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Design and assessment of a teaching program to address temporal concepts in Early Childhood Education and Primary Education using stories

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In the educational field, there is a discussion about how to teach temporal concepts within Social Science in Early Childhood Education and in Primary Education. This debate arises from the young age of the students, which shows the need to make use of different teaching approaches from those used in other higher educational levels. As stories have been proved as an effective teaching method used in this educational level for the past 30 years, the research problem revolves around the following question: is it possible to teach temporal concepts in Early Childhood Education using a non-specific story to teach social sciences? For this reason, the purpose of this study was to design, implement, and assess a teaching program for the temporal concepts *past/present/future*, *before/after*, and *change/transformation* in the third year of Early Childhood Education using a non-specific story to teach social sciences. For a better understanding of the program, a brief explanation of the Spanish Educational system has been included. The participants of the study were the 47 students of an Early Childhood and Primary Education Center in Molina de Segura, Murcia, Spain. Quantitative data were analyzed using the software program SPSS v. 24. With the goal of evaluating the students' achievement of each activity's objectives, as well as the teaching program as a whole, percentages and frequencies of the assessment charts' different components were calculated. Once the data from the brainstorming session on the students' prior knowledge of temporal concepts had been collected, it was transcribed and organized in the corresponding chart. In this way, a primary text document was created. Together with the Initial Questionnaire on Temporal Concepts (IQTC) and the Final Self-assessment Questionnaire (FSQ), which did not require transcription, three hermeneutic categories were created, one for each document, using the program ATLAS.ti (version 7.5.2). The results showed a high percentage of fulfillment of the objectives, with somewhat significant differences between one class and another. These results lead us to conclude that the temporal concepts chosen for this teaching program can be taught in third-year Early Childhood Education classes using the story *Ramona la mona* by Aitana Carrasco.

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Introduction

In the following sections, we will go through the history of the teaching of Social Science in education and, more specifically, in Early Childhood Education classes. Later on, we will focus the attention on the teaching of temporal concepts for students of 3–7 years old. Besides, we will analyze the use of stories and tales as educational resources for the processes of teaching and learning Social Sciences in Early Childhood Education. We will go from the most general aspects of each section to the most specific to ensure a better understanding for the reader.

History of social sciences in Early Childhood Education. Currently, one of the most controversial issues within the educational community is how social sciences can be taught to preschool students because of their young age. (Bustamante et al., 2018; Gómez et al., 2018). Cuenca (2008) and Trepat's contributions (2011, cited in Corral and Miralles, 2014) affirm that the fundamental problem with the teaching–learning process for social sciences is the choice of content and the approach used, rather than the students' age. Authors such as Iofciu et al. (2012) and Fernández-Oliveras and Oliveras (2014) assert there is a need to change the teaching strategies used, especially at this stage. In this environment, different studies have shown that preschool students are capable of learning content related to the social sciences (Brophy and Alleman, 2006; Harnett, 2007). Among them, the most notable are those from Calvani (1986) and Cooper (1995), which showed that children can understand the concept of time and have some sense of history as early as age 5. Other studies call into question Piaget's assumption that children are incapable of comprehending time or a narration's dimension of time (Almagro et al., 2006).

Hernández (2002, cited in Almagro et al., 2006) contends that preschool students should study temporal concepts, time measurement systems, and temporal categories. Skjæveland (2017) proposed different methods to teach history in Early Childhood classrooms, while others such as Luff et al. (2016) and Torunn (2017) approached teaching civics at this stage. Similarly, Kemple (2017) examined the nature of Social Sciences at this stage. For their part, authors such as Sanders and Downer (2012), HyunWook (2014), Maher and Buxton (2015), Krogstad (2016), and Kim and Kwon (2018) explored intercultural aspects in the classroom. Authors such as Keren and Fridin (2014) and Battista and Boone (2015) have examined technology. Studies have also been conducted on gender in Early Childhood Education, notably those by Wohlwend (2012) and Quaresma and Bertuol (2015).

Other studies that analyze and investigate Social Sciences include Stonehouse (2011), Vuorisalo et al. (2015), Trnova and Trna (2015), Sales and Oliveira (2016), Antopolskaya et al. (2017), Boyd (2018), and Kanaki and Kalogiannakis (2018).

Temporal concepts in Early Childhood Education. Focusing on the passage of time, mastery of this concept is one of the most important aspects of an individual's evolutionary development because it allows one to navigate their surroundings as well as enabling the individual to comprehend and structure the world in which they live (Tonda, 2001). According to Rivero (2011), the perception of time is a concept which must be learned; it is not a purely intuitive and natural concept. Authors such as Cooper (1995), Farquhar (2016), and Tesar et al. (2016) assert the importance of learning temporal concepts, especially those related to time, during the Preschool Education stage. However, this was not always the case.

A very reductionist vision of Piaget's theories held that up to 6 or 7 years old children could not begin to understand time and history because prior to this age they were only capable of understanding the time they had lived, and they were unable to comprehend other times. Together with this vision, studies carried out during and since the 1970s asserted that preschool students were incapable of learning temporal concepts since they lacked the necessary capacity for abstraction (Petrovski, 1986; Cuenca, 2008). These theories were refuted by studies such as the one conducted by Calvani (1986), which showed that children between 3 and 6 years old possessed some temporal notions and, consequently, a certain willingness to learn more. Based on this study, many authors began to support teaching temporal concepts in Early Childhood Education classes. Egan (2005) has been a key supporter of teaching temporal concepts using imagination and fantasy. Later, authors such as Rivero (2016, cited in Corral, 2017) asserted that 6-year-old children are capable of learning temporal, spatial, social, and patrimonial concepts.

Other studies (Díez and Lería, 2003; Pérez et al., 2008; Sota, 2014) focused on describing and analyzing small projects or activities used to teach this type of content in the classroom and, in this way, insisting that it can be taught. Nevertheless, there are few practical studies on the teaching of temporal concepts in Early Childhood Education. Sota (2014) proposed a series of activities to teach temporal content such as past/present and before/after. Díez and Lería (2003) decided to teach time using an educational center's own history. Zamboni and Guimarães (2010) conducted a study using children's literature to work on the development of the concept of historical time. Cerreduela (2014) prepared a lesson plan to teach, among other aspects of social sciences, the temporal concepts before/after and past/present/future. Sánchez and Benítez (2014) focused on the procedure of introducing spatial and temporal notions in a 3-years-old classroom. Other studies on the passage of time in Early Childhood Education include Aranda (2003), Monserrat et al. (2015), Tiemann and Fallace (2009), and Tonda (2001).

Unfortunately, despite an obvious need, there are very few studies on specific activities, resources, and methodologies to teach the passage of time in Early Childhood Education classes. For this reason, this study proposed the design, implementation, and assessment of a teaching–learning plan for temporal content using a non-specific children's story to teach social sciences.

Stories as an educational resource for the teaching–learning of Social Sciences. The use of stories emerged in the school setting as a motivational resource to carry out activities related to the subject matter (Godoy, 2008). In the Preschool Education stage, motivation is an essential element to ensure a meaningful learning experience for students, which is one of the standards of the Spanish curriculum for Early Chilhood Education (Decreto 254/2008, 2008). Many studies have shown that preschool students show greater motivation and enthusiasm when carrying out activities based on the reading, narration, or performance of a story (Jao, 2018) as compared to other traditional activities such as filling out worksheets for different subjects areas.

On the other hand, studies exist on the power and importance of stories' educational function in teaching different subjects (Gurbutt and Gurbutt, 2015; Maizonniauz, 2016; Tortella et al., 2016; Baiduri and Khairani, 2017; Taylor, 2018). Taylor et al. (2018) contend that stories are a tool that permits the comprehensive understanding of ideas and texts. Moreover, as Bryant (1989) stated, narration contributes to the improvement of cross-cutting issues such as trust between the teacher and the student, as well as the establishment of attention habits and a relaxed and appropriate environment in the classroom. Also, they allow students to express their experiences and feelings through the representation and dramatization of stories and tales (Chase, 2005).

Likewise, various teaching programs of different content have been carried out using stories as their primary resource (Song, 2015; Thompson, 2017; Spencer, 2018).

For this reason, there are many authors who assert narration, stories, and tales are ideal to teach social sciences in the classroom because they cover a great variety of topics within this subject area (May and Podmore, 2007; Rivero and Pelegrín, 2019). Holdaway (1979) showed that stories allow students to travel from the present to the past and explore human emotions, intentions, and conduct. Furthermore, we have identified studies that show the powerful influence narrating stories has on 5-year-old students' storytelling and comprehension skills (Suggate et al., 2018). Moreover, studies such as Jih and Huang's (2011) showed that stories are ideal for teaching science in Early Childhood Education classes. Klein et al. (2018) show the use of stories to improve the students' knowledge of human rights concepts. On the other hand, studies like Noddings' (2006) showed that stories increase students' cultural interest and help them to raise existential issues of great importance; they help students to understand from a young age the society in which they live and to use this knowledge to integrate (Li and Grieshaber, 2018). Rizkasari et al. (2018) proved the effectiveness of stories as a teaching resource for the comprehension of social science. Thus, stories help in interpreting temporal, spatial, and social aspects (Clandinin et al., 2015).

Research problem and objectives

The research problem revolves around the following question: is it possible to teach temporal concepts (past/present/future, before/after, change/transformation) in Early Childhood Education using a non-specific story to teach social sciences? "Non-specific story" means stories that are not created specifically to teach social science content. Starting from this research problem we defined the main purpose of the study and several objectives for this investigation.

The main purpose of this study was to design, implement, and assess a teaching program for temporal concepts for the third year of Early Childhood Education using a non-specific story to teach social sciences. In an attempt to fulfill this purpose we have defined the following necessary objectives:

1. Understand how much emphasis both teachers put on temporal concepts and how they are taught in the classroom. This objective is essential to know the importance given to temporal concepts by the teachers and the methodology used by them in the class in order to make a program suitable for the students.
2. Design and implement a teaching program to address temporal concepts (past/present/future, before/after, change/transformation) using a non-specific story to teach social sciences.
3. Identify students' prior knowledge of temporal concepts through an initial assessment.
4. Assess the teaching program as implemented and the teachers' performance.
5. Identify the relevant changes, improvements, and modifications to be undertaken prior to putting the program into practice again.
6. Compare the results obtained from implementing the program in two different third-year Early Childhood classes.

Materials and methods

Context and participants. First of all, it is necessary to explain the Spanish Educational System in order to ensure a complete understanding of this section.

From 0 to 6 years old, children are in Early Childhood Education. Between that time, parents are not obligated to roll their children in the education system. For that, the majority of centers for the first cycle of Early Childhood Education (0–3 years old) are non-funding by the government. In the academic year 2018/2019, only 37.9% of the Spanish children were enrolled in any kind of educational center, either public or private. On the first level children are 0–1 years old, on the second level they are 1–2 years old and on the third level they are 2–3 years.

The second cycle (3–6 years old), however, is highly funding by the Spanish government and in 2013 the percentage of children that went to schools was between 95% and 98% according to the Spanish National Institute of Statistics. On the first level children are 3–4 years old, on the second level they are 4–5 years old, and on the third level, they are 5–6 years old. This is the level to which this teaching program is designed.

When they reach 6 years old, and until they had 12 years old, they go to a Primary School, where there are six levels, from one to six. Their enrollment is compulsory. Then, between 12 and 16 years old, they go to a High School, also obligatory, where there are levels from one to four. At the age of 16, children can decide between continuing studying at High School two years more or doing what is called "professional formation" which is oriented to prepare the children for the world of work. Also, they can decide to go straight to find a job.

The school where the teaching program was implemented was the school San Miguel, located in the town of Molina de Segura. This town is located in the Region of Murcia, in the southeast of Spain. The school was selected because is well known for its union with different regional plans and educational projects.

It is a public school, funding by the government, with two classes per grade, 6 preschool groups, 12 Primary Education groups, and 1 Special Education class specifically for students with Pervasive Development Disorders. The socioeconomic and cultural status of the area is lower middle with a predominantly working-class population.

The teaching program was implemented in two third-level Early Childhood Education classes. The participants were 47 students between the ages of 5 and 6. All the students were of Spanish nationality and origin, with the exception of one Moroccan student, who is completely integrated into the class. With regards to educational diversity, class A has two students with autism spectrum disorder (ADS), more specifically, Asperger syndrome. Both students are aided by the speech therapist, and one of them is also aided by the specialist in therapeutic pedagogy. Class B also has one student with Asperger syndrome, which has led to the development of oppositional defiant disorder. He is also aided by the speech therapist and the specialist in therapeutic pedagogy. The educational adaptations for these students have been done according to what is said in the Special Educational Needs Manual (you can see it in https://oswaldoguaman.weebly.com/uploads/8/1/8/0/81804460/temario_nee_manual.pdf).

The Ethical approval was given by the principal, both teachers and the students' parents, who were asked for permission for their children to participate in this study.

Study design. The design chosen for this investigation is qualitative with some quantitative aspects, such that it should be considered a mixed-methods study. This is evident from the data collection and analysis techniques. Thus, a mixed-methods research design was used including the CIPP evaluation model, which has been considered the most suitable method for this study considering the aims. This model, proposed by Stufflebeam and Shinkfield (1987) differentiates between four clear phases: context evaluation, input evaluation, process evaluation, and

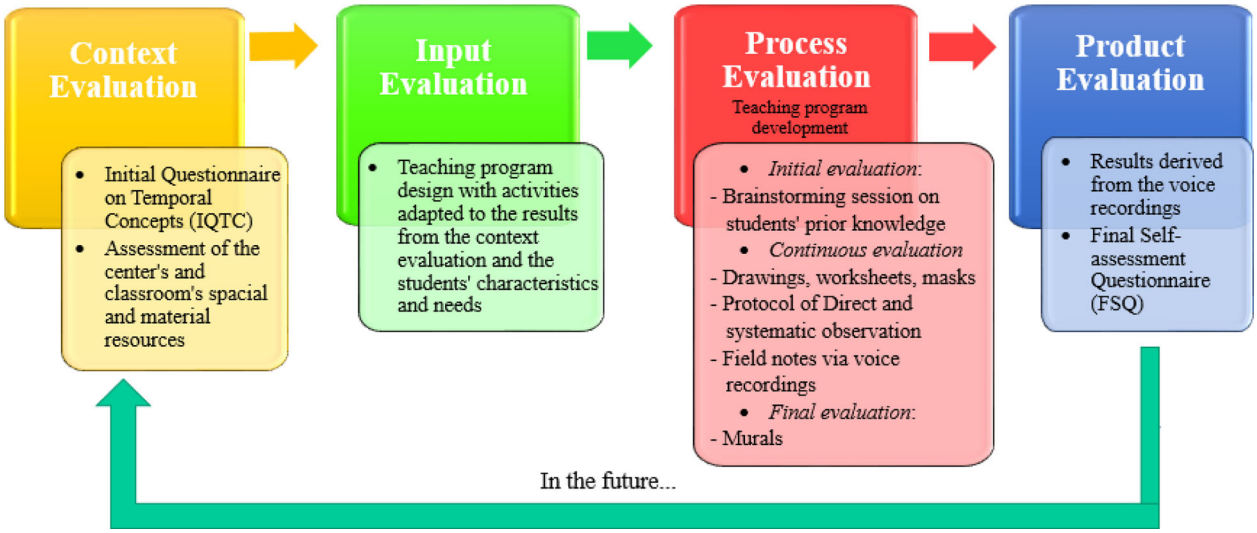

Fig. 1 Mixed methods research design using the CIPP evaluation model. This figure shows the steps of the CIPP evatuation model and how in this investigation the steps has been carried out.

product evaluation. It has recently been used in studies on Early Childhood Education in the area of Social Sciences (Escribano-Miralles, 2013; Gómez et al., 2018), although it has also been used in other areas as well (Mote, 2017; Untari, 2017; Lippe and Carter, 2018). Given we are dealing with a teaching program, the model has been adapted to the educational sphere. The different phases together with their actions, techniques, devices, and designs based on the CIPP evaluation model are shown in Fig. 1.

Proposed intervention

Objectives and content. The teaching program is composed of a series of activities based on the narration of the story *Ramona la mona*, by Aitana Carrasco (2006). This story tells how a little boy feels when his grandfather died and his new sister born. Therefore, it is not a specific story for the work of temporal concepts.

This teaching program seeks to achieve a series of objectives established in the Autonomous Region of Murcia's curriculum for the Second Cycle of Early Childhood Education (the document can be found in https://bit.ly/2Q67429). Based on these objectives, we have established the general objectives of our teaching program. These are:

- Familiarize the students with temporal concepts related to the passage of time, such as before/after, past/present/future, and change/transformation using the human life cycle: baby–child–adult–elder.
- Use spoken language to recount events, experiences, and memories following a basic set of rules that govern oral exchanges: taking turns to speak, raising hands to ask to speak, listening attentively, keeping quiet, etc.
- Value the effort, consistency, and initiative of one's own work as well as other's work, and take pride in said work.
- Likewise, this teaching program addresses content in the three areas of knowledge established in the above-mentioned curriculum.

Method. The method used in the teaching program combines group activities (Linn et al., 2016) with individual activities, always culminating in a presentation in front of the whole group of the work that was completed individually. This methodology of individual work at the students' desks together with group dialogs, which can be termed 'mixed', was chosen to avoid disrupting the momentum established by the teachers in their classrooms. Nevertheless, the majority of the activities were carried out in groups so that students had a leading role for two reasons: firstly, due to requirements established in the objectives and content to user groups; and, secondly, because of the significant advantages that the use of group and participative methodologies present for Early Childhood Education (Slavin and Chambers, 2017).

The data generation process will be explicated in the "Activities" section.

Activities. The teaching program was implemented in two classes of 5 years of Early Childhood Education in the same educational center. This program was intended to be used when working on topics related to the family, the passage of time or books. However, for this study, due to time constraints, the plan was implemented on 11 and 24 April 2019 during timetables previously agreed upon with the teachers. These timetables are displayed in Table 1.

Activity 1: Motivation and awareness of Students' prior knowledge of temporal concepts

To motivate the students, the teacher showed them a cardboard box decorated with EVA foam scraps, called the 'Traveling Box', and told them that there was a story inside they would read the following day, about which they would complete a series of fun activities.

Thereafter, the basic rules of behavior to be followed in the classroom were explained. Special emphasis was put on the difference between the rules for first-year students and those applicable in the third year (for example, that they are going to be more severe with the self-control that allows them to not speak when they want but raise their hands and wait until the teacher gives them permission to talk) so as to begin incorporating the concepts of past and present.

Afterward, a brainstorming session was carried out to identify students' prior knowledge about the passage of time from childhood to old age and the temporal concepts past/present/future, before/after, and change/transformation.

The teacher asked the following questions:

- Do you know what the passage of time is?
- Do you know what happens to babies when time goes by? What were all of you like when you were babies?

Table 1 Timetables for the activities.

Phase	Activity	Date and time	Length (min)
Phase 1. Activities prior to story narration	Activity 1: Motivation and awareness of Students' prior knowledge of temporal concepts	4-11-2018 10:00–10:20 a.m.	15–20
Phase 2. Story narration	Activity 2: Hypothesis about the story and its narration	4-12-2018 12:40–13:15 p.m.	30–35
Phase 3. Activities after story narration	Activity 3: Bruno's family is going on a trip!	4-13-2018 10:30–11:05 a.m.	30–35
	Activity 4: What were we like when we were younger? Bring photos of when we were babies	4-17-2018 9:00–9:45 a.m.	40–45
	Activity 5: What did we do before and what are we doing now?	4-18-2018 11:00–11:25 a.m.	20–25
	Activity 6: What will we be like when we are older?	4-19-2018 12:40–13:30 p.m.	40–50
	Activity 7: Making grandparents masks	4-23-2018 10:30–11:30 a.m.	50–60
	Activity 8: Temporal murals and hypothesis testing	4-24-2018 1:10–13:55 p.m.	40–45

- Do you know what will happen to you when time goes by? What will you be like when you are older, like your mom or dad?
- Do you know what will happen to your moms and dads when time goes by? What will you be like when you are much older, like your grandma or grandpa?
- Do you know what the 'past' is? And the 'present'? And the 'future'?
- Do you use the words 'before' and 'after'? Do you know what they mean?

Moreover, based upon the students' answers to these questions the teacher could ask more questions with the same purpose.

Activity 2: Hypothesis about the story and its narration

The teacher started the session in circle time by showing the students the 'Traveling Box', from which she took a book made of EVA foam titled, *Érase una vez: Ramona la mona*. The book was created by the authors of this study and allows the reader to attach the characters of the story to different scenes in the book using velcro. The teacher asked the students to try to read the story, which was written in uppercase letters large enough for all the students to see. Thereafter, the teacher asked the students what they thought the book would be about. In this way, the teacher collected the students' hypotheses in a journal to verify during the last session whether or not they were correct. Thus, the teacher was addressing past-present hypothesis verification.

In addition to the aforementioned question, the teacher asked the students other questions, at their discretion, to increase the volume of ideas. After recording each student's ideas separately in the journal, the teacher read an adapted version of the story Ramona la mona using the EVA foam book as a visual aid.

When the teacher finished reading the story, she asked the students to sit at their desks and to draw and color their favorite part of the story, individually.

The students who finished the activity more quickly than the others were allowed to play with the materials the teacher had brought: the EVA foam book and the characters, riddles about family members, and Bruno and Ramona dominoes. The students were also asked to create Bruno and Ramona's house and the characters from the story using Playdoh in small groups.

Finally, all the students were organized in circle time and, one by one, showed their classmates their drawings, explaining what they had drawn and why.

Activity 3: Bruno's family is going on a trip!

The teacher started the session by asking the students if they remembered the characters from the story they had read the day before. If they did not remember, they were asked questions to remind them. Once the characters had been mentioned, the teacher explained that Bruno's family was going to go on a train trip for vacation. The train had four coaches, so Ramon would go in one, Bruno in another, mom in another, and grandma in another. The teacher told the students that the train had one rule: the person who was born last and was the youngest had to travel on the first coach, the person who was born before them and was second youngest had to travel on the second coach, the person who was born before them had to travel on the third coach and the person who was born first and was the oldest had to travel on the last coach.

After this, the teacher showed the students the worksheet they had to complete. The teacher explained that the first thing they had to do was to write their name and color in the pictures of the characters. Next, they had to cut out the ovals containing the characters on the dotted lines and use a glue stick to attach them to the corresponding train coach. After finishing, the students were to go to the teacher's desk to receive feedback in the form of stamps with motivational phrases in English. The stamps' function was to indicate the degree of correctness in attaching the drawings to the train coaches. Evidently, the students did not know the meaning of the stamps. The stamps also are used to motive the students and not discourage them because, if that happens, it could lead to a demotivation for the activities and by that, the student could to not show the real learning he or she has done.

Activity 4: What were we like when we were younger? Bring photos of when we were babies

The teacher started the session by explaining to the students that, one by one, they would go up to the blackboard to show the class the photos they had brought in. Then they would have to describe what they were doing when the photo was taken and to identify the differences between the babies in the photos and themselves. Beforehand, the teacher had sent a note home to the students' parents explaining that they had to bring a photo of themselves as a baby into class.

At first, the students were asked to briefly describe their photographs. The teacher did not insist that the student described the details of the photograph exactly, since this was not the activity's objective; although, this helped to familiarize the students with describing photographs using spoken language. Any mention the students made of past habits was considered. Based on these answers, the teacher asked the students to express their past thoughts and memories. Finally, the teacher asked the students questions about changes they had undergone in their physical appearance and behavior since they were babies until the present. The rest of the students were also allowed to participate and identify changes of this type in other students.

Each student took between one and two minutes to show and explain their photograph. If the teacher thought the students were

rambling or not capable of realizing the activity, they were to divide this activity into two separate sessions.

The teacher asked the students a series of questions to help guide them.

Activity 5: What did we do before and what are we doing now?

The teacher started the session briefly reminding the students what was discussed in the previous activity about changes in body morphology and behavior from childbirth until age five.

Afterward, the teacher wrote the words 'past' and 'present' on the blackboard and drew a vertical line between them. Next, the teacher told the students that they had to work together to make a list of the things they did in the past and write them under the heading 'past' on the blackboard. Likewise, they had to make a list of things from the present and, in the same way, write them under the heading 'present'. For example, in the past column they could write "crawl" or "wear diapers" and in the present column "run and jump" or "eat by ourselves".

The teacher encouraged all the students to participate and say, at least, one thing for the past category and one thing for the present category.

Activity 6: What will we be like when we are older?

The students sat in circle time and the teacher explained that they had to imagine that they were older and to try to draw themselves. Afterward, the teacher sent the students to their desks where the materials necessary to carry out the task was waiting. When the students finished their drawings, they had to show them to the teacher and briefly explain what they had drawn.

Once all of the students had finished their drawings, they went back to circle time and, one by one showed and explained to the class what they had drawn. If the teacher felt that a drawing did not transmit ideas about the future, she asked the student-specific questions to check whether or not they had completed the activity properly.

Later, the teacher made a book titled "When we get older…" by compiling photocopies of all of the students' pictures (the originals were glued to the 'Future' section of the mural in activity 8). The teacher showed the students this book during the last session.

Activity 7: Making grandparent masks

The students sat in circle time and the teacher explained that they had to make a mask of themselves, but they had to imagine what they would look like when they were grandpas or grandmas. The teacher gave them several ideas, such as: "Normally, grandparents have lots of wrinkles on their faces from all their experiences" or "when you are grandparents, you may have the same color hair as you have now or maybe it will be white, gray or even have fallen out". After explaining the activity to the students and checking for understanding, the teacher sent them to their desks where a piece of paper with a picture of a head-on was waiting for them. They had to write their name on the back and draw their face and hair. After showing the teacher what they had drawn, they were allowed to use a punch and a pad to remove the spaces for the eyes and the mouth. Afterward, they were allowed to cut the face out. Finally, the students brought the teacher their masks so a thin wooden stick could be glued to the back.

Once all the students had finished their masks, they went back to circle time and, one by one, showing their classmates their masks. They explained why they had drawn the type and color of hair they drew and why they had or had not drawn wrinkles or other facial features typical of older people, etc.

Lastly, the teacher took the students to the classroom with a digital blackboard. There, the teacher had the students sit in a semicircle in front of the digital blackboard and showed them pictures of what they would look like as grandparents. To do so, the application FaceApp was used, which simulates what a person's face would look like when older. Thus, the students continued to assimilate the concept of the distant future through their own likeness.

Activity 8: Temporal murals and hypothesis testing

The students sat in circle time and the teacher explained the activity they were going to do. The teacher brought her own mural, photographs, and pictures to the classroom to aid in explaining the activity. The teacher told the students that they had to attach photographs and images to the mural accordingly: under the heading 'Past', they had to place the photo or image from the past; under the heading 'Present', they had to place the picture from the present; and under the heading 'Future', they had to place the image or drawing corresponding to the future.

After explaining, the teacher asked the students to go to their desks where an A3-sized piece of cardboard with the three previously mentioned headings marked on it, as well as the photographs and images, had been placed. The students had to glue the photos and images on the cardboard with the glue stick.

Once the students had finished the activity, they went back to circle time and the teacher explained that they were going to check whether the hypotheses they made in activity 2 were valid or not using the journal where they had been recorded. In this way, the teacher read the students their hypotheses and asked them, in general, whether each hypothesis was valid or not.

Finally, the teacher showed the students the book made from the photocopies of their drawings titled "When we are older…". The teacher showed each student's picture and made a brief comment about each one of them.

Data collection: tools and procedures. All the data collection tools were created ad hoc for this study. Among them, are charts (checklists, observation scales, etc.) that were used primarily to collect data from the activities of the teaching program through systematic observation and field notes collected via voice recordings during the sessions. In addition, a brainstorming session was carried out to identify the students' prior knowledge of temporal concepts as well as two questionnaires: the Initial Questionnaire on Temporal Concepts (IQTC) for the teachers, with the goal of identifying how much emphasis is given to temporal concepts and the way in which they are taught in the classroom; and the Final Self-assessment Questionnaire (FSQ) to assess the teaching program, its implementation, and the teaching practice.

Data analysis plan

Quantitative data analysis. All the data obtained through systematic observation, the voice recordings, and the students' work (pictures, masks, worksheets, and murals) were transcribed and/or annotated in a series of assessment charts created ad hoc for this study.

Due to the characteristics of this information, it was decided that the best way to analyze the data was from a quantitative perspective, which would allow for its organization, management, and analysis in order to subsequently interpret the data in the most adequate manner possible.

As such, the charts and data collected therein were analyzed using the software program SPSS v. 24. With the goal of evaluating the students' achievement of each activity's objectives, as well as the teaching program as a whole, percentages, and frequencies of the assessment charts' different components were calculated.

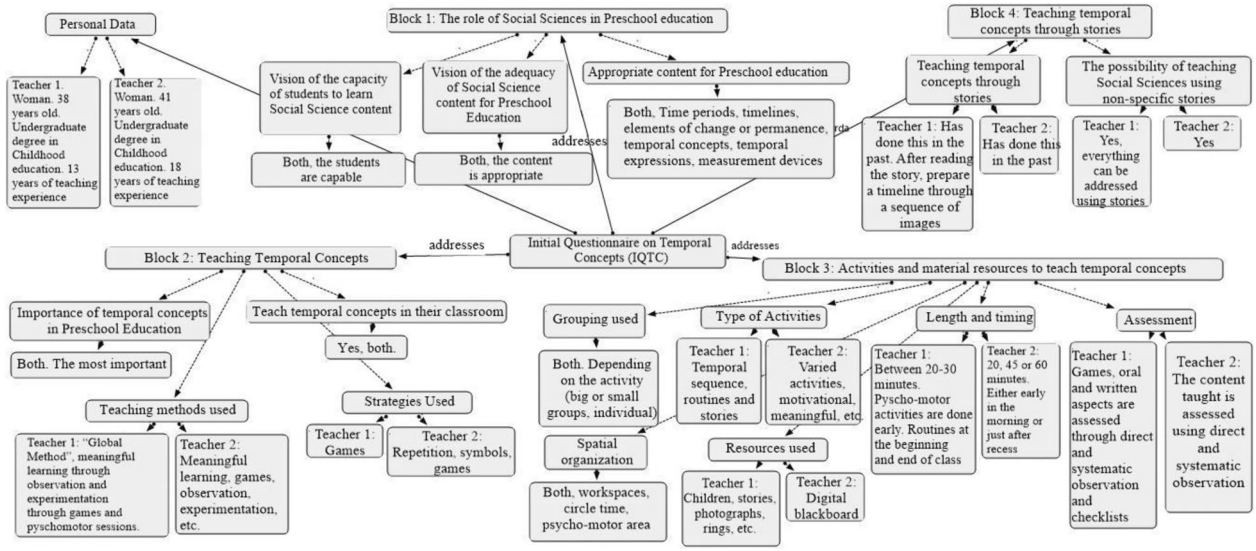

Fig. 2 Semantic network from the Initial Questionnaire on Temporal Concepts (IQTC). This figure shows a semantic network linking the Initial Questionnarie on Temporal Concepts with the answers of the teachers.

Qualitative data analysis. Once the data from the brainstorming session on the students' prior knowledge of temporal concepts had been collected, it was transcribed and organized in the corresponding chart. In this way, a primary text document was created. Together with the Initial Questionnaire on Temporal Concepts (IQTC) and the Final Self-assessment Questionnaire (FSQ), which did not require transcription, three hermeneutic categories were created, one for each document, using the program ATLAS.ti (version 7, vol. 7.5.2.).

The analytic approach for the qualitative data followed Miles and Huberman's model (1984, 1994, cited in Serrano, 1999). According to their studies, the process of data analysis consists of making sense of the data collected. In the case of this study, the textual data obtained from the questionnaires and the brainstorming sessions were reduced to networks of meaningful semantic elements that allowed us to understand the reality being studied. The criterion used for defining the categories of analysis was thematic.

A mixed deductive–inductive approach was used to derive categories from the system given the basis was direct textual information, although there was also a previous theoretic model. In the first phase, qualitative data processing was descriptive. Subsequently, axial coding was used to establish connections between the different categories forming families or meta categories.

Results and discussion

Hereafter, we will describe and interpret the results obtained for each of the objectives, although they will be framed in the different stages of the CIPP evaluation model used in this study.

The first objective is located in the context evaluation stage. To fulfill this objective, the teachers were given the IQTC, which reflects their perceptions of the great importance given to temporal concepts; they are taught in their classrooms through the use of stories and sequences of images. In Fig. 2, the semantic network created using the information obtained from the teacher's answers to the questionnaire is displayed (Fig. 2). In the network, we can see that both teachers confirm they address temporal concepts in their classrooms using the same strategies, resources, and types of activities, although they employ different strategies for the spatial organization and student grouping. These small disparities with regard to methodology could explain the difference in the students' level of prior knowledge from one class to the other, which will be addressed subsequently.

Before carrying out the next phase of the teaching program, the educational center and the two classrooms where the teaching program would be carried out were visited. During the visit, the spatial and material resources available for use in the teaching program were assessed, and it was found that the center possessed all the necessary resources to implement a series of activities through which temporal concepts could be taught. However, the majority of the newer technological resources could not be used as they were out of order. Ultimately, the digital blackboard was available for use during part of one of the activities. In addition, two teachers were consulted to determine what human capital would be available during the implementation of the teaching program.

The second objective is located in the input evaluation phase. To fulfill this objective, the objectives and content to be addressed in the teaching program were established based on a review of the previously mentioned documents, the teachers' answers to the IQTC, and the assessment of the spatial and material resources, and human capital. Next, we reflected on which methodology to use in the activities as well as the appropriate length and timing. Afterward, the activities were drafted based on the objectives, the content, and the students' characteristics and needs. The sessions of the teaching program were implemented in the following phase.

The third objective is located in the process evaluation phase together with the implementation of the teaching program. In this phase, we distinguished between initial assessment, continuous assessment, and final assessment. In the initial assessment, we identified the students' prior knowledge of temporal concepts through a brainstorming session. In Figs. 3 and 4, the semantic networks created using the information obtained from the brainstorming session from each class are displayed (Figs. 3 and 4). Using the brainstorming session, and as a response to the stated objective, we found significant differences between the classrooms in reference to the temporal concepts past and after. While the students in class A gave a variety of examples of both the recent and distant past, the students in class B only mentioned aspects referring to the distant past via personal examples and experiences. With regards to the word after, class A provided more examples with a greater level of specificity than class B. No significant differences were found for the remaining concepts (present, future, and before).

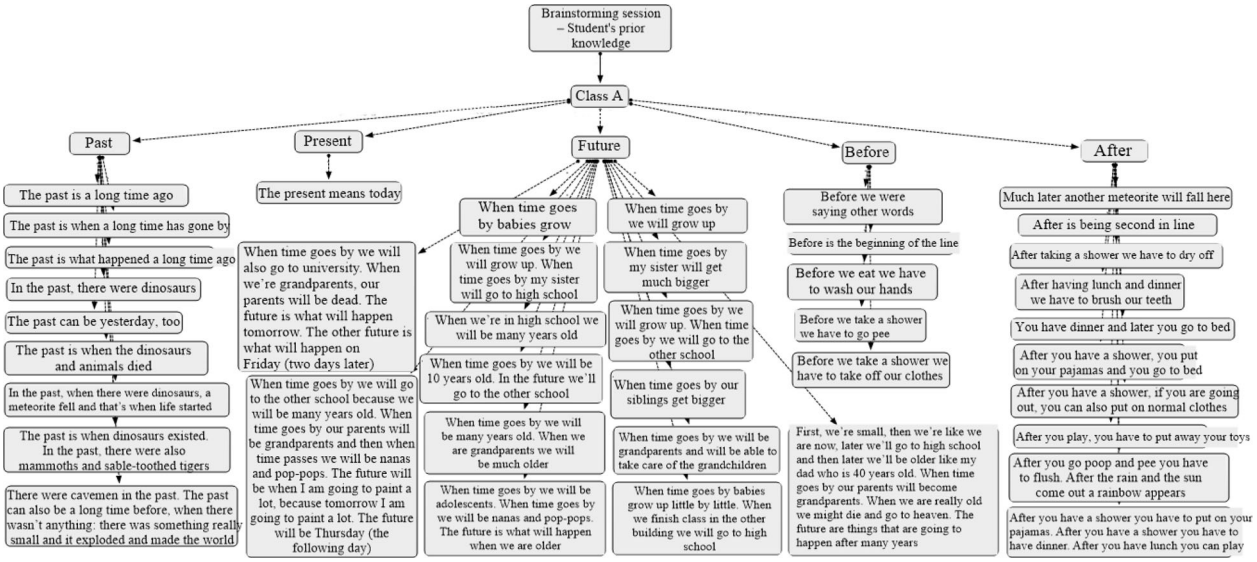

Fig. 3 Semantic network of students' prior knowledge from the brainstorming session with class A. This figure shows a semantic network of the class A students' answers.

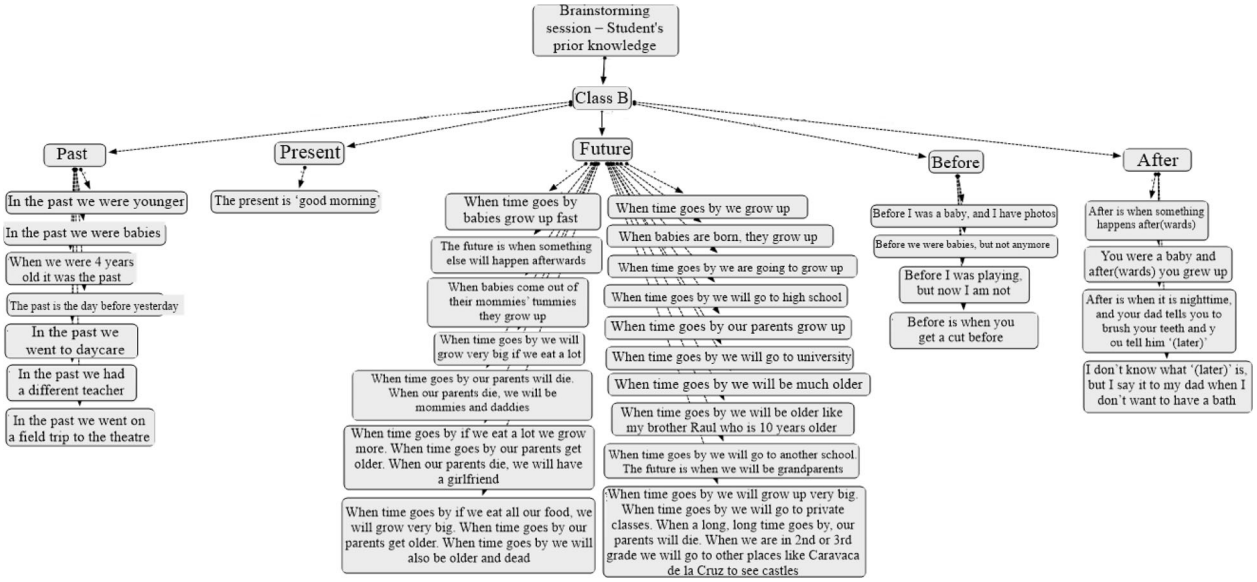

Fig. 4 Semantic network of students' prior knowledge from the brainstorming session with class B. This figure shows a semantic network of the class B students' answers.

In the continuous evaluation phase, the drawings, worksheets, and masks created by the students were evaluated. The drawings from the story were correctly completed by 100% of the students in class A and 95.7% of the students in class B, while 82.6% of students from both classes correctly completed the future drawing. Regarding the training worksheet, 85.7% of the students in class A ordered all the characters correctly compared with 87% of the students in class B. The mask had a disparate percentage of students who included references to the future according to the classroom: 78.3% in classroom A and 52.2% in classroom B. In view of these results, we can say that the number of students in class A is equal, and in many cases slightly superior, to the number of students in class B that completed the activities correctly. On the other hand, aspects related to the students' verbal conduct, actions, and answers were analyzed through direct and systematic observation and, for some activities, through field notes via voice recordings. These were: raising their hands to speak (100% in class A compared to 69.6% in class B), taking turns to speak (91.7% in class A compared with 76.9% in class B), keeping quiet, and listening to classmates (79.2% in class A compared with 76.9% in class B), making hypotheses (45.8% in class A compared with 56.5% in class B), and remembering the characters from the story (100% in both classes). One aspect which should be noted is a higher participation rate in class A than in class B, although the students who participated in class B did so with greater frequency. There was only one activity where the participation rate for the students in class B was significantly higher than in class A: activity 5.

Individual murals, from which data was collected on a checklist, were used in the final evaluation phase. After analyzing the data, we found that 83.3% of students in class A correctly attached the photo referring to the past compared with 73.9% of students in class B. The photograph from the present was correctly attached by 79.2% of students in class A compared with

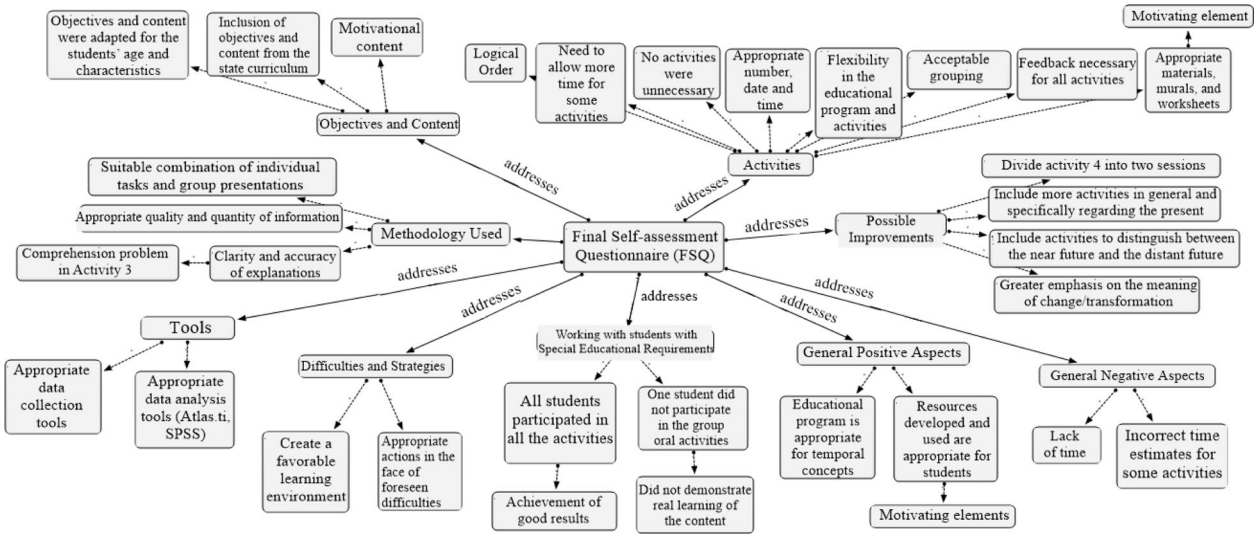

Fig. 5 Semantic network from the Final Self-assessment Questionnaire (FSQ). This figure shows a semantic network linking the Final Self-assessment Questionnaire with its answers.

73.9% in class B. The photograph referring to the future was correctly attached by 87.5% of students in class A and 91.3% in class B. These results indicate a non-significant difference between the classes, with a greater level of understanding of the past and present in class A and a greater level of understanding of the future in class B.

Finally, the fourth objective is located in the product evaluation phase. The FSQ was created to fulfill this objective. It included aspects referring to the suitability of the objectives, content, timing, grouping, materials, and methods; general positive and negative issues; the data collection and analysis tools; difficulties encountered and strategies used; and working with students with special educational requirements. With the answers from the questionnaire, we found that the teaching program had satisfactory aspects, like the methodological approach, the number, and variety of activities, the program's flexibility, the use of motivating elements, etc. However, it has also contained aspects that could be improved, such as removing the content on change/transformation since it was not sufficiently addressed in a specific way or incorporating activities that address it at greater depth, a better forecast of the duration of the activities, the incorporation of more activities dealing with the concept of the present, etc. With the answers from the IQTC and the results obtained from the voice recordings, we addressed the fifth objective. In Fig. 5, the semantic network created using the information obtained from the FSQ is displayed (Fig. 5).

The sixth and final objective is not associated with any of the phases of the CIPP evaluation model, although its inclusion as an objective was considered necessary. The motive for its inclusion is that the research problem can be answered more precisely by comparing the results obtained in each classroom. From the above-mentioned analysis, we can confirm that the students in class A have a slightly greater prior knowledge of temporal concepts, and, demonstrated as much in a large part of the activities. Likewise, the percentage of students that correctly attached the photographs to the final mural is slightly higher in class A than in class B. Nevertheless, in some specific activities, the students in class B significantly exceeded the students in class A. Moreover, the students in class B showed increasing interest in completing the activities as the teaching program progressed, while students' interest in class A was stable, and for some decreased. In order to make these statements more exhaustive, a detailed analysis of each student was carried out (about their prior knowledge, what concepts they learned and/or were reinforced with the teaching program, etc.)

The results from this study are similar to those from previous studies in the field, with special emphasis on the fact all of them confirm the foundations for the teaching–learning of Social Sciences (historical thought, temporal concepts, etc.) should be laid in Early Childhood Education. Thus, as authors such as Calvani (1986) have stated, children of 3–6 years old have some notions of temporal concepts and are capable of learning, recognizing and expressing their meanings. Similar results to this research were found in the investigation carried out by Rizkasari et al. (2018), who proved the effectiveness of stories as a teaching resource to teach Social Science. The investigation of Klein et al. (2018) shows comparable results in the use of stories in students of Early Childhood Education. In the same way, Kim and Kwon (2018) used stories to improve the understanding of the multiculturality concept in students, as has been done in this research with temporal concepts. The results also agree with the investigation carried out by HyunWook (2014), who tried to improve the multicultural attitudes and the comprehension of concepts related to it in students of Early Childhood Education using the fairy tale "Cinderella". This study also concurs with Egan (2005) that teaching temporal concepts is more efficient when using imagination and fantasy, which can be seen in the results obtained.

The research problem this study attempted to answer is: Is it possible to teach temporal concepts (past/present/future, before/after, and change/transformation) in the third year of Early Childhood Education using a non-specific story to teach social sciences? After analyzing the results obtained, we can confirm that it was possible to teach the proposed temporal concepts in the two third-year Early Childhood Education classes chosen using a non-specific story to teach social sciences, specifically, the short story *Ramona la mona* by Aitana Carrasco (2006).

Conclusions

The conclusions presented below have been organized according to the study's objectives and the four phases of the CIPP evaluation model.

The first objective is located in the context evaluation phase, for which some conclusions have been reached. The teachers in both classes give great importance to the teaching of Social Sciences and temporal concepts in Early Childhood Education and teach

them in their classrooms using different activities. Also, the teachers believe that preschool students are capable of learning content related to temporal concepts.

With regards to the assessment of the center's spacial resources, materials and human capital, the analysis was clear. The classrooms have a large variety of resources, although for the most part those related to new technologies were damaged at the time of implementing the teaching program. Furthermore, the spatial resources were those of the public Early Childhood and Primary Education Center.

The second objective is located in the input evaluation phase. Two conclusions have been reached. Firstly, the initial design of the teaching program was followed, although some aspects suffered changes during implementation. Secondly, the story *Ramona la mona* can be used to teach preschool students the temporal concepts past/present/future, before/after, and change/transformation.

The third objective is located in the first part of the process evaluation phase, the initial evaluation, and a number of conclusions have been drawn about it. To being with, the students in class A have greater knowledge of the temporal concepts *past* and *after* than the students in class B. On whole, the students in class A have somewhat greater knowledge than the students in class B with regards to the meaning of the temporal concepts that were studied. However, the students in both classes have similar knowledge of the temporal concepts *present*, *future*, and *after* and greater knowledge of the concepts of the future than of the rest of the temporal concepts.

The second point concerns the continuous evaluation and it can be concluded that class A is equal to and in many cases slightly superior to class B in the number of students who correctly performed the handicrafts activities. Moreover, the students in class A slightly surpass the students in class B in the level of fulfillment of the rules of behavior. However, the students in class B that participated in the activities did so with a greater frequency than the students in class A, although the participation rate for the activities was higher in class A than in class B.

With regards to the third point, which concerns the final evaluation, we can conclude that there were non-significant differences in the creation of the final mural between the two classes.

The fourth objective is located in the final phase of product evaluation. It can be concluded that the teaching program and the resources created were considerably motivational for the students of both classes. Also, the teaching program is considered practical because it uses resources and human capital present in almost all Early Childhood Education classrooms, which justifies its feasibility from a resources point of view. The teaching program did not specifically address the concept change/transformation in depth, despite its intimate relationship with the concepts past/present/future, which were dealt with thoroughly.

The fifth objective is located in the same phase and a considerable number of conclusions have been drawn. First of all, the content related to *change/transformation* should be removed from the teaching program as it was not addressed with sufficient specificity. Otherwise, additional activities should be incorporated that address this concept more specifically and at greater depth. Secondly, the duration of the activities should be estimated more accurately and Activity 4 should be carried out in two separate sessions. Lastly, in general, more activities should be included, specifically with regards to the concept *present*, which has been shown as the most difficult for the students to learn.

With regards to the sixth and last objective, our conclusions have been presented throughout this section.

Finally, with regards to the research problem, we have reached the conclusion that Social Sciences, and specifically, temporal concepts, can be taught in third-year Early Childhood Education classes using the story *Ramona la mona* by Aitana Carrasco.

Data availability

The datasets generated for this study are available on request to the corresponding author.

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Competing interests

The authors declare no competing interests.

Additional information

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