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Articles

Learning of logical-mathematical contents through fairy tales in Early Childhood Education

El aprendizaje de contenidos lógico-matemáticos a través del cuento popular en Educación Infantil

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Abstract

The adaptation and use of stories provide a comprehensive scenario of the content, both from a cognitive and emotional point of view. The aim of this research is to show how reading stories can be used in the early learning of mathematics. In order to do so we describe and assess the effectiveness in the classroom, using learning opportunities that use tales scenes as a learning tool. The design is quasi-experimental with a quantitative approach focusing on a control group, containing a sample of students from Kindergarten. The target group worked in the classroom with resources taken from an adaptation of the story of the Ugly Duckling, while the control group worked on the same contents without any didactic modification. The results of the intervention, evaluated using an individual tool, TEMT (Test of Early Mathematics Assessment), initially show homogeneity of the two groups (target and control) and improvements after the intervention in the level of mathematical proficiency in the target group. No differences by age are observed, and very few differences by gender, only in some variables, showing a better performance of the girls.

Keywords: Children's literature; Early Childhood Education; logical-mathematical learning; early reading; fairy tales

Resumen

La adaptación y el uso de los cuentos facilitan un escenario comprensivo del contenido, tanto desde el punto de vista cognitivo como emocional. El objetivo de esta investigación es mostrar la utilidad de la lectura del cuento en el aprendizaje temprano de las matemáticas, para lo cual se describe y evalúa la eficacia de una intervención de aula, utilizando situaciones didácticas a partir de las escenas de un cuento como herramienta de aprendizaje. El diseño es cuasiexperimental de enfoque cuantitativo con grupo control, con una muestra de estudiantes de Educación Infantil. El grupo experimental trabajó en el aula los contenidos desde la adaptación del cuento del Patito Feo, mientras que el grupo control trabajó los mismos contenidos sin modificación didáctica. Los resultados de la intervención, evaluados utilizando un instrumento individual, TEMT (Test de Evaluación Matemática Temprana), muestran inicialmente homogeneidad de los grupos (experimental y control), y mejoras tras la intervención en el nivel de competencia matemática (NCM) en el grupo experimental. No se observan diferencias por edad, y muy pocas diferencias por sexo en algunas variables, siempre con un mejor comportamiento en las chicas.

Palabras clave: Literatura infantil; Educación Infantil; aprendizaje lógico-matemático; lectura temprana; cuentos populares

Introduction

Listening to stories is the first literary experience for children, where they can be transported to another place, transform themselves into different characters or create new horizons for imagination and creativity. We all remember some children's story that evokes a pleasant memory, but we rarely had the experience of living one of these stories linked to curricular content related to scientific disciplines, such as mathematics.

Storytelling is a fundamental didactic mediator in children's learning that facilitates the conveyance of symbolic messages in a playful and entertaining way, while stimulating their curiosity and imagination, elements that can be considered essential for the learning of content related to scientific disciplines through enquiry (Bevins & Price, 2016).

There is a wealth of research using stories as a learning tool and it facilitates us to go through different learning objectives, especially at an early age. Storytelling provides different elements to work on in the infant classroom, ranging from language development to working with pictures, as well as a wide range of possibilities that are foreseen within the fields that make up the official curriculum (Decreto 17, 2008).

Some of these specific approaches in the early stages of school can be the production of stories with a structured narrative, following an intervention based on reading and reconstructing stories (Borzone, 2005), or on the knowledge of scientific phenomena from representations (Kalogiannakis et al., 2017) or aspects focused on social emotions and feelings, creating a scenario where it is easy to name and recognise them (Sánchez et al., 2018). Storytelling can be a tool to "help generate and develop the necessary behaviours to increase participation and emotional expression, both in normal life situations and in situations of conflict or crisis" (Correa, 2002, p. 140).

From the point of view of early mathematics education, research in mathematics didactics has gained relevance in the last two decades, giving strength to a content formation adapted to the personal characteristics of children at this educational stage, paying special attention to the resources used in the classroom, and providing evidence showing that early mathematical skills form the basis for later learning (Claessens & Engel, 2013). The level of early mathematical

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competence development is positively related to verbal, spatial and memory skills (Locuniak & Jordan, 2008; Mazzoco & Thompson, 2005).

Mathematics instruction should be motivating in the early years, in order to engage children in problem solving (National Association for the Education of Young Children [NAEYC] & National Council of Teachers of Mathematics [NCTM], 2002). Teaching at these stages should facilitate the learning of mathematical content, while encouraging a positive approach to learning (Ginsburg & Golbeck, 2004), based on the creation of an appropriate mathematical environment that leads to experiences through manipulation (Dienes, 1990). The design of classroom situations arousing curiosity leads to the development of the ability to be creative (Casey, 2011); the teacher through the way he/she implements activities presents situations that promote children's analytical and reasoning skills, facilitating their active participation (Jacobi-Vessels et al., 2016).

We should forget the need for adequate competence in linguistic communication in the learning of mathematics, a situation where working with stories can contribute through comprehensive reading and the correct expression of the results obtained. At this age, it is important to use activities that link the different content areas with the natural language, so that children can expand their oral language through listening and interaction with others. Additionally,

> storytelling fits in perfectly with their symbolic play, as stories are represented through a deferred imitation thereof, and it allows them to foster their capacity for abstraction by understanding values such as "evil, goodness, greed, generosity, etc.", to experience their feelings about the story by expressing their sympathies and antipathies towards the characters (Marín, 1999, p. 29).

Reading stories can facilitate children's word knowledge in a context of number sense instruction (Hassinger-Das et al., 2015). The use of stories as a tool for learning mathematics shows different achievements in educational research. Whitin and Whitin (2004) point to storybooks as a good resource for connecting mathematical content with real-life situations. Reading stories can facilitate moments where logic and problem solving are worked on (Saá, 2002). The scenario provided by a story allows us to work with objects with which children can interact, thus acquiring logical-mathematical skills (Alsina, 2012).

Children build mathematical knowledge with positive attitudes by using stories as a means to imagine scenarios, where characters solve problems (Keat & Wilburne, 2009). The creation of connections between different situations gives rise to meaning in mathematical ideas, giving children a start in constructing generalisations from observation (Haylock & Cockburn, 2013).

Barrera (2015) presents a possibility of working on different mathematical contents in a contextualised way in real situations (counting, operations, among others) by constructing a storybook, which can be used from the third year of primary education onwards. Colomer and Ramos (2002) designed a research using fairy tales to work on mathematical content at an early stage, while Aymerich (2010) presented a review of which stories can be useful for working on mathematical content. More specifically as for the learning of a specific content, Rodríguez and Fernández (2016) construct a story to work on the decimal decomposition of numbers. The use of reading in a specific context of a school subject poses as a difficulty its instrumentalisation (Cerrillo, 2007), a fact that must be prevented from the design of the educational intervention, aiming at the creation of realities and contexts that are not far from the essence of the chosen reading.

Finally, we would like to mention an issue raised in didactic research in relation to two covariates, gender and age, assuming that they may influence early mathematics learning. Gender invariance in mathematics learning is widely explored at higher levels, however, studies in Early Childhood Education (EI, as per its Spanish acronym) are not as frequent (Aragón et al., 2013; Arens et al., 2016; Navarro et al., 2010). Any possible differences or similarities in performance according to gender can be considered from three approaches, arithmetic and spatial skills (Bakker et al., 2019; Nowell & Hedges, 1998; Reilly et al., 2017), problem solving strategies (Laski et al., 2013) or the influence of the social and cultural environment (Makosz et al., 2019; Nguyen & Ryan, 2008). However, we believe they are not disjunct situations but that both may or may not lead to differences in mathematics learning because of the intrinsic relationship they have with their objectives and content.

With regard to age, it is common for children in the infant classroom to have a chronological age that is different from their maturational age; in this sense, it is thus reasonable to think that learning outcomes will be conditioned by this variable. Research shows that chronological age may be related to numeracy skills (Nanu et al., 2020), and even that "students younger than average for their grade are more likely to perform poorly in mathematics" (Rodriguez, 2016, p. 5).

Therefore, storytelling is seen as a didactic tool in early ages, which facilitates the design of a motivating didactic scenario allowing a holistic work for the achievement of the teaching-learning objectives.

Objective

In the early stages of schooling, finding elements that motivate children to learn is a constant challenge, while creating situations where mathematical content is given strength at the same time. For this reason, we wanted to combine two focuses attention, presented in the background: reading the story and logical-mathematical learning. The main objective is to show the usefulness of storytelling in the early learning of mathematics, from the development of activities based on their reading; to this end, we set ourselves specific objectives in this work: (1) to adapt *The Ugly Duckling*, setting up a scenario for the development of logical-mathematical thinking from the scenes of the story; (2) to determine whether there are aspects of mathematical competence achievement that differ between children who learned using the stories and those who did not, and (3) to analyse possible gender and age differences in early mathematical learning.

Method

Given the characteristics of the research, a quasi-experimental cross-sectional design with a quantitative approach and a control group was defined.

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Participants

The sample of Childhood Education (EI) students (n=62) belonged to two state-subsidised schools located in the centre of Madrid. Median age in all groups at the start of the intervention is 5 years and 9 months.

The experimental and control groups were chosen randomly (table 1), but the groups were pre-formed.

Table 1.
Distribution of students in the control and experimental groups

Group	Type	N	Gender
N	Experimental	19	9 girls (47.37%)
			10 boys (52.53%)
C	Experimental	18	9 girls (50%)
			9 boys (50%)
R	Control	25	14 girls (56%)
			11 boys (44%)

Instrument

In order to establish homogeneity in the level of mathematical knowledge within the groups, an initial assessment was designed with *an ad* hoc test administered individually, with 9 questions on the different logical-mathematical contents included in the stage curriculum: comparison (V1), classification (V2), correspondence (V3), serial sequences (V4), verbal counting (V5), structured counting (V6, V7), resultant counting (V8) and knowledge of number (V9).

Post-intervention outcomes were measured with the Spanish version of the *Test de Evaluación Matemática Temprana* (TEMT, as per its Spanish acronym) (Navarro et al., 2011). It is an individual test, designed to assess the level of mathematical competence in children aged between 4 and 7. The test has three versions (A, B and C), of 40 items each, grouped into 8 subtests (four of logical skills, P1 to P20; and four of numerical skills, P21 to P40) of 5 items each. For this intervention, the same version (A) was used for all children. The internal consistency of the TEMT is high ($\alpha = .95$) both for the total scale and for the two subscales logical ($\alpha = .94$) and numerical ($\alpha = .93$). The application was done by a single researcher, trained in the use of this instrument, and the application time was between 20 and 30 minutes for each student.

The instrument facilitates the construction of a direct score, defined as a level of mathematical competence (NCM, as per its Spanish acronym), assigning each item a value of 1, and thus obtaining five levels A, B, C, D and E, which are labelled as "very good, good, moderate, low and very low" for each student, calculated in relation to the score obtained by his or her group.

The sample falls within age group III of the TEMT manual (Navarro et al., 2011).

Procedure

The procedure was designed jointly by the teaching staff of both schools. This makes it easier for researchers to focus on the specific domain and identify the real needs in the classroom (Cai et al., 2016).

For this design, the methodological principles of the EI stage have been taken into account, starting from the level of development of the student, the principle of activity and the key role played by the student, with meaningful learning in a globalised environment.

The first step was a diagnosis in the two classrooms that allowed us to find out the mathematical content skills each of the children had. The intention here was to detect possible difficulties and to ensure a homogeneous starting point in both groups.

The second step was the design of didactic situations (Brousseau, 1998) adapted to the reality of the students with whom we were going to work. The story selected was *The Ugly Duckling* (Andersen, 1843). We considered the use of a fairy tale to be an optimal choice because of its structural characteristics and because the children knew the story beforehand.

From the analysis of the original story of the tale, we analysed which scenes (table 2) could be used to work with mathematical content at this stage, in order to develop well-planned activities where this content is not isolated (Cascallana, 1988). One of the essentials elements in a story are the functions of the characters (Propp, 1981); in this case, they are going to determine the design of each activity based on the action they undertake. The story of *The Ugly Duckling* has a main character who acts according to a quest. The hero moves away from the familiar, to have different adventures that will focus us on the mathematical activity, to return later to his place with new learning. This three-phase structure of the story (Campbell, 1984) makes the story an ideal space for activities of an individual and collective nature, without the need for an adaptation of the story cycle.

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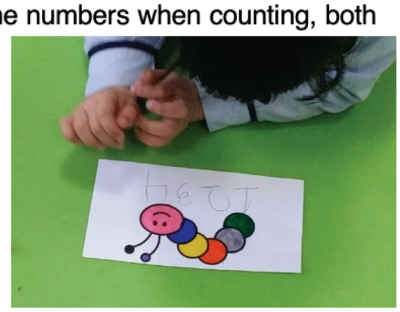
Table 2.
Scenes from the story and mathematical contents that were worked on

Scene	Description
Scene 1: Mummy duck guards her nest. Resulting count	The activity is developed with digital material that can be manipulated. Children have different nests with eggs placed in different positions at their disposal, they label each of them “by activating the cardinal value of the last number word recited as a result of counting” (Hannula-Sormunen et al., 2019, p. 27). 

Scene 2: The ducklings' families are placed in a row. Cardinal and ordinal	 We made coloured hats, two of each colour, with a drawing of a duck. These hats were given to pairs of children who would take on the role of mummy and daddy duck. We prepare cards of the same colour as the hats with the numbers from 1 to 10 dots drawn on them, which will be given to the children. Not all colours have the same number of cards (Fernández & Domínguez, 2018). According to the colour of their card, they have to group with the other children who have the same card, behind the pair of ducks that had that colour on their hats. Following the research by Miller *et al.* (2000), we asked the children to tell us how many people there were in each group (cardinal), so that they would subsequently be ordered from smallest to largest and each one would indicate (ordinal) the position in the row.
Scene 3: The duckling eats a worm. Structured counting and numerical symbols	We count each of the parts of the worm that the duckling eats for a snack using an index card. The aim is to work with the label of each of the numbers when counting, both verbally (forwards and backwards) and in writing (symbolically). The use of fingers is a natural representation, which relieves working memory and facilitates subitisation (Bender & Beller, 2012). 

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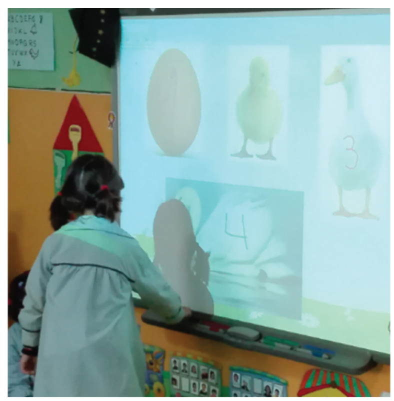
Scene 4: The duckling flies. Classification of geometrical shapes

The activity starts by sorting different flat shapes built with different materials at one's own discretion, a situation that gives rise to different possible solutions and decisions to be taken (Hong, 1996). Once the sorting has been done, each child builds and decorates his or her own duckling to start flying.

Scene 5: My duckling's life. Time serial sequencing

We have different scenes from the duckling's life that the children have to place according to the time in which they took place. The digital format was combined with the manipulable format, where the original illustrations of the story played a key role. Illustrations of a representational nature help to tell and understand the story by combining verbal and pictorial means (Carney & Levin, 2002).



While the story is read, other content was also worked on verbally during the assembly. Some examples of text specifically used to design activities that required movement around the classroom (table 3). Integrating movement into mathematics learning has a positive effect on students' enjoyment and engagement (Riley et al., 2017). This is content that the children already know beforehand and we seek to reinforce and consolidate it.

Table 3.

Story text and mathematical content developed in groups

Text	Mathematical content
One egg was larger than the others.	Comparison by size. Balls of different materials and spherical shapes were used to create an arrangement according to size. In this sense, it is essential that the child can use a scale to compare and realises that sorting by size is not the same as sorting by mass. Working on measurement at these ages facilitates opportunities for the acquisition of adjective comprehension (Keuch & Brandt, 2020).
One day, the farmer's sons were playing with the Duckling, threw flour on the ground, and left all over the place with footprints.	Movements in the plane. Footprints were placed on the floor on which the children placed themselves and changed their position. “Knowing where you are and how to move through the world; that is, understanding the relationships between different positions in space, at first with respect to your own position and your movement through it" (Clements & Sarama, 2014, p. 124) is essential in order for children to understanding the environment.

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That day, the Duckling saw himself reflected in the water, and discovered he was just like them.	Symmetries, using a mirror book. The illustration of the story plays a key role in this scene, as it allowed the children to visualise the space as a whole, and to focus on the specific detail of the reflection that will allow us to reproduce it with the mirror book. Facilitating situations that allows them to create their own patterns is a good starting point for children to understand geometric transformations in a perceptually regulated process (Swoboda & Vighi, 2016).

The *Duckling* went back to the farm and told Mummy Duck and his brothers all about it.	Problem posing and solving using different materials that can be manipulated, based on images shown to the children on the digital screen. Experimenting with problems through story work facilitates the connection between mathematical content and the imaginative ideas in books, making it easier to make sense of elements in the environment (White, 2017).

Thirdly, the structure of the implementation in the sessions was designed by alternating individual and group work. This work was carried out as materials were constructed simultaneously. The aim was to use materials not specific to didactics, but made for the occasion from objects from the child's everyday life. The criterion that guided the choice was to have "a material with which to carry out activities in which the student is an active and participatory agent in the teaching-learning process" (Rodríguez & Fernández, 2016, p. 72).

As for staging, two considerations were taken into account: firstly, the proposals had to be adapted to the dynamics carried out by the teacher during the school day and secondly, this planning had to be flexible, in order to adapt to the needs of the children.

Oral narration of the story by the teacher is the first stage in the classroom. The children listen to the story as they are shown the illustrations, either on paper or digitally. The use of illustrations captures attention and it also enhances comprehension and memory in children (Follmer & Semb, 2008). When the children participate or ask questions, reading stops to ask them, and these questions "are extremely helpful when using the story as a learning tool, as they allow us to follow the thread of the children's understanding and acquisition of the contents that appear in the story" (Marín, 2013, p. 9). How the teacher incorporates these questions into the storytelling will be his or her most important task, because it will make the learner nurture and increase his or her curiosity because “the story is not only to entertain, but to cause and be the cause of revolutions. One does not narrate only to know more, one narrates to learn to ask questions and to generate more and better questions” (Agudelo, 2016, p.14).

Once the teacher has finished the story, the storytelling starts again, but this time each scene is reinforced by the use of the different teaching materials. The aim is to make the mathematical content to be worked on perceptible; this phase is repeated every working day in each of the activities.

Results

The initial diagnosis results show that there are no differences between the control and experimental groups on any of the items, so it can be considered an equivalent control group design. Table 4 shows the p-values corresponding to the Chi-square test, where the null hypothesis states that there is no difference in the responses (percentage of correct answers) between the control and experimental groups.

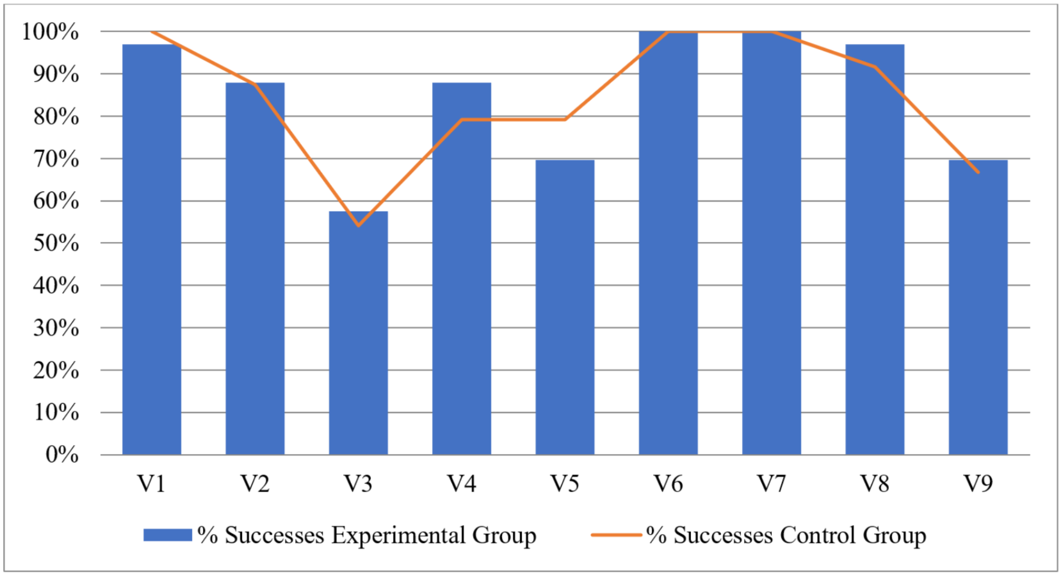
Table 4.
Initial diagnostic results

Item	V1	V2	V3	V4	V5	V6	V7	V8	V9
p	.390	.966	.798	.373	.423	a	a	.410	.808

Note: a =constant variable; all are correct in both groups.

Furthermore, we can point out that the level of success performance in each of them is always above 50%, as can be seen in figure 1.

Figure 1.
Initial diagnosis results



As for the results after the intervention, the percentages of success in the experimental and control groups in each of the skill blocks (figures 2 and 3) show better results in almost all the items for the experimental group.

Figure 2.
TEMT results for logical skills

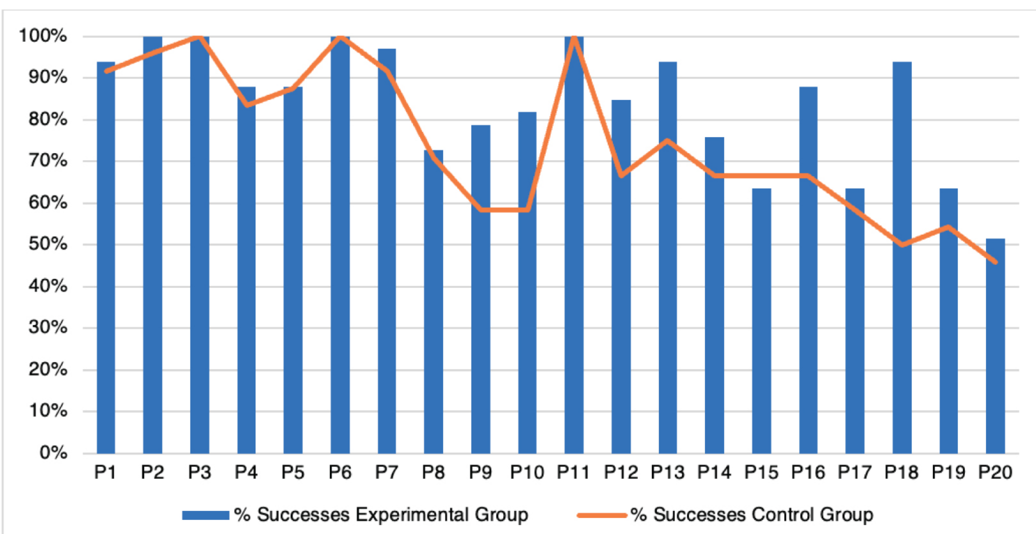
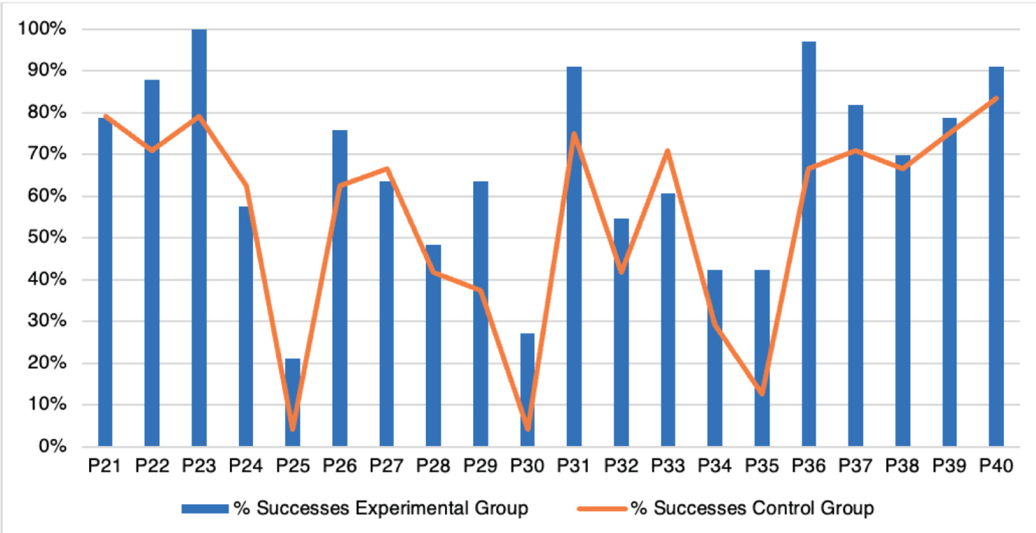


Figure 3.
TEMT results for numerical skills



The items with lower scores in the experimental group are P15, P24, P27 and P33. Despite these differences found in favour of the control group, none of them are statistically significant. Table 5 lists those items that do show these differences in favour of the experimental group.

It is worth mentioning four items that show low scores in both groups, P25, P30, P34 and P35, all of them related to counting skills. These items coincide with the only items that are classified as “very difficult” in the TEMT manual, with a difficulty index below .25.

P25 asks for counting by twos up to 14; P30 aims at counting backwards from 17; P34 shows how children count 19 objects without the possibility of manipulation, while P35 aims at children counting up to 12 but as part of an additive strategy, giving first 5 objects to be hidden and then adding 7 more.

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Table 5.
Results of the items of the TEMT instrument that are statistically significant

Item	p	Skill	Subtest	Rating according to the difficulty index
P9	.096 *	Logic	Classification	Easy (.74)
P10	.051 *		Classification	Difficult (.43)
P13	.042 **		Contact	Easy (.74)
P16	.026 **		Serial sequencing	Easy (.60)
P18	.000 **		Serial sequencing	Easy (.55)
P23	.006 **	Numerical	Verbal count	Easy (.64)
P25	.067 *		Verbal count	Very difficult (.19)
P29	.051 *		Structured count	Difficult (.35)
P30	.024 **		Structured count	Very difficult (.22)
P35	.015 **		Resulting count	Very difficult (.11)
P36	.002 **		Knowledge of numbers	Easy (.64)

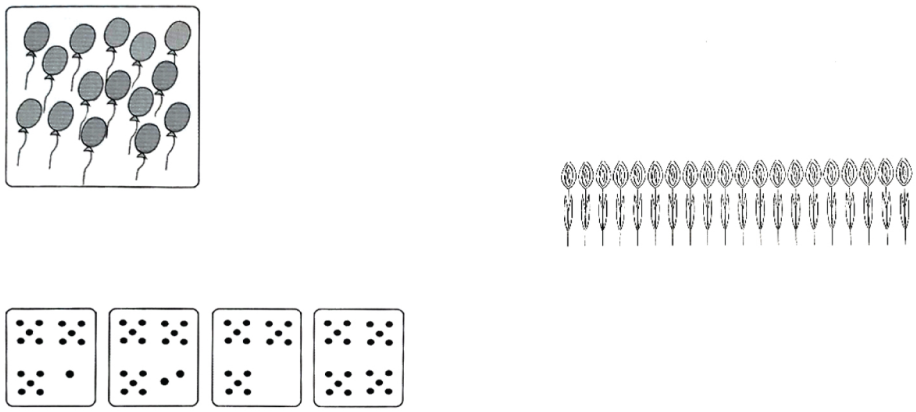
Note: * =p<.05
** =p<.10

As we can see, the significant differences, which always indicate better results in the experimental group, are slightly higher in the area corresponding to numerical work, with six items, compared to five in the logic area.

These differences occur in 3 of the 4 items considered to be the most difficult in the tool.

Items P15 and P24 (figure 4) focus attention on instructions where the representation used for objects is too compact. In P15, the child is asked to count the number of balloons and to point out which of the lower squares has the same number of dots (counting), and in P24 the child is asked to locate the 18th flower (ordinal).

Figure 4.
Evaluation sheet for items 15 and 24 of the TEMT, model A



These results are confirmed when we calculate the NCM of each student in both groups, and are contrasted with a Student's t-test, after checking the assumption of normality in the two groups (Kolmogorov-Smirnov tests with the Lilliefors and Shapiro-Wilk correction), obtaining significant differences with better overall results in the experimental group. Specifically, the mean takes a value of 30.5 in the experimental group and 25.9 in the control group, rejecting the null hypothesis of equality of means (p = .002).

With regard to differences by gender, the Chi-square test shows that there are few items with differential results (table 6). The girls obtain better the results in all of them.

Table 6.
Results of the TEMT instrument items showing differences by gender

Item	p	Skill	Subtest
P9	.087 *	Logic	Classification
P24	.093 *	Numerical	Verbal count
P29	.025 **	Numerical	Structured count

Note: * =p<.05
** =p<.10

Items P9 and P24 stand out in particular for the type of object they seek to identify, a handbag in item P9 (figure 5) and flowers in item P24.

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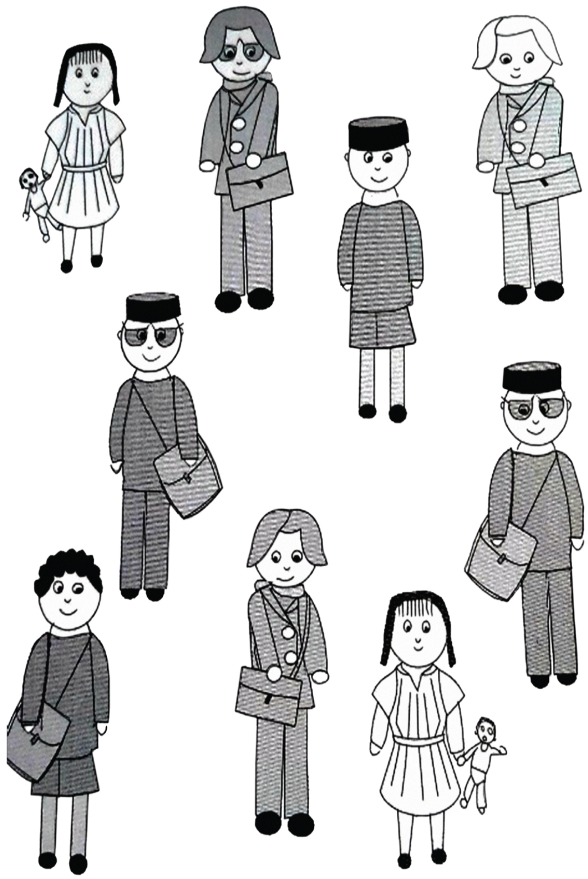
Figure 5.
TEMT item 9 evaluation sheet, model A



As for any potential impact of age, measured in days, it can be stated that this variable is not significant in the analysis. To test this, logistic regressions have been adjusted with age as an independent variable. In no case was significance found at 5% and in the few cases where there was significance at 10% (table 7) the impact was practically nil (beta coefficient of the logistic regression very close to 0).

Table 7.
Results of the TEMT instrument items showing differences by age

Item	p	Beta	Skill	Subtest
P28	.067	.005	Numerical	Structured count

We checked whether there were differences in relation to gender and age using the NCM value of each of the students for the two groups once again, and no significant differences were found in relation to either of the two variables. There is no significant statistical evidence to reject normality and equality of means (p=.740), and uncorrelatedness between NCM and age (p=.277).

In addition to the information provided by the tool, in the daily meetings between the teaching and research teams, other qualitative results of the experience - the result of classroom observation - could be assessed, such as the rapid and spontaneous acquisition of the linguistic expression of mathematical content by the children.

Discussion and conclusions

The initial specific objective was to develop the adaptation of a story to a specific scenario for the development of logical-mathematical thinking. The results from the different scenes of the story previously presented show this context as a facilitator for the early learning of mathematical contents. Math education can be enhanced if learning is placed in a context that facilitates social interactions, where children can construct knowledge from their experiences. (Sawatzki & Sullivan, 2018). This context can be built from the story told in the story as a connection with the child's environment that motivates him/her to learn from curiosity and interest, facilitating the visualisation of mathematical concepts from concrete actions to more abstract contents. (Maricčić et al., 2017).

One of the advantages of combining mathematics and literature in the EI classroom is that the two content areas are not disconnected, and that we can consider such interventions as a way to build understanding and enthusiasm and a way of discovering mathematical concepts" (Kribs & Ruebel, 2008, p. 36). Maintaining high levels of reading motivation can be beneficial from a reciprocal relationship with the reading ability (Hebbecker et al., 2019).

The second specific objective focused on determining the influence of the didactic experience on the achievement of mathematical competence shows more favourable results in the students who participated in the intervention with the story. These results stand out especially for the different counting strategies. These counting principles facilitate the subsequent possibilities of arithmetic calculations without the need for counting (Jordan & Dyson, 2013). Better results are observed in 27.5% of the items of the instrument in the experimental group, while the rest have the same results.

In the four subtests of logical skills, we can point to improvements in classification and serial sequencing, fundamentally in accordance with the type of activities presented, especially those carried out in individual format. As for the results in numerical skills, the results in verbal counting stand out, fundamentally in the sequence of number words, both one by one and two by two.

It should also be noted in this block that the items considered to be the most difficult in the instrument for this age group show significant differences in favour of the experimental group in three of them (P25, P30 and P35). The results in items P25 and P30 focused on the last two levels of acquisition of the numerical sequence, numerable chain level and bidirectional chain level, can be justified from the work of systematisation of the numerical sequence from the ordinal context (Fernndez, 2016).

In those items related to general knowledge of numbers, shown from a verbal problem, we found improvements in one of the items of the block (P36), an aspect that has been worked on from the recreation of problem situations in group activities with the story.

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The comparative results of the overall score of the instrument as a level of mathematical competence indicate better results in the experimental group.

In relation to the objective of analysing mathematical learning, using gender and age as differential variables, we can say that few differences have been observed, coinciding with previous research (Alsina & Berciano, 2018; Navarro et al., 2010).

Although the research has achieved its specific and thus its general objectives, demonstrating the usefulness of the use of storytelling in early mathematics learning, reflection is needed for future research, given that it has been carried out with a small sample size. It would also be advisable to carry it out over a longer intervention period and with more than one story to check the effects of the story, and even of the type of materials used or the use of stories specifically constructed for learning mathematics. We also find it advisable to review the instrument used, given that some results are conditioned by the typology of the illustrations on the objects to be counted. Any future research should also include in this type of intervention the assessment of geometry-related content, along the same lines as the recommendations made in recent research (Assel et al., 2020), based on the consideration of geometry as a basis for the development of more abstract reasoning (Geary, 2007).

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