

“Literacy in Mathematics with “Mother Goose”

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Abstract

Integrating songs and stories in mathematics learning constitutes an important tool for cultivating mathematical literacy as well as one of the ways of overcoming learning difficulties. Learning mathematics is attributed greater importance if it integrates topics associated with children's environment. This paper makes use of one of Mother Goose songs for implementing a mathematical activity dealing with the issue of series and their graphic presentation.

Keywords: Literacy in mathematics, activities, Meaningful learning, mathematical language

1. Introduction

"Mother Goose" songs are undeniably essential and well-grounded in children's literature no less than classical legends such as "Red Riding Hood", "Cinderella" or "The Sleeping Beauty" which are also called "Mother Goose Legends". A first printed collection of Mother Goose Rhymes was rather ancient and it was published already in the 17th century.

The songs entitled "Mother Goose" have passed from generation to generation. Many children around the globe know to recite them by heart since they read and sing them from a very young age. Some are play songs – namely songs which are accompanied by moving or clapping your hands according to the rhythm and rhyming. Others are songs with a famous melody. Their linguistic value is considered to be high linguistic due to the rhyming and vocabulary and hence they are important also for the development of language. Mother Good songs are usually used for getting acquainted with names of numbers and for counting. This paper makes use of one of Mother Goose songs for implementing a mathematical activity dealing with the issue of series.

2. Songs and stories for fostering mathematical literacy

Learning mathematics is attributed greater importance and interest if it integrates topics associated with children's environment and with things they know from their previous experience and daily life (NCTM,2000). Integrating songs and stories in mathematics learning constitutes an important tool for cultivating mathematical literacy as well as one of the ways of overcoming learning difficulties, reducing anxieties and enhancing the understanding of the subject contents.

In recent years, several studies have been conducted on the subject of literacy and math, indicating the contribution of discussion in math, as well as that of reading and writing, to the process of building the understanding of mathematical concepts in the learner (Darvin, 2007; LaBonty.& Danielson, 2004; Levenberg & Ophir, 2001). It is assumed that such a combination

will allow the pupils to build a bridge between the technical concepts of math and their daily experience.

Furthermore, teaching mathematics through songs and stories promotes mathematics learning due to the fact that it is done also in an experiential, emotional and imagination-developing way. All this is supported by studies of this topic.

There are many children songs and stories which encompass a "covert" and sophisticated mathematical content. In some cases even their name does not divulge the mathematical content included in them. Moreover, they are now known to teachers and learners as mathematics books. However, they offer a wide variety of inquiry activity options. These are usually books of a good literary quality and are worthy of reading, in addition to options of mathematical activity. In fact, the purpose is to view all these books in a different light. The same applies also to "Mother Goose songs" which comprise a rich mathematical message for activities.

2.1 "The first day of Christmas" as a source for activity with series

The song "The first day of Christmas" describes a treasure of gifts which a lover brings to his beloved girl for 12 days, adding a new gift every day (words of the song are presented in the Appendix). The name of the girl and her lover are not mentioned in the song but the names of the numerous and strange gifts are explicitly mentioned, including the daily amount of every gift. Each of the 12 verses of the song repeats both the type of gift and the amount.

The mathematical activity presented here uses the words of the song and the stages of performing the activity as a way for developing literacy and mathematical thinking are specified.

The first stage: after reading the song, the pupils have to estimate the numbers of the gifts received by the girl by guessing or intuitive feeling. This stage is very important in order to examine and compare the mathematical intuition versus the examination and calculation which would be made later.

The second stage: the pupils collect data from the words of the song and check the options of gathering and presenting them. At this stage they can type the data into the computer. They can use Excel software for a graphic presentation of the data (see graphs No.1 and No. 2).

The third stage: The pupils examine the obtained results and are exposed to various types of series.

3. Recommendations for the activity

This activity is recommended for pupils in the 4th-8th grades. It depends on the teachers' decision regarding the mathematical level in the topic of series they wish to achieve with their pupils. Below are recommendations for engaging in the activities with the pupils:

Stage 1

- a. Read the song and add a verse according to your wish. This can be a verse which sums up the plot.
- b. Let's assume that the lover brings everyday a new load of all the gifts to his beloved girl.

Try estimating:

- ❖ What gift did the beloved girl receive the highest number of times?
- ❖ What gift did the beloved girl receive the fewest number of times?
- ❖ It is possible that certain gifts were received the same number of times?
- ❖ Try to estimate how many gift items did the beloved girl receive during all the 12 days? (less than 100? More than 100? More than 300?)

Please note that moving on to the second phase of the activity can be done only after having written your estimates!

Stage 2

You have to plan how to present the gifts which the beloved girl received each and every day. At this stage teachers can recommend building a table which will include all the items received by the beloved girl during the 12 days.

Table 1.

Type of gift / days	1 st day	2 nd day	3 rd day	4 th day	Total No. of gifts
Partridge	1	1	1	1		12
Turtle doves		2	2	2		22
.....						
Total number of gifts each day						

Then, the pupils should sum up the numbers presented in each column and line.(Table 1)

Stage 3

- Now check your estimates from stage 1. Were you right?
- Which gift did the beloved girl receive the highest number of times?
- What else can you say about the list of gift numbers which you achieved?

The following points should be highlighted for the class discussion:

One can see that completion of the suggested table and checking the columns and lines yield sums which constitute a series.

- Each column has an arithmetic series of numbers which becomes longer and the last column contains all of them from 1 to 12.
- The number of gifts is increasing every day. The following series is obtained:

1, 3, 6, 10, 15, 21, 28, 36, 45, 55, 66, 78

It is important to draw the pupils' attention to the fact that this series is not arithmetic but the series of differences constitute an arithmetic series. In that way expose them to another type of series which exists in mathematics and even encourage them to build a similar or different series with defined rules. The graphic presentation (Figure 1) can also be used for demonstration that this series is not Arithmetic.

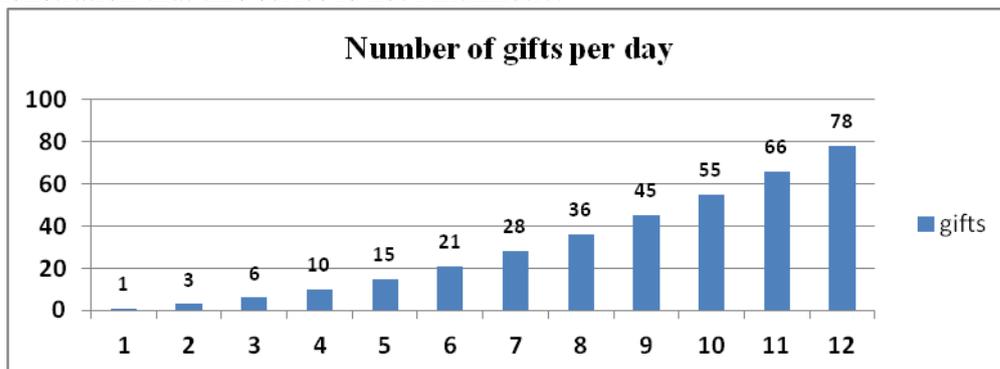


Figure 1: Number of gifts per day

- The intuitive guess that the number of gifts on the last day is the highest is not surprising. This is the sum of the arithmetic series of the numbers from 1-12 (78 gifts on the 12th day). Conversely, when calculating and checking which gift (or gifts) were received the highest number of times, their number is very surprising.
- Checking the sum of the gift numbers of any type after 12 days (column 13) presents the following series:

12, 22, 30, 36, 40, 42, 42, 40, 36, 30, 22, 12
 $+10, +8, +6, +4, +2, +0, -2, -4, -6, -8, -10$

It is appropriate to discuss the behaviour of the series, behaviour of the difference series, and of an increasing and decreasing series. Moreover, one can see that some gifts were received the same number of times on the sixth and seventh day and the reason for it should definitely be deliberated. It can be presented as a graphic presentation (see Figure 2).

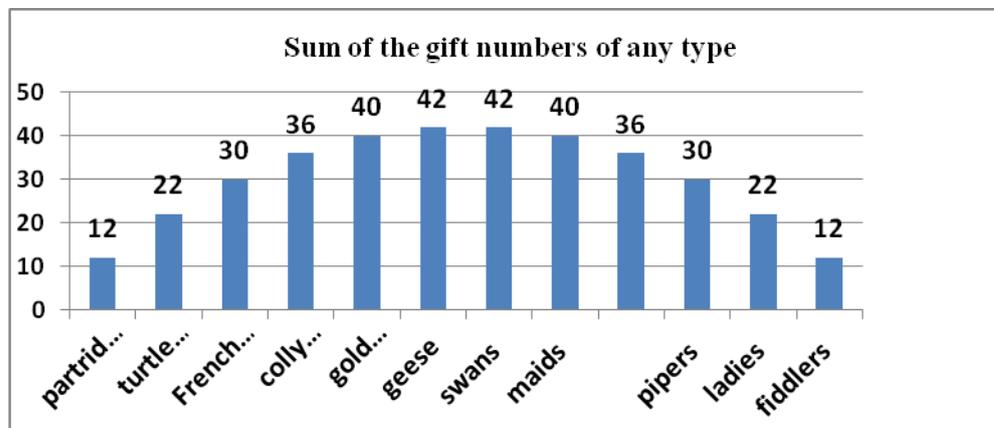


Figure 2: Sum of the gift numbers of any type

5. From this point one can move to summing up all the gifts and checking the pupils' estimates from Stage 1.
6. Discuss the reasons for the differences between the estimates in Stage 1 and the calculated results in Stage 3.

4. To sum up:

The suggested activity for getting acquainted with a series of numbers and at the same time develop mathematical literacy and thinking is interested and unusual. Moreover, it responds to the objectives of mathematics teaching in all the curricula. For example:

- a. Enrich the language in general and the mathematics language in particular through a learning experience which evokes inquisitiveness.
- b. Present the relation between mathematics and other learning disciplines, e.g. literature, history and others.
- c. Reduce the pupils' anxiety about the subject while underscoring the part of mathematics in daily life.
- d. Offer opportunities for mathematical activity also to pupils who encounter difficulties in this subject.

Interdisciplinary teaching not only saves time but adds to pupils a much wider view as well as develops several skills together. This is but one example for such a combination and additional songs of "Mother Goose" constitute an unfathomable source for varied mathematical activities.

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Appendix
"THE FIRST DAY OF CHRISMAS" BY MOTHER GOOSE

<p><i>The first day of Christmas, My true love sent to me partridge in a pear tree.</i></p> <p><i>The second day of Christmas, My true love sent to me two turtle doves, and partridge in a pear tree.</i></p> <p><i>The third day of Christmas, My true love sent to me three French hens, two turtle doves, and partridge in a pear tree.</i></p> <p><i>The fourth day of Christmas, My true love sent to me four colly birds, three French hens, two turtle doves, and partridge in a pear tree.</i></p> <p><i>The fifth day of Christmas, My true love sent to me five gold rings, four colly birds, three French hens, two turtle doves, and partridge in a pear tree.</i></p> <p><i>The sixth day of Christmas, My true love sent to me six geese a-laying, five gold rings, four colly birds, three French hens, two turtle doves, and partridge in a pear tree.</i></p> <p><i>The seventh day of Christmas, My true love sent to me seven swans a-swimming, six geese a-laying, five gold rings, four colly birds, three French hens,</i></p>	<p><i>The ninth day of Christmas, My true love sent to me nine drummers drumming, eight maids a-milking, seven swans a-swimming, six geese a-laying, five gold rings, four colly birds, three French hens, two turtle doves, and partridge in a pear tree.</i></p> <p><i>The tenth day of Christmas, My true love sent to me ten pipers piping, nine drummers drumming, eight maids a-milking, seven swans a-swimming, six geese a-laying, five gold rings, four colly birds, three French hens, two turtle doves, and partridge in a pear tree.</i></p> <p><i>The eleventh day of Christmas My true love sent to me eleven ladies dancing, ten pipers piping, nine drummers drumming, eight maids a-milking, seven swans a-swimming, six geese a-laying, five gold rings, four colly birds, three French hens, two turtle doves, and partridge in a pear tree.</i></p> <p><i>The twelfth day of Christmas My true love sent to me twelve fiddlers fiddling, eleven ladies dancing, ten pipers piping,</i></p>
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*Two turtle doves, and
partridge in a pear tree.
The eighth day of Christmas,
My true love sent to me
Eight maids a-milking,
Seven swans a-swimming,
Six geese a-laying,
Five gold rings,
Four colly birds,
Three French hens,
Two turtle doves, and
partridge in a pear tree.*

*Five drummers drumming,
Eight maids a-milking,
Seven swans a-swimming,
Six geese a-laying,
Five gold rings,
Four colly birds,
Three French hens,
Two turtle doves, and
partridge in a pear tree.*