose a learning situation in line to the plot of *Mais où est donc Ornicar ?,* it is necessary to identify the different aspects of "classifying" in this book. q

On the front page are represented the two main characters of the story: the teacher and Ornicar, a Platypus. Arrival of this new pupil, Ornicar in the class consists a problem to the teacher because she does not know in to which group to place it. The animals in the whole (without Ornicar) know themselves, they know who is who, and they know to which group they belong. Ornicar is a priori excluded of the class. With a work of classification, Ornicar may be included in the class.

At the beginning of the storybook, the class includes animals that know each other while at the end of the storybook, the class includes an unfamiliar animal, Ornicar the platypus. The provocation step corresponds to the arrival of a new and « strange » pupil in the class, Ornicar. The teacher has to create some groups using a reason (the step of action). Firstly, she considers some animals' features (or functions). These features are « to drink some milk » and « to have feathers and a beak ». But it doesn't work because Ornicar presents incompatible features from the teacher point of view. Secondly, she considers some animals' skills: « Musical skill », « athletic skill » and « artistic skill ». And it works: Ornicar is included in the class.

If the teacher solves the problem in a social way, she does not solve it in a scientific way: she doesn't manage to classify Ornicar. The issue of this story is to understand why teacher's reasoning is not scientific. In this paper, we focus on the way children understand the criterion "to drink some milk" and how it allows them to imagine that Ornicar can be included in the class. That's why we only consider the teacher's action, when she tries to make some group with the criterion « to drink some milk ».

METHOD

The pupils came from three different classes from two schools of disadvantaged districts of Lyon, a French big town in the centre of the country. The two involved teachers are committed in our research group and ensured the science and technology teaching.

The learning situation studied originates in the complication to which the characters of the story are confronted: what group can Ornicar, the new one of the class, belong to?

The issue is to enable the pupils to understand the teacher's problem and to explore the possible solutions. Hence pupils are invited to produce a fictional narrative the first time. More precisely, during the first session, having read the first pages to the whole class, the teacher forms groups of pupils to whom she supplies the 3rd double spread with as only text, the sentence of the character of the teacher: "For the school canteen, those who drink milk go together!". The idea is for every

group "to imagine in the form of a text what the Duck and the Platypus say to each other and possibly to the other animals". The pupils had 30 minutes to prepare their text.

Data are made up of 21 narratives produced by the pupils. These narratives are produced by pupils from three classes. Two classes, noted A and B, are managed by one female teacher, one class noted C, by another female teacher.

The qualitative analysis of data was structured according to 2 themes:

- First, the process of classification and/or exclusion (in a scientific way).
- Second, the criteria used by the pupils to consider the groups of animals.

RESULTS

Out of the 21 narratives, 17 considered a group of classification for the Platypus associated - or not - to one or several criteria. 3 narratives (2A, 9C, 8C) did not propose a group of classification and 1 narrative (4B) proposed a group, which did not include the Platypus. Figures 1a and 1b present 15 narratives, which associated a classification group to one, two or several criteria.

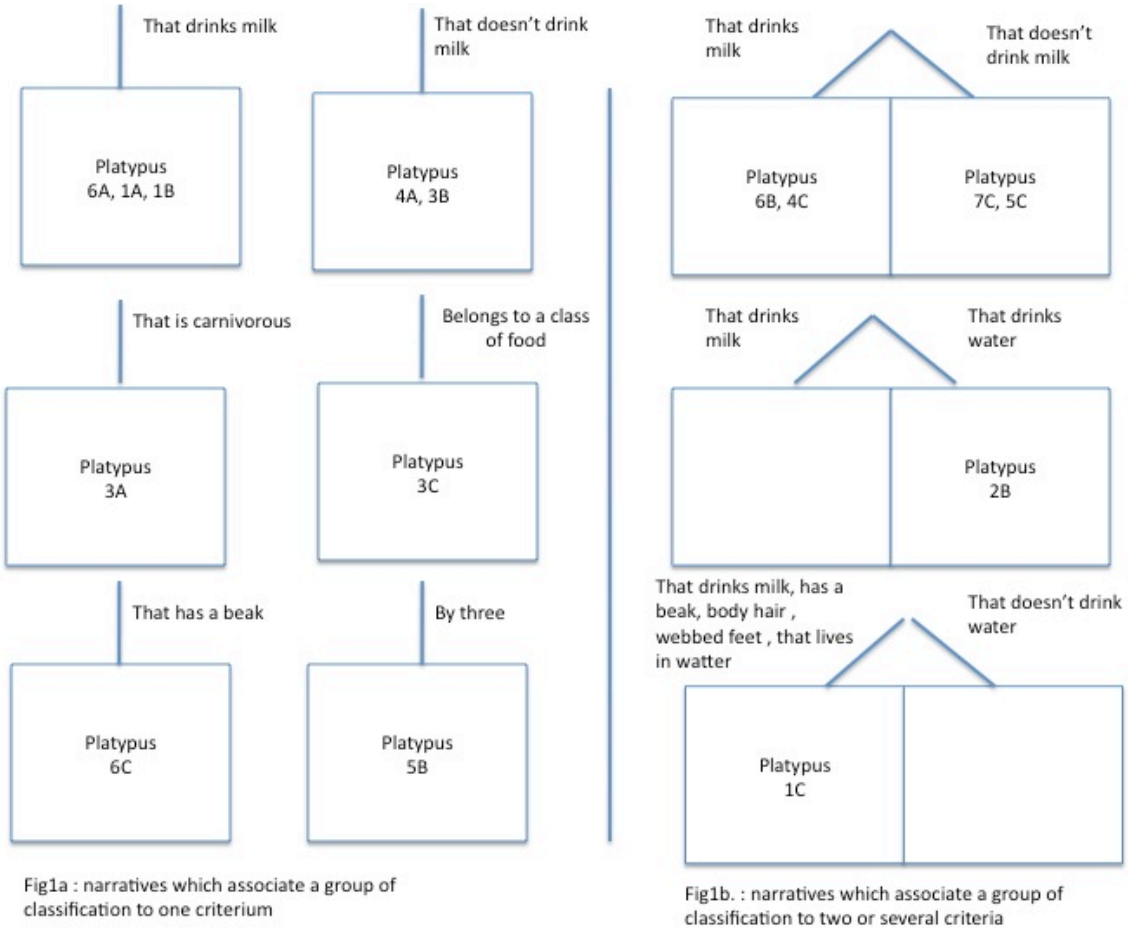

Figure 1. Narratives' classification

Out of the 9 criteria of classification which appear in narratives, 8 fall under an animal characteristic: food, anatomical or in connection with a living place. The presence of the characteristic "to drink some milk" or its absence mainly appears in narratives mentioning a criterion (10/16).

Figure 2 presents the distribution of the 17 narratives, which included the Platypus in a group of classification, according to 'speeches' of exclusion and inclusion delivered by animals or felt by the Platypus. These are the 9 narratives, which considered a classification group on the basis of a

single criterion, which have the most speeches of inclusion and exclusion and the 6 narratives, which consider two groups of classification on the basis of two or several criteria. 6 narratives expressed exclusion felt by the Platypus.

No narrative expressed a speech of inclusion felt by the Platypus. So, narrative 6C (extract 1) combines the voices of various animals (Dog, Bear, Sheep) which carry speeches of exclusion in their intonation or their contents, in that of the Platypus which expresses a feeling of exclusion and that of the duck which carries a speech of inclusion justified by the fact that the Platypus, just like the Duck, has a beak.

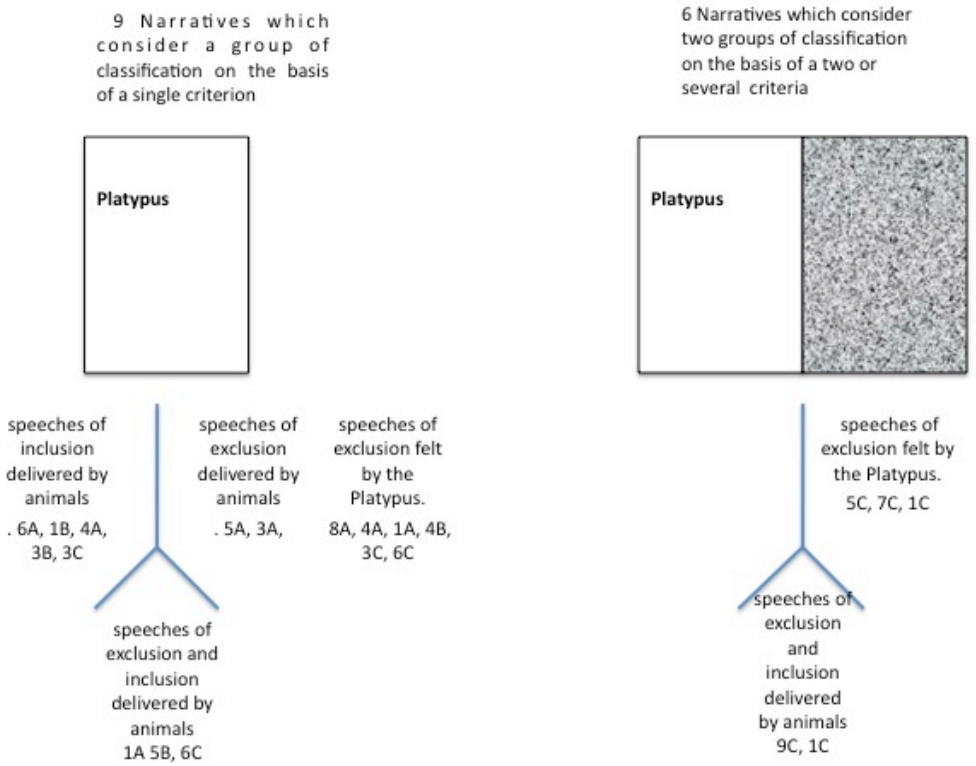

Fig 2. narratives which include the Platypus in a group of classification, according to the speeches of exclusion and inclusion delivered by animals or felt by the Platypus, and **depending on the number of groups and criteria**

- Look at them! The Dog screamed (showing the Duck and the Duck-Billed Platypus)
- They are not like everybody, the Bear said
- Meh meh meh, the Sheep laughed.
- I am the only one that is different, the Duck-Billed Platypus said.
- No, you are not the only one, I am different too and then you have a beak and I have a beak, the Duck said.

(Extract 1)

DISCUSSION AND CONCLUSIONS

These narratives, which develop possible solutions for the inclusion of the Platypus, work as exploratory tools to find whether these pupils from disadvantaged districts the problematic tensions between inclusion and exclusion but also between group and criterion of classification. And even more so because some underprivileged pupils encounter the similar problem than the

platypus in the story. We can ask what would have been the impact of other forms of narrative produces by pupils on their way to understand the complex problem of classification.
We can conclude that the commitment of the pupils in a complex scientific thought on classification suppose:

> On the one hand to go beyond certain prejudice in the observation of a new animal and to consider it in the same way that any other animal: what features share this animal with the others?

As Levy-Leblond (1996) reminds us, when the first explorers discovered the Platypus, they considered it as an hybrid animal, even primitive, while a recent scientific study shows that it is indeed a new living being whose beak is of an evolutionary innovation.

> On the other hand, to take into account the social dimension of classification in order to distinguish with the pupils the subjective and objective features.

This teleological and anthropomorphic character (Kallery et Psillos, 2004) of the proposed learning situation would be an asset to assist the pupils express themselves and consider the questioning on classification such would also enable we assert the pupils to think in another way about the relationships with the others in a long-lasting perspective.
This research considers new orientations given by the European commission of the expert group on science education and science education for responsible citizenship (2015) across the link between science and other subjects and disciplines with such questions as:

- How to use an activity based on realistic fiction as a starting point to introduce scientific thinking?
- To what extend learning about science through literature offer a more integrative and interdisciplinary approach?

We seek to answer them.

Acknowledgement:

We would like to thank the three teachers who have participated to this research, and the pupils who worked for them.

REFERENCES

Bruguière, C., & Triquet, É. (2014). Realistic-fiction storybook as a resource for problematic questioning of living beings with pupils in primary school. In C.-P. Constantinou, N. Papadouris & A. Hadjugeorgiou (Eds), e-Proceedings of the ESERA 2013 Conference (pp. 3021-3032)

Costa da Silva, P.-R., Miranda Correia, P.-R., & Infante-Malachias, M.-E. (2009). Charles Darwin goes to school: the role of cartoons and narrative in setting science in an historical context. *Journal of Biology Education*, 43(4), 175-181.

Glasauer and Stehr (2000). Mais où est donc Ornicar ? Paris : L'École des Loisirs.

Kallery, M. & Psillos, D. (2004). Anthropomorphism and animism in early years science: Why teachers use them, how they conceptualize them and what are their views on their use. Research in Science Education, 34, 291-311.

Larivaille, P. (1973). L'analyse morphologique du récit. Poétique, 19, 368-388.

Lecointre, G. (2008). Comprendre et enseigner la classification du vivant (2ème edition). Paris : Belin.

Lévy-Leblond, J.-M. (1996). La pierre de touche : la science à l'épreuve. Paris : Gallimard.

Orange (2012). Didactique des Sciences de la Vie et de la Terre. Rennes : Presses Universitaires de Rennes.

Orange-Ravachol, D., & Ribault, A. (2007). Les classifications du vivant à l'école : former l'esprit scientifique ou inculquer la bonne solution ? *Grand N*, 77, 91-107.

Patrick, P., Byrne, J., Tunnicliffe, S.-D., Carvalho, G., Havu-Nuutinen, S., Sigurjonsdottir, H., Ostkarsdottir, G., Tracana, R. & Bartozeck, A. (2013). Students (ages 6, 10 and 15 years) in six countries knowledge of animals. *NorDiNa*, 9(1), 18-32.

Tunnicliffe, S.-D., & Tomkins, S. (2015). Naming the living world: From the infant's perception of animacy to a child's species concept. *Directions in Mathematics and Science Education*, 28, 147-167.