



## Research paper

# Empirical validation of the Oral Narrative Competence Evaluation with the TellingApp (ONCE) Scale in Early Childhood

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## ABSTRACT

This study aims to discuss the design of the scale *Oral Narrative Competence Evaluation with TellingApp* (ONCE), and to validate it. ONCE was designed to evaluate oral narrative competence in preschool children ( $N = 93$ ) aged 4 to 6 through oral storytelling, using a digital application. Exploratory and confirmatory analysis were performed to confirm the starting theoretical model, giving good reliability ( $\alpha = .842$ ) and adequate indices of fit, justifying the validity of the scale. oral narrative competence is defined by 16 variables making up narrative competences (originality, coherence, cohesion, and conclusion of the story), communicative competences (pronunciation, intonation, gestures, vocabulary, tenses used, correct use of tenses, morphology and syntax), and engagement provided by the app (interest, curiosity, immersion, and enjoyment). Weighting was proportional to the level of precision, highlighting that engagement with the narrative task supported by the app was what most affected children's levels of oral narrative competence. In addition, multiple linear regression analysis confirmed the high predictive capacity of the ONCE scale. The scale contributes to the evaluation of preschool children's levels of oral narrative competence as a theoretical construct due to its reliability and validity.

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## 1. Introduction

Language acquisition begins in the first year of life, and how it progresses is directly related to the communicative situations children are exposed to at home and at school (Isbell et al., 2004; Pascual & Quirell, 2021; Shiel et al., 2014). In Preschool Education, children make significant progress in oral language which is promoted by certain pedagogical practices and strategies (Shiel et al., 2014). This development of oral language is crucial for the subsequent acquisition of reading and writing skills (Whorral & Cabell, 2016), which highlights the importance of stimulating children's communicative competences and of designing effective evaluation instruments.

Oral communicative competence includes the ability to understand and produce a variety of speech, linked to different contexts, including oral narration. Narration is decontextualized monologue speech (Pinto et al., 2019), which pre-schoolers find more complicated, but which also offers more opportunities for progress in communicative skills. Because of that, oral storytelling is a suitable activity for linguistic progress and the development of narrative skills (Shiel et al., 2014). In this context,

mobile devices are interesting resources for stimulating communicative abilities, such as in learning foreign languages (Read et al., 2021) and early literacy (Ablyaev et al., 2020; Neumann, 2018). There are also applications for producing digital stories which go beyond classical storytelling by including multimedia elements (Kucirkova, 2019; Lantz et al., 2020). These applications incorporate fun, creative activities that encourage linguistic development (Oakley et al., 2020) and stimulate narrative skills.

This study begins with the consideration that story creation apps are ideal resources for creating digital narratives in Preschool Education. It is worth highlighting that the analysis of narratives produced by children helps identify their linguistic abilities (Akmese & Kanmaz, 2021; Gorman et al., 2016; Pinto et al., 2019). This means that apps which record children's oral narrative discourse are particularly relevant as they allow subsequent evaluation. In this paper we present the design and validation of a scale for evaluating infant oral communicative competence, through the production of stories created with a story creation app.

### 1.1. Communicative competence

The concept of communicative competence arose from the ethnography of communication (Hymes, 1972), and can be defined as, "What a speaker needs to know to communicate effectively in culturally significant settings" (Gumperz & Hymes,

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1972, p. 3). It includes the combination of knowledge and abilities needed to communicate (Canale, 1983), systematized according to various categorization models. According to the *Common European Framework of Reference for Languages (CEFR)* (Council of Europe, 2001), communicative competences in a language are broken down into linguistic, sociolinguistic, and pragmatic competences. Linguistic competences refer to the rules of the language system, sociolinguistic competencies include social rules about language use, and practical competences are about coherently constructing messages and using them for a given communicative purpose.

The present study focuses on oral communicative competence, which is particularly important in Infant Education.<sup>1</sup> Various dimensions from the CEFR model were selected which affect the production of oral narrative speech created from an app. The linguistic competences considered included *phonological competence* (phonemes and intonation), *lexical competence* (vocabulary and categories of words), and *grammatical competence* (application of grammatical conventions such as verb conjugation and syntax). Sociolinguistic competence was assessed solely through *body language* (gestures) when using the app. Finally, pragmatic competence, which included *discursive competence* (coherence and cohesion) and *functional competence* (the message being appropriate to the goal), were related to the production of a story which was assessed independently as a central element in the study.

### 1.2. Narrative competence

Narrative competence, which is the capacity for producing stories, involves various linguistic, cognitive, and socio-emotional skills (Akmese & Kanmaz, 2021; Zanchi et al., 2020). Producing a story is a complex task which requires the use of various elements of language—managing vocabulary, syntax, etc.—as well as the application of a narrative structure (Akmese & Kanmaz, 2021; Heilmann et al., 2010). Narrative competence requires the ability to organize both the micro-structure (Gorman et al., 2016) and the macro-structure of a story. Macro-structure is the overall coherent organization of the story. For Pinto et al. (2016), it includes whether the organization of the text conforms to storytelling grammar: a narrator tells a story, with protagonists, made up of a sequence of linked events which, from a conflict, lead to a resolution and conclusion. Macro-structure also includes *coherence*, which is the logical, meaningful organization of the story components. The micro-structure of a story deals with the way that the spoken components of the text are linked together via *cohesion* (Pinto et al., 2016) and other aspects of language, such as management of *vocabulary*, *syntax*, and *grammar* (Gorman et al., 2016), which make up part of communicative competence.

More specifically, *oral narrative competence* can be defined as “the ability to orally present a series of events in a temporally coherent fashion as required to generate or retell a story” (Piasta et al., 2018, p. 1480). This is a key ability in Infant Education as it is related to other communicative abilities and promotes subsequent acquisition of written language (Akmese & Kanmaz, 2021), and is “a bridge between oral language and printed text” (Piasta et al., 2018, p. 1480). According to the study by Piasta et al. (2018), infants’ narrative competence affects other early literacy skills which in turn stimulate the beginning of reading. A study by Pinto et al. (2016) concluded that oral narrative competence in Infant Education is a predictor of written narrative competence in the first year of primary school. More specifically, they found

that the structure of oral narratives was related to the capacity to apply structure and coherence to written stories.

From the age of 2, children begin to tell stories, although in the early stages they are limited to listing actions and characters without developing a plot (Monforte & Ceballos, 2014). During the second phase of Preschool Education (3–6 years), they undergo significant progress and incorporate formulaic expressions of narrative fiction (Akmese & Kanmaz, 2021). At 5 years old they can tell a story, sequencing the events and adopting the basic elements of narrative structure, although sometimes lacking some elements—such as a conclusion or characters’ goals—and there are deficiencies at the level of micro-structure (Pinto et al., 2019).

Due to the interest in pre-schoolers’ oral narratives, there has been much research in the field, which has used a variety of models to analyze it. In addition to the now-classic categorization of narrative structures from Applebee (1978), which explained the development of infant narrative skills, there have been other approaches, such as those in Heilmann et al. (2010), Landaeta et al. (2009), Monforte and Ceballos (2014), Pinto et al. (2016), and Bowles et al. (2020).

Studies about pre-schoolers’ narratives are based on the free production of stories (Monforte & Ceballos, 2014) or on re-telling already-known stories (Heilmann et al., 2010; Piasta et al., 2018; Pinto et al., 2016), which are then recorded for subsequent analysis. It is very common for studies to use images (Akmese & Kanmaz, 2021) or picturebooks to stimulate children’s narrative discourse (Piasta et al., 2018). In fact, non-verbal graphic texts are crucial for learning in Infant Education and facilitate the production of coherent oral discourse (Teubal & Guberman, 2014). Picturebooks in particular are an ideal resource for supporting the development of narrative abilities in early years, as they allow the production of oral stories from a sequence of images (Grolig et al., 2020). However, the use of digital apps for similar story creation has been less explored. Apps which incorporate sequences of pictures may offer the benefits of wordless picturebooks combined with the inherent characteristics of digital devices.

### 1.3. Engagement

Children use digital devices from a very early age, a fact that presents positive aspects as well as some risks, if technologies are used inappropriately. However, digital devices provide multiple benefits, as they can foster several skills, contribute to cognitive development, promote formal and informal learning, etc. (Brita & Dias, 2020). The use of tablets in Preschool Education offers opportunities to learn through play, providing multi-sensorial stimulation. Fun-creative apps—such as story creation apps—encourage communication and creation of digital messages, driving motivation for literacy learning (Neumann, 2018) and promoting children’s engagement (Al-Bogami & Elyas, 2020).

Engagement is a complex concept with cognitive, affective, and behavioral aspects (Zhou et al., 2021). It has an impact on academic performance, and is essential for language learning (Aubrey et al., 2020). In this context, mobile devices may improve student engagement in language-related tasks—enhancing participation, motivation towards learning, and enjoyment—especially when used in creative communicative activities (Al-Bogami & Elyas, 2020). Tasks which allow children to create their own content have been shown to enhance student engagement (Lambert et al., 2017). In this regard, creating stories supported by easy-to-use technological tools may be an ideal strategy for increasing children’s engagement and immersion in the narrative task (Sylla et al., 2015). For this reason, engagement is an important element when assessing app-supported oral narrative competence.

<sup>1</sup> In the Spanish education system, Infant Education includes two stages: stage 1 (0–3 years) and stage 2 (3–6 years). This study focuses on the second stage and, in particular, in the children aged 4 to 6.

Thus, it is necessary to point out that there are several scales to assess oral narrative competence in children (Applebee, 1978; Bowles et al., 2020; Heilmann et al., 2010; Landaeta et al., 2009; Monforte & Ceballos, 2014; Pinto et al., 2016, etc.). However, none of them is specially conceived for assessing oral productions supported by apps, hence the originality of the scale presented in this paper. It was considered that the intervention with an app implied an added motivational value, linked to the children's engagement with this technological resource, provided with interactivity and attractive visual elements. For this reason, it was considered relevant to assess also additional issues linked to the engagement, such as the interest arisen, the immersion, etc.

## 2. Material and methods

### 2.1. Objective

The aim of the current study is to design and validate the Oral Narrative Competence Evaluation with TellingApp (ONCE) scale. This is a tool for evaluating preschool children (4–6 years) oral narrative competence through their oral storytelling from the illustrations in a digital story application.

### 2.2. Design of the measurement scale

The design of the scale was based on the indicators defined in the previous research related to the assessment of oral communicative competence in early childhood. Besides, the dimensions of the communicative competence (Council of Europe, 2001) mentioned in Section 1.2 were taken into account. With regards to the existing scales for assessing narrative competence, López et al. (2014) mention several indicators to measure the understanding and production of narrative texts in preschool children, Merino (2017) describes the construction of the narrative fictional discourse in children, Monforte and Ceballos (2014) design a model for analyzing the oral narrative structures in children, and Pinto et al. (2016) study the development of narrative competence for children aged 5 to 7 when they transform oral stories into written texts. However, none of these studies includes indicators to assess the oral productions supported by apps, hence the originality of the present scale.

Thus, the oral narrative competence is measured from: (1) indicators linked to the children's *narrative competence*: originality, coherence, and cohesion of the story created, along with the ability to conclude it, and (2) indicators to measure the *communicative competence*, which includes: (a) lexical-grammatical aspects, linked to the vocabulary and morphological elements used, verb tenses used and correctness of use, and syntax, (b) phonological aspects, related to pronunciation and intonation, and (c) socio-linguistic aspects, referring to the gestures used by children when they tell their stories.

Besides, the indicators of Al-Bogami and Elyas (2020) and Zhou et al. (2021) were included to evaluate the children's engagement linked to the interaction with the app. The engagement is understood as the ability of the app to involve the users in the narrative task. The indicators are: the interest, curiosity, enjoyment, and its immersive capacity.

In order to quantify the qualitative indicators included in the scale ONCE, several categories were defined, taking into account their nature, as recommended by DeVellis and Thorpe (2021), in the area of Social Sciences. Thus, several gradients were established, so that the individuals can be classified according to their competence level.

Finally, the scale designed includes 16 indicators (Table 1).

### 2.3. Selection of the story creation app

After revising several story creation apps without written text, Imagistory was selected, because it was recommended in children's apps review websites (<https://bestappsforkids.com/imagistory/>), as a suitable app for 4 to 6 years. As selection criteria, it was considered that the app should be designed for a children audience, created by educational specialists, access free, with an attractive and intuitive interface, allowing to record the children speech and able to create videos in order to analyze the oral narratives. Thus, the selected app includes sequences of images telling stories easy to understand by preschool children. It also allows the addition of oral speech, so that each child can create their oral story. Four experts (Ex) in the areas of Infant Education, Technology, Language and Methodology assessed the usability of the app. They evaluated the dimensions Efficiency (E1), Effectiveness (E2), Learnability (L) and User satisfaction (S), from 10 indicators, based on Masood and Thigambaram (2015) and Mkpojiogu et al. (2018), with a Likert scale (1 = Not at all; 2 = Little; 3 = Enough; 4 = A lot). Its reliability reached a Cronbach's Alpha =0.878 (Table 2).

Imagistory presents a series of pictures supporting the oral production of pre-reading children (Lantz et al., 2020). Specifically, the app provides several stories, so that children can develop their own oral narrative (Fig. 1), generating a video for each narration. The app is available for iOS devices. There is a free version in the Apple Store, which gives access to the stories *The Little Red Bucket* (Paloma Ozier and Elaine Ngeow) and *The Tree Boat Saga* (Matt Haworth). The library can be increased thanks to the In-App Purchases. Besides, it includes a user manual addressed to families and teachers, with practical suggestions for its application in the classroom, which facilitates its implementation in several contexts.

To carry out the intervention, a simple story was selected, where the main character is a girl who searches for her lost bucket in the sea. Thus, the girl lives an adventure in which she meets and interacts with several unexpected characters in her underwater journey.



Fig. 1. Screen to access the stories and illustrations of the selected app.  
Source: App Imagistory.

**Table 1**  
Identification of ONCE variables and categories.

| Variables                |                              | Categories   |
|--------------------------|------------------------------|--|
| Narrative competence     | V1. Concluding the story     | N1: It did not have an ending<br>N2: It ended abruptly<br>N3: There was a coherent ending<br>N4: There was a coherent ending and the phrase “the end”/ a customary ending was used   |
|                          | V2. Originality of the story | N1: It was confined to a description of the pictures<br>N2: There were questions and hypotheses about the pictures and comparisons between them<br>N3: There were new characters<br>N4: Events other than those illustrated were provided<br>N5: Dialogs between characters were invented<br>N6: Characters' thoughts and emotions were verbalized |
|                          | V3. Story coherence          | N1: The story was fragmented and split up without continuity<br>N2: It was difficult to make the story coherent<br>N3: There was a coherent story based on the pictures<br>N4: Causal and time relationships were used to give the story continuity  |
|                          | V4. Story cohesion           | N1: Connectors were no used<br>N2: Basic connectors and time connectors were used<br>N3: Causal connectors and/or formulaic phrases were used  |
| Communicative competence | V5. Pronunciation            | N1: The student was tongue-tied<br>N2: There were problems with some phoneme<br>N3: No problems  |
|                          | V6. Intonation               | N1: The tone did not vary<br>N2: Exclamations and questions were emphasized<br>N3: There were inflections of voice or tone   |
|                          | V7. Gestures                 | N1: Never<br>N2: Occasionally<br>N3: Often   |
|                          | V8. Vocabulary               | N1: Difficulties naming elements or used generic terms<br>N2: Used generic terms<br>N3: Accurate naming of what the student sees<br>N4: Resorts to strategic competence<br>N5: Complements the narration   |
|                          | V9. Verb tenses used         | N1: Impersonal forms: gerunds, infinitives, and participles<br>N2: Present<br>N3: Past<br>N4: Future and conditional<br>N5: Subjunctive [note: the subjunctive is much more widely used in Spanish than in English]  |
|                          | V10. Correct use of tenses   | N1: Never<br>N2: Sometimes<br>N3: Often  |
|                          | V11. Morphology              | N1: Prepositions<br>N2: Possessive and personal pronouns<br>N3: Qualifying adjectives<br>N4: Demonstrative pronouns<br>N5: Adverbs   |
|                          | V12. Syntax                  | N1: Nominal phrases<br>N2: Simple phrases<br>N3: Co-ordinate phrases<br>N4: Subordinate phrases  |
| Engagement               | V13. Interest                | N1: None<br>N2: Little<br>N3: Quite a lot<br>N4: A lot   |
|                          | V14. Curiosity               | N1: None<br>N2: Some<br>N3: A lot  |
|                          | V15. Enjoyment               | N1: None<br>N2: Some<br>N3: A lot  |
|                          | V16. Immersion               | N1: None<br>N2: Some<br>N3: A lot  |

**Table 2**  
Experts' evaluation of the usability of the app.

|  | Ex1 | Ex2 | Ex3 | Ex4 | Total | X    |
|--|-----|-----|-----|-----|-------|------|
| E1. The loading and opening times are short                          | 4   | 4   | 4   | 4   | 16    | 4.00 |
| E1. The task can be done quickly                                     | 4   | 4   | 4   | 4   | 16    | 4.00 |
| E2. Its use is intuitive   | 4   | 4   | 4   | 4   | 16    | 4.00 |
| E2. It provides attractive stimuli                                   | 4   | 4   | 3   | 3   | 14    | 3.50 |
| E2. The navigation has a logical structure and is easy to understand | 4   | 4   | 4   | 4   | 16    | 4.00 |
| L. It fosters the user's participation                               | 4   | 4   | 4   | 4   | 16    | 4.00 |
| L. The system is easy to learn                                       | 4   | 4   | 4   | 4   | 16    | 4.00 |
| S. It promotes the interest towards the task                         | 4   | 4   | 3   | 3   | 14    | 3.50 |
| S. It fosters the creativity   | 4   | 4   | 3   | 3   | 14    | 3.50 |
| S. It provides enjoyment   | 4   | 3   | 3   | 3   | 13    | 3.25 |

#### 2.4. Validation of the ONCE scale

In order to validate the scale, an intervention was carried out. There was a no probabilistic sampling, conditioned by the voluntary participation of three state-funded Elementary and Primary schools located in rural areas of the Principality of Asturias (Spain), due to the restrictions linked to the COVID-19. The sample comprised 93 boys (51.6%) and girls (48.8%) in Elementary Education. The division by age group was as follows: four years old (9.7%), four and a half (25.8%), five (21.5%), five and a half (29.0%), and six years old (14.0%). Testing was performed during April and May 2021 in individual sessions which lasted a total of 16 h. In order to participate, the children's guardians informed consent was required, taking into account the recommendation for research with children (Shaw et al., 2011). The consent was written in accordance with the standards of the Helsinki Declaration (World Medical Association, 2008).

After they were given relevant guidance, the children handled the app individually for 10 minutes, being supervised by one researcher. The oral speech was self-recorded -together with the app illustrations-, so that few minutes videos were produced, which could be viewed later. During the intervention no usability problems were posed. To guarantee the ecological validity of the assessment scale, the intervention was carried out in the daily school context, and the children behaved in a spontaneous way, seeming not conditioned by the researcher's presence.

Once the intervention with the children was finished, three researchers listened to the stories in detail (15 minutes per story, 23 hours in total) and evaluated by consensus the children's oral narrative competence by analyzing the content of the stories, considering the variables and categories identified in the scale. Besides, the researcher in charge of the intervention carried out an individual registration to determine the engagement, based on the observation of the interest, curiosity, pleasure and immersion showed during the interaction with the app, as point out Al-Bogami and Elyas (2020) and Zhou et al. (2021). To do that, verbal productions, gestures, attitudes, disposition towards the task, etc. were taken into account. This type of evaluation conforms to the hermeneutic paradigm (Merino, 2017), encouraging the evaluations to be as homogeneous as possible from agreement established between the researchers. The analyses of the stories were recorded in a database for subsequent empirical validation.

#### 2.5. Data analysis procedure

Dada analysis was carried out with SPSS, taking also into account the recommendations of Cabrera-Nguyen (2010). A factorial exploratory analysis was done to identify the number of factors or components which conform oral narrative competence. This test was considered sufficient, according to Kline (2005). The factorial model of extraction of principal components was chosen, as it is the most appropriate for quantitative variables. Besides, as the variables interfere with each other, none of them standing out, the matrix of correlations was used.

**Table 3**  
Total variance explained.

| Variables                  | Initial eigenvalues |               |              |
|----------------------------|---------------------|---------------|--------------|
|                            | Total               | % of variance | % cumulative |
| 1 Concluding the story     | 6.148               | 38.425        | 38.425       |
| 2 Originality of the story | 1.752               | 10.947        | 49.372       |
| 3 Story Coherence          | 1.196               | 7.476         | 56.847       |
| 4 Story Cohesion           | 1.078               | 6.740         | 63.587       |
| 5 Pronunciation            | .897                | 5.603         | 69.190       |
| 6 Intonation               | .821                | 5.130         | 74.320       |
| 7 Gestures                 | .754                | 4.713         | 79.034       |
| 8 Vocabulary               | .594                | 3.715         | 82.748       |
| 9 Verb tenses used         | .566                | 3.538         | 86.287       |
| 10 Correct use of tenses   | .490                | 3.064         | 89.351       |
| 11 Morphology              | .422                | 2.640         | 91.991       |
| 12 Syntax                  | .376                | 2.353         | 94.343       |
| 13 Interest                | .307                | 1.919         | 96.262       |
| 14 Curiosity               | .273                | 1.708         | 97.970       |
| 15 Enjoyment               | .194                | 1.212         | 99.182       |
| 16 Immersion               | .131                | .818          | 100.000      |

Additionally, instead of defining a fix number of factors to extract, the eigenvalues higher than one (K1 rule) were utilized. The 25 iterations which appeared by default were maintained, as they permitted to find the suitable factorial solution. Finally, the factorial solution was maintained without rotation, and the sedimentation graph was included.

KMO and sphericity tests were performed. The value for the Kaiser-Meyer-Olkin (KMO) measure was high (KMO = .853), indicating that the variables being studied affected each other, and there were strong correlations, as will be seen subsequently. In addition, Bartlett's sphericity test was significant ( $p < .001$ ), allowing factor and cluster analysis to be performed.

##### 2.5.1. Factor analysis

Factor analysis was used to confirm the validity and grouping of the variables used for the components making up oral narrative competence. Table 3 shows the contribution of each variable to explaining the target components, establishing the relationships and interdependence, from the percentage of total variance explained, for each variable.

The values were grouped around 4 components which explained around 65% of the variance in the results. This indicates that the selection and construction of the variables was adequate, as at least 7 of the 16 initial variables are needed to not lose important information. The scree plot (Fig. 2) indicates the contribution and importance of the variables used to measure oral narrative competence.

Grouping the highest assigned values in each component gives four groups: (1) variables defining narrative competence and

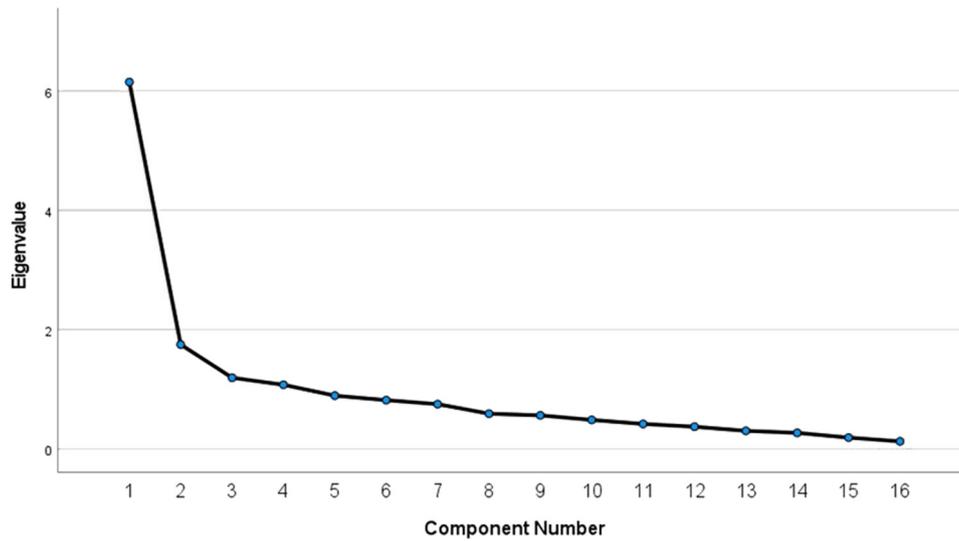


Fig. 2. Scree plot.

**Table 4**  
Components matrix.

| Variables                   | Components |      |      |      |
|-----------------------------|------------|------|------|------|
|                             | 1          | 2    | 3    | 4    |
| 1. Concluding the story     | .729       |      |      |      |
| 2. Originality of the story | .738       |      |      |      |
| 3. Story coherence          | .817       |      |      |      |
| 4. Story cohesion           | .759       |      |      |      |
| 5. Pronunciation            |            |      | .476 | .674 |
| 6. Intonation               | .577       |      | .369 | .309 |
| 7. Gestures                 |            |      |      | .515 |
| 8. Vocabulary               | .499       |      |      |      |
| 9. Verb tenses used         | .552       | .582 |      |      |
| 10. Correct use of tenses   |            | .645 |      |      |
| 11. Morphology              | .582       |      |      |      |
| 12. Syntax                  |            |      |      |      |
| 13. Interest                | .637       |      |      |      |
| 14. Curiosity               | .770       |      |      |      |
| 15. Enjoyment               | .861       |      |      |      |
| 16. Immersion               | .837       |      |      |      |

**Table 5**  
Cronbach's alpha per element.

| Variables                   | Cronbach's alpha if the element is eliminated | Difference with the original Cronbach's alpha |
|-----------------------------|---|---|
| 1. Concluding the story     | .822  | -.020   |
| 2. Originality of the story | .830  | -.012   |
| 3. Story Coherence          | .817  | -.025   |
| 4. Story Cohesion           | .827  | -.015   |
| 5. Pronunciation            | .850  | .008  |
| 6. Intonation               | .833  | -.009   |
| 7. Gestures                 | .844  | .002  |
| 8. Vocabulary               | .836  | -.006   |
| 9. Verb tenses used         | .835  | -.007   |
| 10. Correct use of tenses   | .845  | .003  |
| 11. Morphology              | .832  | -.010   |
| 12. Syntax                  | .863  | .021  |
| 13. Interest                | .829  | -.013   |
| 14. Curiosity               | .826  | -.016   |
| 15. Enjoyment               | .819  | -.023   |
| 16. Immersion               | .818  | -.024   |

engagement at the theoretical level; (2) variables related to the use of verb tenses, which make up part of communicative competence; (3) other variables defining communicative competence, except the use of gestures; and (4) already grouped variables (pronunciation and intonation) and body language, making up a component with its own identity, associated with speech-related aspects. The matrix shows the grouping of the variables in four main components (Table 4).

2.5.2. Analysis of reliability

Cronbach's alpha was used to check the reliability of ONCE, giving a value of .842, which confirms a high level of internal consistency. There was no redundancy or duplication of items. Table 5 shows the value of Cronbach's alpha for the 16 variables together with the value if any were to be removed. Only pronunciation, use of gestures, and correct use of verb tenses were negative, although they hardly reduced the reliability of the scale, only syntax had a significant impact.

Besides, it can be pointed out that the scale has been used by several researchers during the assessment process, having obtained similar results with the same children. This can be considered an additional proof of the qualitative reliability of the instrument.

3. Results

3.1. Correlations between variables

Table 6 shows that most of the variables demonstrated highly significant bilateral correlation, although the variable *gestures* only significantly correlated with the variables making up the *engagement* dimension. The variable *correct use of verb tenses* was only significantly correlated ( $p < .01$ ) with *type of verb tense used* and with *story coherence*. *Syntax* was only correlated with *verb tenses used* and, to a lesser extent, with *story coherence* and *correct use of verb tenses*.

In addition, the original data for each particular variable were used to construct the three dimensions making up oral narrative competence and the correlations between those dimensions were calculated:

- Narrative competence (4) Vs. Engagement: .725\*\*
- Communicative competence (8) Vs. Engagement: .636\*\*
- Narrative competence (4) Vs. Communicative competence (8): .655\*\*

All of the dimensions exhibited strong correlations, such that a high level of narrative competence meant high levels of communicative competence and engagement.

**Table 6**  
Correlations.

|    |       |       |       |      |       |       |       |       |       |      |       |       |       |       |       |    |
|----|-------|-------|-------|------|-------|-------|-------|-------|-------|------|-------|-------|-------|-------|-------|----|
|    | 1     | 2     | 3     | 4    | 5     | 6     | 7     | 8     | 9     | 10   | 11    | 12    | 13    | 14    | 15    | 16 |
| 1  | 1     |       |       |      |       |       |       |       |       |      |       |       |       |       |       |    |
| 2  | .61** | 1     |       |      |       |       |       |       |       |      |       |       |       |       |       |    |
| 3  | .45** | .57** | 1     |      |       |       |       |       |       |      |       |       |       |       |       |    |
| 4  | -.03  | -.02  | .06   | 1    |       |       |       |       |       |      |       |       |       |       |       |    |
| 5  | .39** | .33** | .49** | .12  | 1     |       |       |       |       |      |       |       |       |       |       |    |
| 6  | .11   | .20*  | .12   | -.05 | .19   | 1     |       |       |       |      |       |       |       |       |       |    |
| 7  | .38** | .33** | .26** | .07  | .32** | .10   | 1     |       |       |      |       |       |       |       |       |    |
| 8  | .16   | .27** | .07   | .06  | .03   | .11   | .06   | 1     |       |      |       |       |       |       |       |    |
| 9  | .32** | .39** | .47** | -.08 | .23*  | .09   | .22*  | -.01  | 1     |      |       |       |       |       |       |    |
| 10 | .04   | -.21* | .03   | -.06 | .04   | -.15  | -.10  | -.22* | -.07  | 1    |       |       |       |       |       |    |
| 11 | .53** | .70** | .56** | .09  | .40** | .14   | .33** | .26*  | .41** | -.17 | 1     |       |       |       |       |    |
| 12 | .20*  | .35** | .35** | -.02 | .16   | .18   | .09   | .19   | .21*  | -.01 | .26*  | 1     |       |       |       |    |
| 13 | .39** | .40** | .34** | .03  | .28** | .35** | .23*  | -.04  | .30** | .08  | .39** | .19   | 1     |       |       |    |
| 14 | .48** | .56** | .49** | -.15 | .32** | .29** | .32** | .08   | .38** | -.02 | .44** | .26** | .58** | 1     |       |    |
| 15 | .58** | .63** | .54** | -.08 | .37** | .33** | .34** | .11   | .48** | .10  | .57** | .35** | .63** | .75** | 1     |    |
| 16 | .56** | .60** | .65** | -.06 | .45** | .29** | .36** | .02   | .46** | .04  | .49** | .37** | .52** | .66** | .79** | 1  |

\*\* The correlation is significative in the level .01 (bilateral). Variables names: please, see Table 5.

3.2. Cluster analysis

To identify if the stories reflected several competence levels, a two-step cluster analysis was made (Fig. 3). Cluster analysis is a set of multivariate techniques intended to identify groups that are unknown a priori (González-Romero et al., 2021). Compared to other techniques, two-step analysis automatically selects the optimal number of clusters, considering at the same time continuous and categorical variables (Antonenko et al., 2012). This allowed to detect two perfectly distinguishable levels.

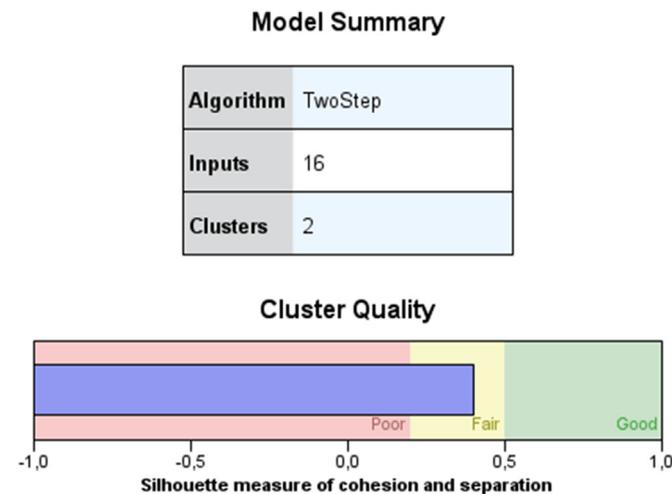


Fig. 3. Two-step cluster analysis.

The quality of the two clusters –namely, two competence levels in the stories– produced by the analysis was within the acceptable range (inputs = 16; clusters = 2) (Fig. 4). The first cluster was made up of 37% of the cases (stories), the second was made up of the remaining 63%.

The results for the two clusters are given in Table 7.

The stories included in the cluster 1 had better results in practically all of the variables, with either moderate or high scores in oral narrative competence. Both clusters had similar competence levels in pronunciation, vocabulary, and tenses used. The stories belonging to the cluster 2 only had better results in the variable *correct use of verb tenses*, with medium competence levels. In the other variables, they tend to have low scores.

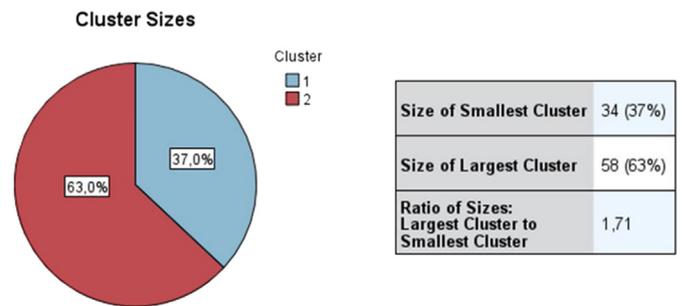


Fig. 4. Cluster size.

**Table 7**  
Results per cluster.

| Variables                   | Cluster 1   | Cluster 2   |
|-----------------------------|-------------|-------------|
| 1. Concluding the story     | Medium-High | Medium-Low  |
| 2. Originality of the story | Medium      | Low         |
| 3. Story coherence          | Medium-High | Medium      |
| 4. Story cohesion           | Medium-High | Medium      |
| 5. Pronunciation            | Medium-High | Medium-High |
| 6. Intonation               | Low         | Very Low    |
| 7. Gestures                 | Medium      | Medium-Low  |
| 8. Vocabulary               | Medium      | Medium      |
| 9. Verb tenses used         | Medium      | Medium      |
| 10. Correct use of tenses   | Medium      | Medium-High |
| 11. Morphology              | Medium      | Medium-Low  |
| 12. Syntax                  | Medium-Low  | Low         |
| 13. Interest                | Medium-High | Medium      |
| 14. Curiosity               | Medium-High | Medium      |
| 15. Enjoyment               | High        | Medium-Low  |
| 16. Immersion               | Medium-High | Medium-Low  |

3.3. Multiple linear regression analysis

ONCE aims to evaluate 4 to 6 years old children’s levels of oral narrative competence in telling stories with an app. It is important to check whether the data—from this test—has sufficient predictive capacity in order to determine whether it can be extrapolated to measure oral narrative competence in other individuals and in similar contexts. To this end, multiple linear regression analysis was performed.

The dispersion chart (Fig. 5) shows the high predictive capacity of the variables defining oral narrative competence, linearity between low scores in the variables and low levels of this competence and vice versa—high scores in all variables correspond to the highest level.

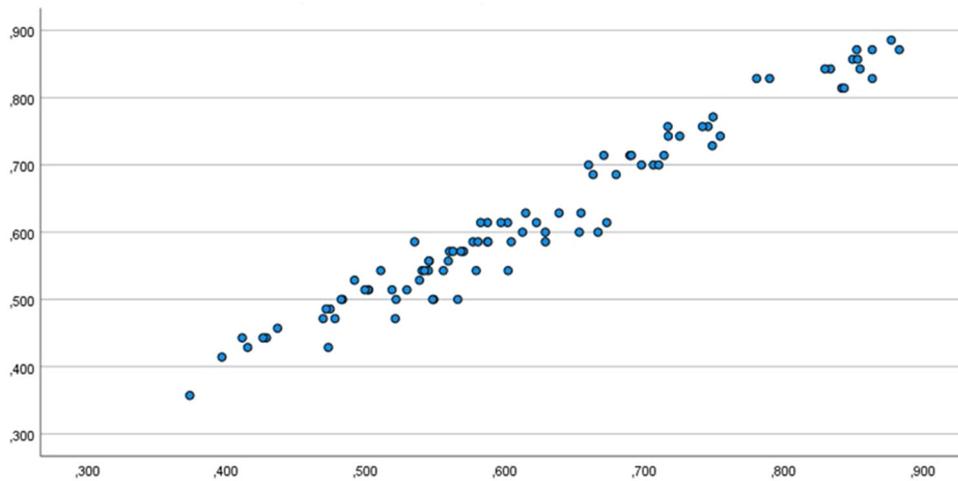


Fig. 5. Dispersion graph of the oral narrative competence.

Table 8 shows the standardized coefficients for each of the 16 variables in the scale:

The determination coefficient ( $R^2$ ) was .972, which confirms that these 16 variables can correctly predict future results in more than 97% of cases. This high value is because almost all of the variables significantly contribute ( $p < .05$ ), to the prediction value. Only three variables do not reach this critical value: *intonation*, *correct use of tenses*, and *enjoyment*.

### 3.4. Variable weighting

With regard to the influence of the variables—collected in ONCE—Fig. 6 shows that the variables with greatest impact were those that define the *engagement* dimension, followed by the variables making up *narrative competence*, and then *communicative competence*.

Because the weighting of each variable in the scale should be proportional to its predictive capacity, weighting was based on each variable’s predictive level. A proportional weighting was assigned on a scale of 0 to 10 (Table 9), where the four variables in *narrative competence* had a weight of 2.67 points, the eight

variables in *communicative competence* had a total weight of 2.23 points, and the four variables in *engagement* had the remaining 5.11 points. Undoubtedly, the engagement with the app will be decisive for the creation of children’s stories. For this reason, it is crucial to select a suitable app that promotes motivation.

## 4. Discussion and conclusion

### 4.1. Discussion

The empirical validation process -taking into account the good results of the regression analysis as well as the cluster analysis- demonstrated the high levels of consistency and representativeness in ONCE, which justifies the interest in it being applied in the classroom. In other words, due to the representativeness of the scale, the results could be translatable to a wider sample with similar characteristics, in order to measure their oral narrative competence. Regarding the ecological validity, it is guaranteed by the fact that the scale was tested in a quotidian environment, namely in the classroom context, so that the children participated in a spontaneous and not conditioned way.

Table 8  
Coefficients.

|   | Standardized coefficients |        |      |
|---|---------------------------|--------|------|
|   | Beta                      | t      | Sig. |
| Dimension Narrative Competence (Constant)     |                           | 14.025 | .000 |
| 1. Concluding the story                       | .086                      | 3.115  | .003 |
| 2. Originality of the story                   | .241                      | 8.016  | .000 |
| 3. Story coherence                            | .184                      | 5.199  | .000 |
| 4. Story cohesion                             | .114                      | 3.708  | .000 |
| Dimension Communicative Competence (Constant) |                           | -.157  | .876 |
| 5. Pronunciation                              | .107                      | 5.250  | .000 |
| 6. Intonation                                 | .047                      | 1.858  | .067 |
| 7. Gestures                                   | .118                      | 5.282  | .000 |
| 8. Vocabulary                                 | .114                      | 5.163  | .000 |
| 9. Verbal tenses used                         | .098                      | 3.540  | .001 |
| 10. Correct use of tenses                     | .021                      | .911   | .365 |
| 11. Morphology                                | .126                      | 5.231  | .000 |
| 12. Syntax                                    | .134                      | 5.698  | .000 |
| Dimension Engagement (Constant)               |                           | 9.397  | .000 |
| 13. Interest                                  | .082                      | 3.025  | .003 |
| 14. Curiosity                                 | .083                      | 2.596  | .011 |
| 15. Enjoyment                                 | .067                      | 1.532  | .130 |
| 16. Immersion                                 | .086                      | 2.283  | .025 |

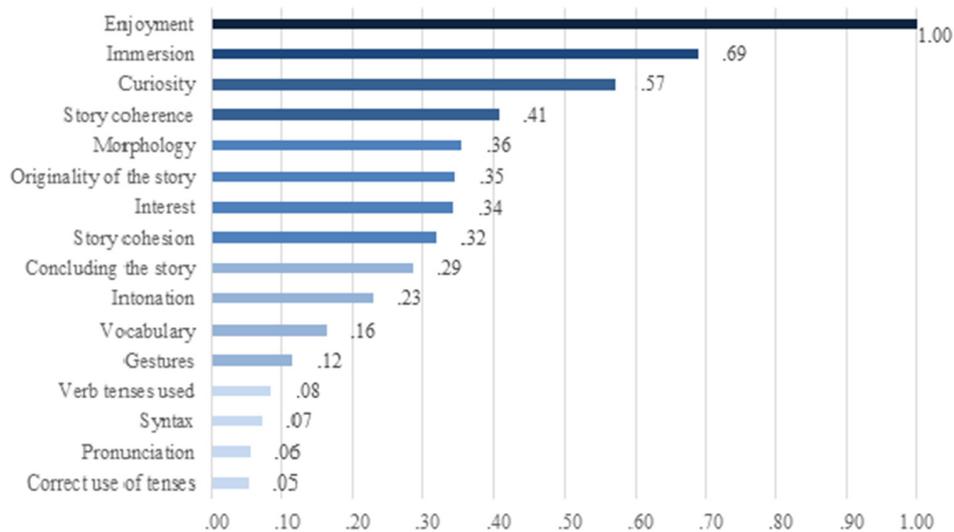


Fig. 6. Importance of the predictor.

Table 9  
Weighting of the variables.

| Variables                  | Weighting                |      |
|----------------------------|--------------------------|------|
| Narrative C.<br>(2.67)     | Concluding the story     | .56  |
|                            | Originality of the story | .68  |
|                            | Story coherence          | .80  |
|                            | Story cohesion           | .63  |
| Communicative C.<br>(2.23) | Pronunciation            | .11  |
|                            | Intonation               | .45  |
|                            | Gestures                 | .23  |
|                            | Vocabulary               | .32  |
|                            | Verbal tenses used       | .17  |
|                            | Correct use of tenses    | .11  |
|                            | Morphology               | .70  |
| Syntax                     | .14                      |      |
| Engagement<br>(5.11)       | Interest                 | .67  |
|                            | Curiosity                | 1.13 |
|                            | Enjoyment                | 1.96 |
|                            | Immersion                | 1.35 |

All of the variables in the scale were useful to the evaluation of oral narrative competence supported by apps, providing relevant information to the teacher when it comes to assessing children’s abilities. The consistency of the theoretical constructs defining the three dimensions established (narrative competence, communicative competence, and engagement) was confirmed by factor analysis. In addition, the scale demonstrated high predictive coefficients, such that the test data indicates that the results will be representative and may be used predictively.

The originality of this scale lies in the opportunity it provides to assess app-supported oral narration. In addition, it addresses engagement in the narrative task as a key dimension, which is defined from student interest, curiosity and immersion in the stories presented, and how much children enjoy them. *Engagement* with app-supported narrative tasks increases attention, participation, and meaningful involvement in telling the stories. This is also clear from the study by [Aubrey et al. \(2020\)](#) in relation to engagement in activities that promote linguistic skills. Children’s engagement with the narrative task with the app has a large impact on their oral narrative competence. It is worth pointing out that there are no previous studies about the contribution of digital applications in interventions intended to stimulate the oral narrative competence in 4 to 6 years old children. For this reason, this research contributes to the scientific progress in this

area. This also makes it important to choose apps that provide motivating stimuli that invite children to immerse themselves in the stories.

#### 4.2. Conclusion

From very young ages, creating stories is an effective activity for autonomously encouraging creativity, mental agility, and the cognitive processes involved in narration ([Addone et al., 2021](#)). Some digital story creation apps are very motivating and promote planning and regulation of the narrative task, successfully stimulating children linguistic–grammatical abilities and creative skills ([Del Moral et al., 2021](#)), which is why teachers should consider them useful resources for their teaching practice. Children should be familiar with these resources and already know the sequences of pictures in the app stories to make the oral narrative process easier and allow them to anticipate and plan their story. In fact, when children retell already known stories, they have been shown to make more elaborate, more detailed productions ([Heilmann et al., 2010](#)) than when they produce spontaneous stories.

Taking into account the importance of developing oral narrative competence in early ages, as well as the appropriateness of story creation apps for this purpose, this research provides an instrument that can be applied in other studies about children’s oral narrative productions supported by apps. The paper intends to contribute to the field of child–computer interaction, as it takes into account the role of digital interactions in children’s oral narrative competence training and acquisition. More specifically, it focuses on the study of children’s interaction with apps in early ages. Thus, the envisioned contribution is to conceptualize and design a scale that allows the assessment of children’s oral narrative competence development based on digital supported interactions, and to evaluate this scale.

Additionally, the contributions of this study can be relevant for teachers, as they can use the scale in order to assess children’s oral narrative competence supported by apps. Besides, although the scale was tested with *Imagistory*, it could be used with other story creating apps.

Thus, ONCE can be used for diagnostic evaluation of 4 to 6 years old children’s oral narrative competence to determine their previous level and identify specific language limitations. Based on the diagnostic outcomes, intervention programmes can be defined, including activities to improve language limitations or

deficiencies, such as pronunciation, errors in verb tenses, lack of vocabulary, etc. It is also useful to facilitate children’s non-verbal expression, paying attention to the gestures that accompany oral narration, which generally increase with more engagement in the narrative task. Children have been observed to resort to gestures and movements to express positive emotions aroused by creating their stories (Sylla et al., 2015), which could be boosted if the app is motivating.

In order to provide guidance about the use of this scale to assess oral narrative competence, a figure showing the process step by step is included in a final Appendix (Fig. 7).

### 4.3. Limitations and implications for further research

The limitations of this scale are related to the application age (4–6), as it should be modified to assess oral narrative competence of older children. In this case, a story should be selected that aligns with the average competence level that the child is being taught to at school, according to the educational stage. It is worth noting that the scale has been tested with Imagistory, thus being advisable to check it with other story creation applications. Besides, the children sample size could be extended.

As a future research line, the scale may be useful for interventions aimed at improving oral narrative competence through creation of digital stories, an improvement that could be confirmed via pre-test and post-test, such as in the study by Pinto et al. (2019). In addition, although the scale has been tested with children in elementary education (4–6 years old), it may also be used to evaluate in the initial levels of primary education. In either case, it is important to consider the background variables that may affect results, such as family context, storytelling and listening habits in school and at home, and how familiar the children are with mobile devices.

Additionally, in an indirect way, this scale could be used to assess the appropriateness of other story creating apps to foster the children’s engagement during the narrative task. The elements that increase engagement could be identified and taken into account for designing apps intended to the development of narrative competence in children.

Future studies may look at applying the scale to children with learning difficulties. It may also be interesting to perform a broader study about children’s oral communicative competence relating it to other variables such as reading habits in the home or literacy practice in the classroom. In addition, it may also

be worth comparing the use of storytelling apps and producing stories from wordless picturebooks, as other studies have done (Piasta et al., 2018), to determine which technique is more effective. ONCE also has a potential application in testing oral narrative competence in foreign languages. Finally, it is worth noting that it may also be useful to compare the improvements in children’s oral narrative competence using several apps.

### Note

The researchers interested in consulting the dataset of this study may contact the authors to request access.

### Selection and participation of children

The participants were 93 preschool children from rural schools of Asturias (Spain), which took part in this research voluntarily. In order to participate, the children’s guardians had to give their informed consent, which was worded in accordance with the standards in the Helsinki Declaration (World Medical Association, 2008). The research was carried out following the recommendations for research with children (Shaw et al., 2011).

### CRedit authorship contribution statement

**Jonathan Castañeda-Fernández:** Investigation, Formal analysis, Software, Methodology, Validation, Visualization, Writing. **M. Rosario Neira-Piñeiro:** Conceptualization, Investigation, Data curation, Writing, Resources, Reviewing and editing. **Nerea López-Bouzas:** Conceptualization, Investigation, Data curation, Writing, Resources. **M. Esther del-Moral-Pérez:** Conceptualization, Investigation, Data curation, Writing, Resources, Project administration, Supervision.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Data availability

Data will be made available on request

### Appendix

See Fig. 7.

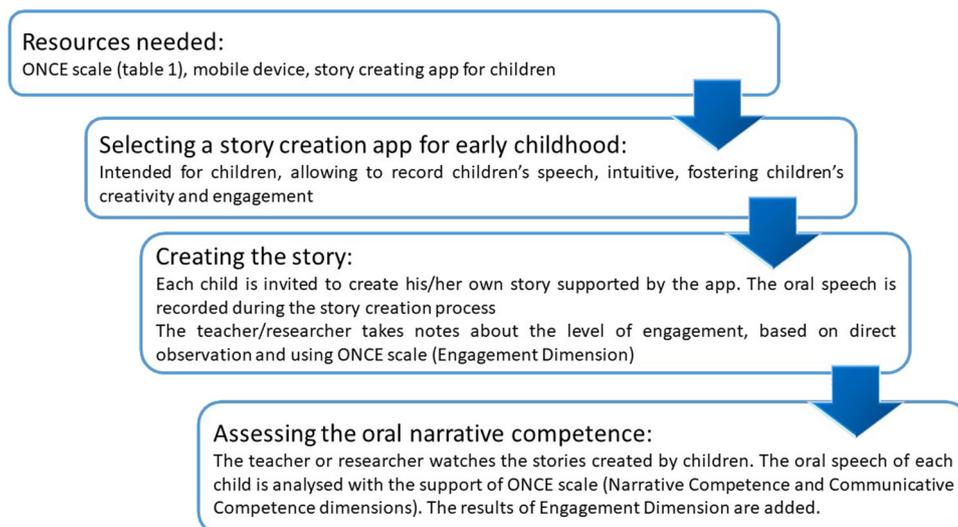


Fig. 7. Assessment of the oral narrative competence supported by apps. Step by step guide.

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