

Lafontaine's Quarter and the Number Quarter: The Difference between Jungle Justice and Mathematics Justice

Dorit Patkin, Kibbutzim College of Education <patkin@netvision.net.il>

Abstract

This article discusses a unique approach to mathematics teaching, grounded in the use of examples taken from the world around us and implemented in two 4th grade classes. It presents literacy activities designed to foster a language of mathematics for all pupil populations (mainstream, gifted and pupils with special needs) and highlights the relation between the daily language and the language of mathematics. The concept is rooted in the requirement to strengthen the inter-disciplinary connections in different systems, including education systems. Thus, we have the opportunity to implement a tool of meaningful learning, entailing better comprehension of the subject and finding the beauty encompassed in it. The activities focus on the positive effect of integrating fables as literary genre for improving the language of mathematics, reducing the fear of mathematics problem solving and increasing the satisfaction with mathematics.

Theoretical background

Professional literature emphasizes that teaching mathematics, combined with literacy activities, enables teachers to reach a variety of pupils (Ackerman, 1993; Fulwiler & Young, 1990). Moreover, a study of different populations of mathematics teachers illustrates that integration of literacy in teaching may enhance understanding of the subject, reducing fear of it (Ezer, Patkin & Millet, 1999). This approach underscores that comprehension of the subject is achieved by multi-disciplinary systems.

The following example is an adaptation of a mathematical topic taught at elementary school by way of allegory. Appropriate assignments for children with different mindsets and different competences are consistent with the pupils' development. Pupils might find in the activities a "path" for performing literacy and mathematics assignments (Patkin, Millet & Ezer, 2004). The example illustrates how literacy activities can be integrated for the purpose of developing and enhancing mathematics thinking. These activities can serve as an introduction to a studied subject, the core of the studied subject or, alternately, they can be introduced in enrichment advanced lessons or as a summary of a chapter. The significance of the activities are corroborated by the study conducted by Hershkovitz, Peled & Littler (2009), dealing with teachers' role in the presentation of creativity-promoting tasks. The study highlights how important it is that pupils receive from their teachers open and varied assignments, consisting of activities based on the need for observation and developing visual competence.



The pedagogical and didactic functions of the activities are:

1. Offer interesting and unusual mathematical activities to the pupils.
2. Develop mathematics studies out of experience and inquisitiveness.
3. Develop the learners' ability to cope with problems taken from their daily environment.
4. Present the relation between mathematics and other disciplines, such as biology, architecture, etc.
5. Reduce anxiety of the subject.
6. Create opportunities for mathematical activity also for pupils who find the subject difficult.

Within the framework of enrichment studies for pupils, this study explored learning materials presented later with 160 pupils in the 4th grade at elementary school. The pupils experienced numerous activities during several lessons. A discourse about the question: "What have you learnt that you had not known

previously?" was conducted after each activity. Jean de Lafontaine, who was a famous French fabulist, bases the example on a fable. It is a didactic literary work, designed to instill moral values and wisdom.

It is recommended to start the activity by describing fables and Lafontaine himself. The fable is the earliest form of secular world literature. Many fables go back three thousand years and more. They came in different forms in numerous countries and languages and all fabulists used to tell their parables in the name and spirit of their people and era. Fables were not intended specifically for children, but already during the Enlightenment period, storytellers realized they affected children's psyche and way of thinking. Typically, the parable is short, has a clear structure and its plot is simple, speaking directly to the heart of the child. It "personifies" animals, making it easy for children to identify with the characters and even absorb the moral idea of the story.

Jean de Lafontaine was born in 1621 in France and died in 1695. For many years, he served as a forest and waterways ranger near his home. Hence, his stories and parables are derived from this world. After his death, people said that the fables "would never die, bestowing upon him respect across generations."

The chosen Lafontaine's fable is "The lion who divided the prey" or, in the language of mathematics: The story of one quarter.

A lion, a dog, a wolf, and a fox mutually swore to share everything. One day the fox hunted a deer. He immediately called his partners to share the prey. The lion approached the dead deer, tore the flesh of the prey into four equal parts and said: "Now, I'll make a just division: The first quarter is mine, because I'm the leader and the king of the forest; the second quarter is mine because I'm the strongest; the third quarter is also mine, because I am entitled to a share according to the agreement as a partner with equal rights; and the fourth part - woe to him who dares to touch it." The three partners bowed their heads and left without saying a word.



Examples of activities and recommended questions (accompanied by explanations for some of the activities)

One of the first activities introduced to the pupils was reading the story and telling it in other words; marking the words that represent mathematical concepts and trying to explain using other words how we can divide a whole into four equal parts. Ask "What is the name of each part?"

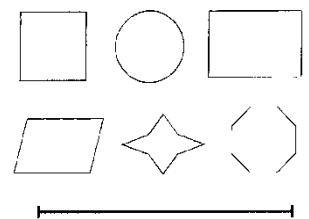
The main idea of this activity is to guide pupils to cope with a familiar literary text while looking also through the prism/perspective of mathematical concepts. When students read the story for the first time, they focus on the plot. However, when they are requested to indicate mathematical words, they have the opportunity to see also the mathematics in the story.

- The mathematical words appearing in the story are: divide, four equal parts, division, first quarter, second quarter, third quarter, fourth quarter
- If we divide a whole into four equal parts, each part is called a "quarter" and in a mathematical way of writing: $1:4 = 1/4$.

Another activity and recommended questions:

Four animals swore to divide the prey into four equal parts.

1. If the prey is the whole, what is the part for each animal? _____
If the prey is the whole, then the share of each partner is a quarter.
2. Highlight the part of each of the animals in the following shapes:



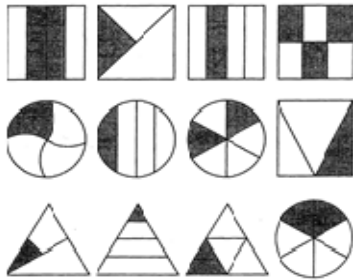
3. What part of any shape each of the animals received?

In words: _____ in number: _____

Explain your answer in your own words: _____

The idea underlying this activity is to show that it does not matter what the shape looks like. Every shape represents a whole. However, the relative part of every shape divided into four equal parts is always called "quarter."

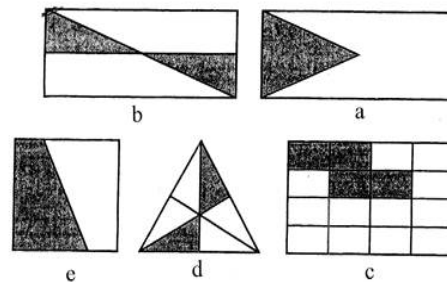
4. Indicate the shapes painted as a quarter of the shape:



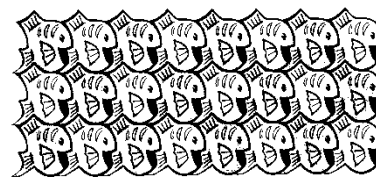
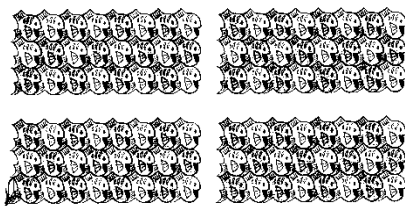
5. To the right are painted areas representing $1/2$, $1/3$ and $1/4$. Arrange the shapes, from the smallest dark area to the largest dark area. Describe in your words: _____



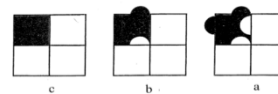
6. To the right are some shapes with darkened areas. Describe in your way: which part of the whole is represented by the darkened area



7. Below are some carpets with fish (in Esher's style). Color $1/4$ of the fish in each carpet. Do it in other different ways.



8. Choose among the three shapes *a*, *b*, and *c* the largest darkened area.

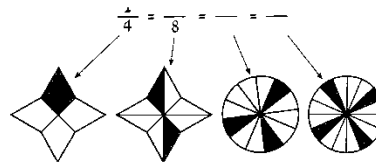


Explain your answer: _____

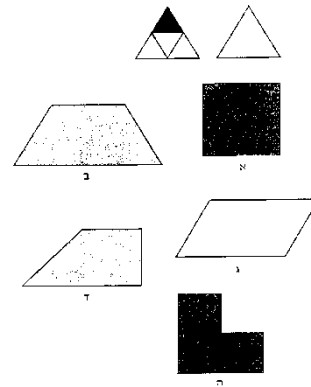
Can you create another shape that will be equal to the darkened area as shape *a*?

Explain: _____

9. Different names for the quarter.
Complete the fractions according to the drawings:



10. A Challenging assignment: Divide each of the following figures into four congruent shapes (equal area and equal shape), similar to the original figure:



11. Return to the fable “The lion who divided the prey.” The lion said that he divided the prey equally.

Did every animal get what it was entitled to? _____

How much did the dog get? _____

How much did the wolf get? _____

How much did the fox get? _____

How much did the lion get? _____

Was the division fair? _____

Was the division made according to the agreement as partners with equal rights? _____

What is "justice" in mathematics? _____

What is "justice" in the forest? _____

What did you learn from this fable?

In mathematics: _____

In everyday life (moral): _____

The dog, wolf and fox did not get any share of the prey whereas the lion received all the prey, namely the whole which is 4/4. The division was unjust because the agreement of equal partners and equal right was not enforced. According to the forest laws, justice implies that the strong deserves everything. According to mathematics justice, everyone should get an equal part. The lesson in this story is that the strong can defeat the weak and agreements are not fairly implemented. This is the difference between mathematical justice and forest laws.

As I mentioned before, pupils in the 4th grade took part in the activities. At the beginning of the study, 75% of the participants testified that learning the subject of fractions is considered difficult. However, after learning the term fraction by using the fable of "The Lion who divided the prey" by Lafontaine, 90% changed their view, saying they felt more confident in learning this term.

I received the following responses from the pupils:

- I have not thought I can find mathematics in fables.
- I have never seen any relation between mathematics and language.
- At first I did not understand what the teacher meant.
- How can mathematics be connected to the textbook?
- I feel that I want to continue learning mathematics.
- I would like to receive additional activities like this.

The findings indicate that using intriguing fables that stimulate mathematics thinking, leading to an educational lesson promotes the positive approach to the teaching of mathematics and to using the language of mathematics.

Summary

The article illustrates activities of mathematical literacy designed for all pupil populations (mainstream, gifted and pupils with special needs). It presents one example, which illustrates that mathematics studies can provide a rich environment for enhancing mathematical thinking, developing logical thinking skills, using intuitions and acquaintance with our environment and reality. The activities comprise a challenging, creative, enriching inter-disciplinary combination, including complex thinking skills and principles of informed use of natural language and the language of mathematics for teaching the concept of quarter.

Mathematical activities along these lines enhance acquaintance with and inculcation of mathematical processes and the implementation thereof, improve verbal communication in general and mathematical one in particular. Hence, it is highly recommended to integrate **mathematics** lessons activities like those presented above as well as a multi-disciplinary practice, which will entail pupils' better and more meaningful comprehension of mathematics and will enrich knowledge of this subject.



References

- Ackerman, J. M. (1993). The promise of writing-to-learn. *Written Communication*, 10(3), pp.334-369.
- Ezer, H., Patkin, D., & Millet, S. (1999). Literacy in mathematics perception of mathematics educators: From literacy in mathematics to mathematics literacy. In O. Zaslavsky (Ed.) *Proceeding 23th International Group for the Psychology of Mathematics Education (PME)*, 1, 274, Haifa, Israel.
- Fulwiler, T. & Young, A. (1990). *Programs that work*. NH: Heineman Educational Books.
- Hershkovitz, R., Peled, I., & Littler, G. (2009). Mathematical creativity and giftedness in elementary school: Task and teacher promoting creativity for all. In: R. Leikin, A. Berman & B. Koichu (Eds.), *Creativity in mathematics education of gifted students*. Pp. 255-271. Sense Publishers.
- Millet, S., Patkin, D., & Ezer, H. (2002). What is between Lafontaine's quarter and the rational number quarter? Or what is the difference between mathematics justice and jungle justice? The 26th Conference of the International Group for the Psychology of Mathematics Education – (PME), 1, 362. Norwich, UK.
- Patkin, D., Millet, S., & Ezer, H. (2004). *Numbers from the stories: about fables, legends and mathematics*, Tel-Aviv: Rechgold Ltd. Publishers. [Hebrew]

Dorit Patkin, Associate Professor, & Ph.D. in mathematics education, was the head of the mathematics department at the Kibbutzim College of Education in Israel. Her research interests are in math teaching and education, exploring students' mistakes and misconceptions in math and professional development of math teachers.

