OCNOS Journal of Reading Research

Ocnos
Journal of Reading Research
https://revista.uclm.es/index.php/ocnos

Open Access Full Text Article

Ocnos, 20(3), 2021. ISSN: 2254-9099
https://doi.org/10.18239/ocnos_2021.20.3.2440

Articles

Literary education and reading promotion supported in immersive literary environments with augmented reality

Educación literaria y promoción lectora apoyadas en entornos literarios inmersivos con realidad aumentada

María del Rosario Neira-Piñeiro*[1]
Esther del-Moral-Pérez[2]

[1] Universidad de Oviedo, Spain
[2] Universidad de Oviedo, Spain

Funded: This research work derives from the ITINER-AR research project, financed by the Universidad de Oviedo (Reference PAPI-18-EMERG.22).

* Contact: neiramaria@uniovi.es

Received: 29/06/2020; Accepted: 17/04/2021

Abstract

The immersive literary environments (ILE) are educational settings designed on the basis of physical objects that recreate children's literature works. They also provide digital information overlapped with augmented reality (AR), favouring immersive learning, coming from the interaction with several elements introducing activities. With this qualitative research -focused on cases study- we intend: a) to analyse 25 ILE created by pre-service teachers (N=95), intended to promote literary education and reading in preschool education. Two dimensions are considered: a) technological-interactive, describing the support and the AR resources, and b) educational and literary, identifying and quantifying the types of texts and activities. 2) To determine the satisfaction level of the preservice teachers at the end of the experience, by means of a survey. The results reveal that the ILE -based on literary texts- recreate fictional worlds with AR resources, bringing characters to life and including activities with and without AR. 64% of the ILE employ models, 24% a lapbook and the rest prioritise other supports, including AR coloring pages, videos, characters' animations, online games, AR markers, QR codes, etc. The innovative experience became very satisfactory for pre-service teachers, who took profit of AR opportunities to design activities for literary education and to promote a playful and multisensory learning.

Keywords: Children´s literature; literary education; digital environment; reading materials; educational Innovation; Preschool Education

Resumen

Los entornos literarios inmersivos (ELI) son escenarios educativos diseñados a partir de objetos físicos que recrean obras literarias infantiles, proporcionando información digital superpuesta con realidad aumentada (RA) y favoreciendo un aprendizaje inmersivo. Con esta investigación cualitativa -

centrada en el estudio de casos- nos proponemos: 1) analizar 25 ELI elaborados por futuros maestros, para promover la educación lectora y literaria en infantil, atendiendo a dos dimensiones: a) tecnológico-interactiva, describiendo el soporte y recursos RA utilizados, y b) didáctico-literaria, identificando y cuantificando la tipología de textos y actividades. 2) Determinar el nivel de satisfacción de los futuros maestros al concluir la experiencia. Los resultados revelan que los ELI -basados en textos literarios- recrean universos ficcionales apoyados en recursos RA, dando vida a los personajes e incluyendo actividades con y sin RA. El 64% de los ELI utiliza maquetas, el 24% *lapbooks* y el resto prima otros soportes, incluyendo láminas-marcadores, vídeos, animaciones de personajes, juegos *online,*activadores RA, códigos QR, etc. La experiencia innovadora resultó muy satisfactoria para los futuros docentes, quienes aprovecharon las oportunidades de la RA para diseñar actividades de educación literaria y promover un aprendizaje lúdico y multisensorial.

Palabras clave: Literatura infantil; educación literaria; entornos digitales; materiales de lectura; innovación educativa; Educación Infantil

Introduction

Technological resources have burst into the literary domain, giving a boost to reading in digital formats and favouring social reading practices on the Net, such as *BookTuber* and *Booktrailer* (Lluch, 2014; Paladines-Paredes & Margallo, 2020; Tabernero-Sala, 2016). Digital Children and Young Adult literature (CYAL) have emerged too (Al-Yaqout & Nikolajeva, 2015; Manresa & Real, 2015; Ramada, 2018; Zeng, 2017), using formats like the augmented book, which combines reading in paper with digital contents accessed by means of a device (Palomares-Marín, 2014; Lim & Park, 2011). Alongside Augmented Reality (AR), these resources have the potential to enrich literary education and to enhance the promotion of reading. Nevertheless, the presence of digital CYAL in classrooms remains scarce, partly due to teachers' ignorance and prejudice (Ramada & Turrión, 2019). A compelling need thus exists to train the teaching staff in the knowledge and use of emerging technologies for reading and literary education.

This work aims to analyse immersive literary environments —identified with AR-assisted pedagogical proposals that facilitate literary education at early ages— created by trainee teachers within the framework of the ITINER-AR Project (2018-20), aimed at the development of future teachers' didactic and digital competences.

Literary education and reading promotion at early ages

The approach to literature in infant education relies on the pedagogical model of literary education, focused on the reader and the access to the text (Colomer, 1996). This model seeks to activate literary competence (Cantero & Mendoza, 2008; Prado, 2004) and promote the habit and enjoyment of reading (Munita, 2017; Prado, 2004). It conceives literary reading as a key activity to drive literary competence (Mendoza, 1999), fostering progress in interpretation —supported on activities such as literary discussion—, the development of reading responses, the incorporation of literary creation tasks or the transfer of social practices that revolve around reading into the classroom, such as the exchange of recommendations (Colomer, 1996; Margallo & Mata, 2015). It likewise suggests extending the reading experience through other

Ocnos, 20(3), 2021. ISSN: 2254-9099
https://doi.org/10.18239/ocnos_2021.20.3.2440

activities that bring together different languages and supports or formats, including the making of plastic productions and the adaptation of texts using a variety of artistic media, drama or games (Colomer, 2010).

Within infant education, the literary communication experience relies on a mediator —the agent that makes it possible to access the text (Prats, 2016)— prioritising the oral transmission carried out by the teacher, who narrates, reads, recites or sings (Colomer & Duran, 2008). The combination of shared reading and literary conversation permits oral interaction and linguistic development (Díaz-Plaja & Prats, 2016; Goikoetxea & Martínez, 2015), favours shared interpretation and the expression of the reading response, thus helping to develop literary competence. In this regard, it becomes necessary to devise varied activities which can enrich and broaden the reading experience, avoiding routine (Colomer & Duran, 2008). Equally of interest are expressive and manipulative tasks (role play, reciting, preparation of plastic productions...), in addition to promoting the social dimension of reading via peer work or games (Pascual-Díez, 2004). A relevant place also corresponds to activities oriented to the initiation in literary creation, adapted to emerging readers' abilities (Fons, 2009).

The selection of texts for reading must primarily be guided by artistic quality, the suitability for addressees and their didactic utilisation (Colomer et al., 2018). It is additionally essential to have a varied corpus regarding styles, topics or genres, so that we can train competent readers capable of reading texts of various types (Manresa, 2009). Furthermore, reading is no longer confined to linear texts, present in tangible formats; now, there are also reading texts which imply the interpretation of codes, for instance, the QR codes that require digital devices to unravel their messages (Mowafi et al., 2019), which entails an added level of digital competence. This fact raises the convenience of reconciling both training demands by means of integrative proposals.

Digital scenarios and augmented reality for literary education and for reading

The irruption of mobile devices, digital applications and virtual or augmented-reality based resources into classrooms has resulted in digital scenarios that offer a great opportunity to acquire and develop a wide range of competences (Deaton et al., 2018; Kumar & Chand, 2019; Papadakis et al., 2018). Within such scenarios, learning and knowledge acquisition are conceived from interaction with real or virtual elements (Herpich et al., 2019). More precisely, AR generates immersive environments which immerse subjects into enriching multi-sensory experiences, thus favouring meaningful learning (Eisenlauer, 2020) via interaction (ChanLin, 2018). Likewise, tablets and/or smartphones are facilitating the access to complementary information and virtual resources associated with real elements, thus increasing their potential (Gong et al., 2019; Suh & Prophet, 2018).

Reading experiences with augmented reality

AR's capacity to provide multi-sensory stimulation along with its potential in terms of motivation helps bring students closer to reading in a fun way, enhancing concentration and the comprehension of concepts (Wang et al., 2019) or reducing the difficulty involved in reading vowels and numbers in infant education (Cieza & Lujan, 2018). There are AR-assisted

experiences which foster diverse skills, promoting an immersive type of learning through interaction with non-tangible 3D elements, the reading of QR codes or the activation of markers linked to multimedia contents (Dong & Si, 2018; Oranç & Küntay, 2019).

In particular, the augmented book combines the reading of physical works with digital contents that enlarge and enrich the reading experience (Chen & Tsai, 2014; García-Rodríguez & Gómez-Díaz, 2016), leading to an immersive, multi-sensory and multi-format sort of reading through interaction with digital contents (Lim et al., 2011). This serves as a catalyst for learning which positively impacts on readers' attitude and motivation (Cheng, 2017), reinforcing beginners' interests too (Palomares-Marín, 2014). Moreover, some AR-based ludic experiences performed in the context of libraries stress its potential to promote reading (Arroyo-Vázquez, 2016).

From the augmented book to the immersive literary environment

One of the resources in which AR materialises in CYAL is the augmented book, which has quickly acquired great relevance when it comes to illustrating scenarios and stories with special effects, mainly in texts addressed to early ages (Arellano & Sbriziolo, 2020). Even though the corpus of augmented CYAL in Spanish is scarce and despite the predominance of a didactic intent therein (Ramada, 2018), it can still be a suitable resource to boost reading and literary education.

Other uses of this technology in literary education and reading promotion refer to the preparation of creative activities from characters and scenarios generated with AR applications (Moreno & Onieva, 2017), the production of interactive literary maps based on geolocation (Leiva & Moreno, 2015; Onieva, 2016) or the implementation of AR-assisted activities connected to literary reading (Puig & Gómez, 2016).

Similarly, it is our contention from the ITINER-AR project (Del-Moral, 2018) that a need exists to encourage the design of pedagogical proposals with AR for literary education, materialised in the creation of the so-called *immersive literary environments* (ILEs), which expand and enrich the reading experience (Neira-Piñeiro et al., 2019a & 2019b). This term was coined within the framework of the aforesaid project in order to define an educational environment which, designed from physical objects —3D models, lapbooks or murals—, recreates children's literature scenarios and provides superimposed dynamic digital information helped by AR, favouring subjects' immersive learning by means of interactions and reading.

Despite the potential offered by this emerging technology, few research studies have hitherto paid attention to its implementation within reading and literary education, especially at early ages, a field where this investigation pursues to contribute. Furthermore, since teachers are responsible for methodological change at school, AR integration must inevitably include their training for the management and use of this technology. This is actually the cornerstone of the ITINER-AR Project.

Ocnos, 20(3), 2021. ISSN: 2254-9099
https://doi.org/10.18239/ocnos_2021.20.3.2440

Method

The research objectives consisted in I) analysing the potential of *immersive literary environments* devised by future teachers (N=95) using AR —within the framework of the ITINER-AR Project— to promote literary education and reading in infant education; and II) verifying the *level of satisfaction* of the students who took part in the above-mentioned project, in addition to developing their proposals. The methodology adopted, which has a qualitative nature and revolves around the study of cases (Peña, 2009), works through the examination of the ILEs designed. On the one hand, we assessed 25 ILEs carried out by undergraduate students from the Degree in Infant Education Teacher Training (University of Oviedo, Spain) (2018-20), enrolled in the subjects *Didáctica de la Literatura Infantil* [Didactics of Children's Literature] (N=79) — 3rd year— and *Comunicación, desarrollo infantil y Educación* [Communication, children's development and Education] (N=16) —fourth year. Furthermore, a survey permitted to know their level of satisfaction and their perception after the activity.

As for the students' involvement in this research, the project was presented to them at the beginning of the year, giving them detailed information about it; those who agreed to participate committed themselves through a learning contract. It is worth highlighting that, regardless of whether they were included in the project or not, every student had the chance to pass the practical section of the respective subjects. In the very few —isolated— cases of some students who did not take part due to different circumstances, an alternative individual equivalent task was designed for them.

Regarding evaluation, the task consisting in the collaborative creation of ILEs was envisaged from two different standpoints. On the one hand, as a part of the research project, we analysed and assessed the ILEs designed, as can be seen in this paper. On the other hand, as an evaluable task, the ILEs designed were assessed by the person in charge of each subject, abiding by what had been previously established in the corresponding teaching guides. This evaluation was framed within the context of the respective subjects.

Instruments

ILEs were supported on a physical support that had to be designed by students (model, lapbook or mural) and a didactic guide, prepared with the program *Genial.ly.* The analysis was performed using an *ad hoc* ethnographic tool, assessing two dimensions: 1) Technological-interactive, describing the format and the integrated AR resources (Cawood & Fiala, 2008); and 2) Didactic-literary, identifying the typology of texts and categorising —for their subsequent quantification— the activities referred to: a) literary reading, b) oral expression, c) role play and creative tasks, d) fun tasks, and e) reading and writing (Colomer & Duran, 2008; Díaz-Plaja & Prats, 2016; Fons, 2009; Pascual-Díez, 2004; Prats, 2016). Activities with and without AR were distinguished and quantified as well.

An online questionnaire was additionally designed so that the participating students could record their level of satisfaction —after completing the experience— through a 1-to-5 Likert-type scale (1= wholly dissatisfied; 5= very satisfied). Likewise, attention was paid to their

perception concerning the extent —*not at all; hardly; quite; very much*— to which the project had helped them develop their general and specific didactic, digital, socio-collaborative and creative competences, alongside other types of learning acquired via ILE design. The extent to which the experience had contributed to their teacher training, together with their assessment of ILEs as pedagogical resources and their didactic implementation were also observed.

Process through which the ILEs were prepared

The 25 ILEs examined were carried out during 12 face-to-face sessions and under the teachers' guidance. Additionally, students received didactic and technological training related to the use of AR applications; *Quiver* and *Chromville*, which permit to scan pre-designed colouring sheets, generating 3D figures, animations and games; *HP Reveal*, which is used to transform images and objects into AR activators, linked to 3D videos or elements; *Wallame*, which serves to hide virtual images or texts on a wall by means of geolocation; and QR code editors associated with online resources. They were also taught to use animation applications such as *PhotoSpeak* and *Evertoon* —along with the program *Learning Apps*, to create online microgames— and given access to a repository with resources (https://gitecna.wixsite.com/proyectoitinerar). Finally, an example of an ILE devised by the university lecturers was presented and different types of supports were shown, allowing participants to choose the one that best suited each ILE.

Figure 1 describes the stages of the ITINER-AR Project in detail.

Figure 1.
Stages of the ITINER-AR Project: collaborative ILE design

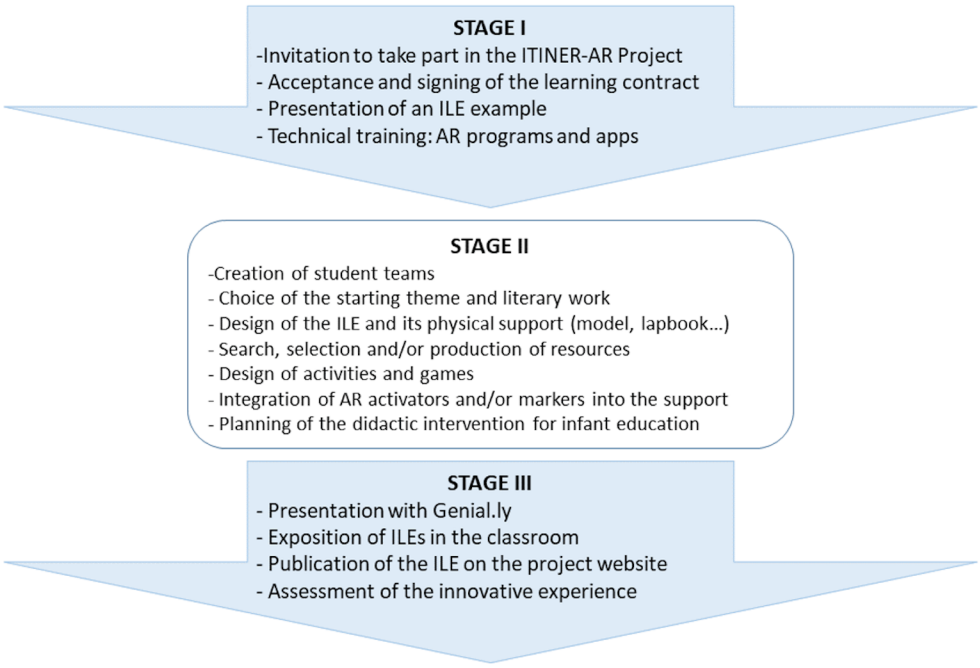


Table 1 below lists the ILEs collaboratively designed by the future teachers, identifying the format and the literary texts chosen as their structuring axis.

Ocnos, 20(3), 2021. ISSN: 2254-9099
https://doi.org/10.18239/ocnos_2021.20.3.2440

Table 1.
ILE description

Proposal, age and physical support	*Main literary text*
ID1 The Very Hungry Caterpillar (4-5 years). Caterpillar puppet.	Picturebook *The Very Hungry Caterpillar* (E. Carle)
ID2 The Space Voyage (5-6 years). Artistic installation.	Picturebook *The taste of the Moon* (M. Grejniec)
ID3 Antón Museum (5-6 years). Model of a museum.	Picturebook *The Dot* (P. H. Reynolds)
ID4 The Little Prince (4-5 years). Model.	Adaptation from *Le petit prince* (Saint-Exupéry)
ID5 Adventures of Bu (4-5 years). Lapbook.	Tale created by students
ID6 Unexpected Encounter (5-6 years). Model.	Tale created using "Fairy-tale salad"
ID7 The Little Princess (5-6 years). Model, puppet and rocket.	Tale inspired in *Le petit prince* (Saint-Exupéry)
ID8 Adventures of Hansel and Gretel (4-5 years). Model.	Adaptation of the tale (Grimm)
ID9 The Jungle Book (5-6 years). 3D model.	Adaptation of *The Jungle Book* (Kipling)
ID10 Hansel and Gretel (5-6 years). Model.	Adaptation of the tale (Grimm)
ID11 *Alice in Wonderland* (4-5 years). Model.	Adaptation of the novel (L. Carroll)
ID12 *Pippi Longstocking* (5-6 years). Model.	*Pippi Långstrump* (Astrid Lindgren).
ID13 The most musical animals (5-6 years). Lapbook.	Adaptation of *The Bremen Town Musicians* (Grimm).
ID14 The Little Prince (5-6 years). Model of planets.	Adaptation of the novel (Saint-Exupéry).
ID15 Neverland (4-5 years). Lapbook and murals.	Adaptation of *Peter Pan* (J. M. Barrie).
ID16 The Wolf and the Red Huntress (4-5 years). Lapbook.	Rewriting of *Little Red Riding Hood* (Grimm).
ID17 In a far-away town (5-6 years). Lapbook.	Tale created using "Fairy-tale salad"
ID18 The Mermaid of the Lake. Model.	Tale created using "Fairy-tale salad"
ID19 The Little Mermaid (5-6 years). Model.	Adaptation of the tale (Andersen).
ID20 Snow White Boy (5-6 years). Model.	Rewriting of *Snow White* (Grimm).
ID21 The adventures of Hansel and Gretel (5-6 years). Model.	Tale created using "Fairy-tale salad"
ID22 The Ugly Duckling (5-6 years). Model.	Adaptation of the tale (Andersen) in chapters.
ID23 Little Red Riding Hood (4-5 years). Mural.	Adaptation of the tale (Grimm).
ID24 The Bremen Town Musicians (5-6 years). Lapbook.	Adaptation of the tale (Grimm).
ID25 Jacinto, the naughty wolf. (5-6 years). Model.	Rewriting of *Little Red Riding Hood* (Grimm).

Fuente: Elaboración propia.

Results

Analysis of the ILEs devised

It relies on an instrument which takes account of two dimensions: a technological one and a didactic-literary one, linked to the opportunity that they offer to undertake literary education and reading promotion in infant education.

a) Technological-interactive dimension

64% of ILEs adopt a model as their *physical support* (figure 2) to represent the scenario for their respective story. They all integrate characters from the play and define the movement of the main character along the fiction space, allow for the recreation of the story and incorporate AR activators to perform various activities. Moreover, they favour symbolic game by permitting the manipulation of the ILE's physical elements (puppets, houses…).

Figure 2.
Models for the ILEs Unexpected Encounter (ID6) and The Little Mermaid (ID19)

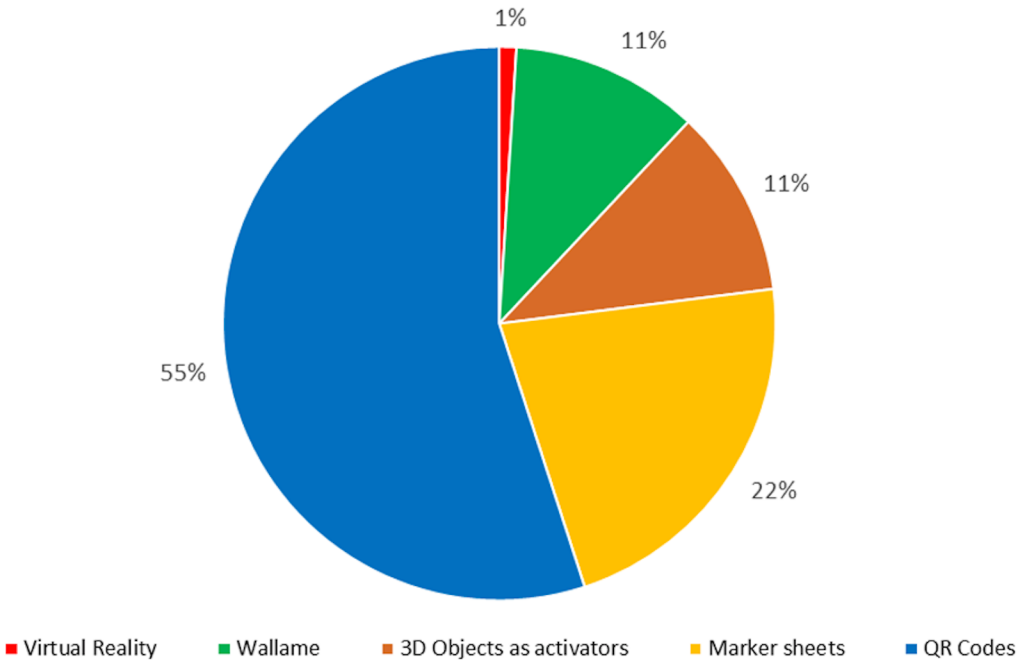
24% use a lapbook (figure 3), the cover of which presents the story with some introductory activity, whereas the interior recreates the fiction space, incorporating AR activators connected to activities. Most of them contain textures, elements to stick and unstick, windows or flaps to manipulate and play. The remaining 12% adopt other formats: an expanded polystyrene caterpillar with QR codes to introduce the activities, some artistic installation and murals with elements resembling those of lapbooks.

Ocnos, 20(3), 2021. ISSN: 2254-9099
https://doi.org/10.18239/ocnos_2021.20.3.2440

Figure 3.
Lapbooks of Neverland (ID15) and *The Adventures of Bu* (ID5) and figure from *The Very Hungry Caterpillar* (ID1)

Regarding *augmented reality resources* (Figure 4) integrated into ILEs, QR codes account for 55%, followed by the marker sheets of *Quiver* and *Chromville* (22%). They include to a lesser extent objects and images converted into activators with the program *HP Reveal* (11%), as well as the geolocation application *Wallame* (11%) to access hidden messages. Only 1% utilise virtual reality goggles.

Figure 4.
AR resources: incorporated applications.



QR codes are linked to songs and other secondary texts related to the literary work, in addition to providing access to the main text in some ILEs (ID1, ID16, ID19). They likewise introduce online games and activities created by means of *Learning* apps, and incorporate sounds that suggest an atmosphere (the jungle in ID9, or a night ambiance in ID15) or videos which recreate elements of the play (swans in ID22), thus strengthening the immersive nature of ILEs.

The application *HP Reveal* served to insert images, such as the witch in *The Little Mermaid* (ID19), as well as to *give life* to different characters, turning the cardboard puppets or figures into activators (figure 5), associated with videos generated with the applications *Photospeak* and *Motion Portrait*. This allows characters —through videos— to talk to the child audience, to present activities or to recite poems.

The marker sheets included had to do with scenarios, characters or other elements of the literary text, generating sounds and 3D elements which made it possible to interact in a fun way. Finally, the geolocation application *Wallame* was used to conceal riddles, tongue twisters or characters on the classroom wall.

Figure 5.
Pippi puppet that activates video by means of HP Reveal (ID12). Pirate sheet animated with Quiver (ID15). Access to hidden characters using Wallame (ID6).

In short, from a technological-interactive standpoint, ILEs characteristically combine a physical support, enriched with different types of AR activators which provide sounds, videos or animations, amongst other things, giving life to characters and other story elements.

Ocnos, 20(3), 2021. ISSN: 2254-9099
https://doi.org/10.18239/ocnos_2021.20.3.2440

Furthermore, having designed the formats to contextualise each specific literary work, along with the possibility to create one's own materials using a variety of programs and applications, made it possible to adapt the digital resources to the characteristics of each ILE.

b) Didactic-literary dimension

All ILEs are articulated from a main text (table 1). In 57% of them, it is a tale, adapted from a CYAL classic or created by participants taking Rodari (2002) as a reference. 29% start from adapted CYAL novels, while 14% use picturebooks destined to early ages (figure 6). ILEs additionally incorporate secondary literary texts by means of AR activators: songs (41%); texts linked to play, such as riddles and tongue twisters (33%); author's poems (15%); and picturebooks and tales (11%). They also bear a thematic relationship with the main text and are inserted as an audio, video or image file, by activating AR markers (QR codes) integrated into the ILE.

Figure 6.
Types of literary texts used

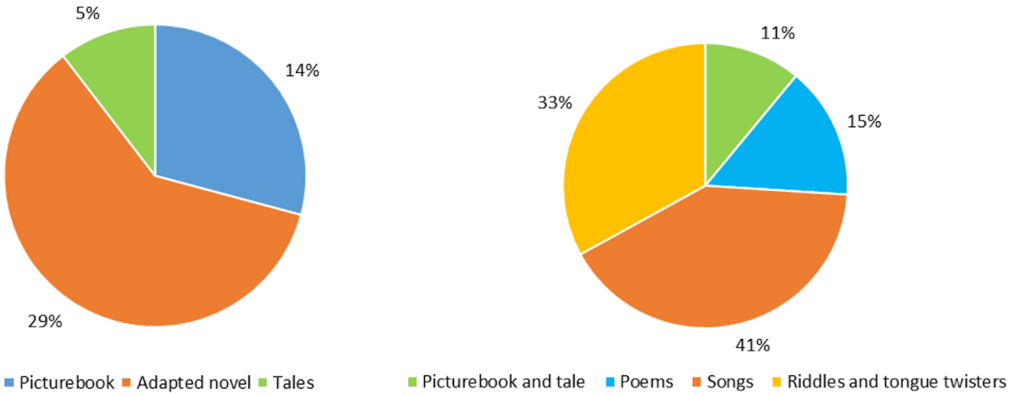


Table 2 lists the activities (with and without AR) included in ILEs, grouping them together according to the established categories (literary reading; oral expression; role play and creative tasks; fun tasks; and reading and writing).

Table 2.
Percent distribution of activities linked to ILEs with and without AR

Typology of activities	% With AR	% Without AR
1) Literary reading:		
- Literary text reading or listening	92	68
- Pre-reading activities (hypotheses, previous knowledge …).	52	4
- Comprehension and information-retention activities	28	12
- Literary conversation (shared interpretation)	52	-
- Sequencing of parts in a story	20	-
2) Oral expression, role play and creative tasks		
- Reciting and staging of songs and poems	44	-
- Oral narration of a tale	16	-
- Drama games based on characters, situations and stories	24	-
- Making plastic productions from the text	32	20
- Literary creation (inventing an ending, rewriting, completing a text...).	20	4
3) Fun activities:		
- Reading and solving riddles	4	52
- Reproduction of tongue twisters	-	4
- Games about literary texts (guessing or finding characters…).	12	36
- Reading and writing games (e.g. word search and crossword)	-	28
- Animation and interaction with characters and other elements	-	68
4) Reading and writing:		
- Text-image association	-	32
- Reading words or sentences	-	8
- Reading written texts (practical or scientific use)	8	12

Source: elaborated by the authors.

Every ILE integrates literary text reading or listening, carried out by the teacher (92%) or introduced by AR activators (68%), a key practice when it comes to discovering literature at early ages. This combines with pre- and post-reading activities, literary conversation prevailing, mostly with no support of AR resources. Activities that develop verbal and body language are incorporated too, including oral narration, poem reciting or staging and role play. Also, creative tasks such as plastic productions (murals, drawings, masks) in response to reading, or the

Ocnos, 20(3), 2021. ISSN: 2254-9099
https://doi.org/10.18239/ocnos_2021.20.3.2440

initiation to writing or literary rewriting. On some occasions (20%), AR is utilised to carry out digital photographs or to colour on the tablet.

Game-based activities (such as interacting with characters and objects or solving riddles, to quote but two) which promote a playful approach to literature and to reading enjoyment stand out from the rest. Most of them are supported on digital and AR resources (QR codes, *HP Reveal, Quiver and Chromville* sheets), fundamentally to animate elements (68%) and to find riddles concealed using geolocation applications like *Wallame* (52%).

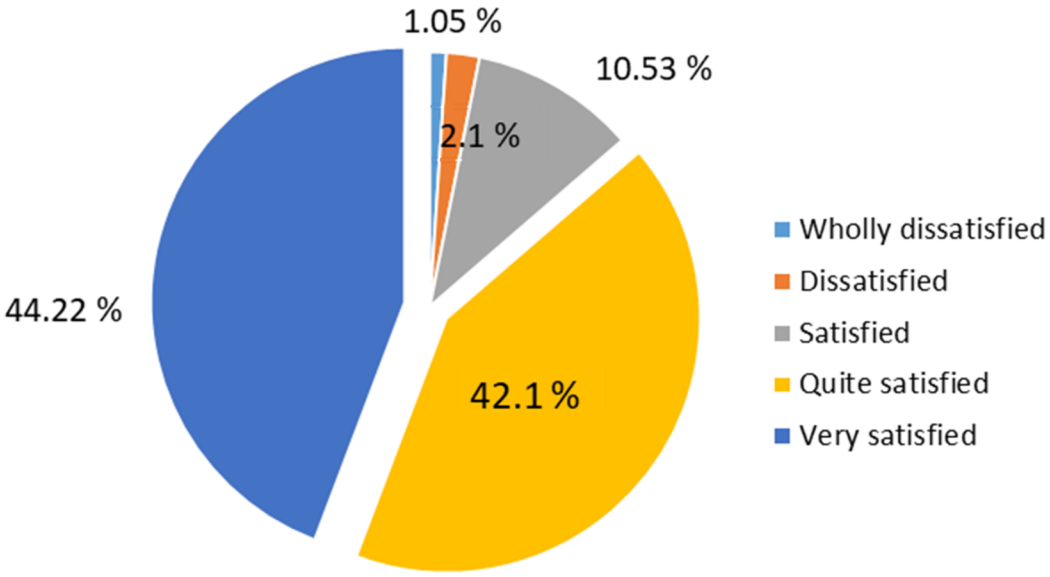
Lastly, attention is paid to tasks oriented towards the knowledge and use of written language, where AR provides access to online activities consisting in the association of words and images, created with the application *Learning Apps* (32%). Some AR markers in the ILE are linked to non-literary texts, amongst them recipes or letters "sent" by characters (12%).

ILEs thus adapt to experts' recommendations for literary education in infant education, offering a diversity of texts, along with varied activities which extend and enrich the previous reading. Their most important peculiarity lies in combining oral texts and printed books with digital locutions of literary works introduced with AR. Similarly, manipulative, expressive or plastic activities are interspersed with others in digital media and AR. All of this makes it possible to integrate new digital supports to come closer to literature, without needing to relinquish other more traditional formats and activities which coexist with the previous ones.

Participants' level of satisfaction and perception

Figure 7 reflects the distribution of the participating students in accordance with their level of satisfaction. The results are highly positive, since 96.85% of them claimed to be satisfied with the experience to a greater or lesser extent, as opposed to only 3.15%, who were little satisfied or wholly dissatisfied.

Figure 7.
Participants' level of satisfaction



As shown in table 3, the perception about the competences developed and the teacher training in general is rather positive. 89.1% considered that they had quite or very much improved their management of digital tools for literary education and, likewise, 88.4% learned to design resources with AR for the same purpose. Thanks to this activity, 94.7% have discovered the valuable potential of ILEs, and 95.5% are happy with their own ILEs, which they think can be applied in infant education classrooms.

Ocnos, 20(3), 2021. ISSN: 2254-9099
https://doi.org/10.18239/ocnos_2021.20.3.2440

Table 3.
Percent distribution of subjects according to their perception about the contributions made by the ITINER-AR Project

	Not at all (1)	Hardly (2)	Quite (3)	Very much (4)	Average X
I developed didactic competences	1.1	12.6	53.7	32.6	3.46
I developed competences related to the didactics of literature	2.1	15.8	45.3	36.8	3.50
I developed digital competences	2.2	8.4	34.7	54.7	3.60
I developed socio-collaborative competences	3.2	13.6	34.8	48.4	3.46
I developed creative competences	2.1	8.4	30.5	59.0	3.33
It was useful for my teacher training	0	4.2	41.1	54.7	3.50
I learned to use digital tools for literary education	2.1	8.4	30.5	59.0	3.46
I learned to design resources with AR for literary education	0.0	11.6	26.3	62.1	3.50
I participated in the production of creative proposals	0.0	10.5	36.9	52.6	3.42
I discovered that ILEs are a valuable didactic resource	1.1	4.2	40	54.7	3.48
I designed an ILE that can be implemented in infant education	0.0	4.2	29.5	66.3	3.62

Source: elaborated by the authors.

Discussion and conclusions

The *immersive literary environments* analysed arise as AR-assisted innovative strategies for literary education which demand a strong involvement of teachers in the design, creativity and mastery of these new tools so that they can have a didactic implementation. Unlike augmented books, their originality lies in combining the reading of a literary text —which serves as a structuring axis— with the design of an ILE.

The physical support (model, lapbook, mural…) recreates the fiction universe and houses AR activators that enrich it with sounds and videos, give life to characters, permit to interact with elements of the story, insert new literary texts or lead to carry out activities, in addition to allowing for manipulation as well as for playing with the tangible items (e.g. puppets, houses…) that form part of it. All of the above undoubtedly endows ILEs with a multi-sensory immersive atmosphere capable of involving users in the story, enhancing the reading experience through interaction with mobile devices. This effect is similar to the one obtained with augmented CYAL works (Arellano & Sbriziolo, 2020). At the same time, the establishment of separate moments for the reading of the main text and the exploration of the physical support prevents interactive elements from hindering concentration and comprehension of the work, a danger against which some scholars have already warned (Arellano & Sbriziolo, 2020; García-Rodríguez & Gómez-Díaz, 2016).

With regard to the advantages that these innovative proposals bring for literary education and reading promotion, AR resources have proved suitable to incorporate varied activities linked to a given text, especially fun-based ones, helping to extend reading (Colomer & Duran, 2008) and create an immersive atmosphere which seeks to submerge students in the fiction universe. The connectivity supplied by AR makes it possible to link several texts and present them in different formats. Equally worthy of mention is its potential to integrate *ludic* elements, such as online games or animated characters who talk to children, and *pseudo-magical* ones, by discovering hidden characters or messages and watching how some elements come to life after interacting with mobile devices.

The novelty introduced by AR resources and the interaction possibilities —at least in the beginning— might positively impact on the interest and motivation towards reading, as it happens with augmented books (Arellano & Sbriziolo, 2020). Note that the ILEs analysed have achieved a balance between the digital and the non-digital, combining the approach to technological resources and the performance of non-technologically-mediated activities (storytelling, singing, role play…), as well as the exploration and manipulation of the physical support, developing motor skills and games.

Despite the scarce CYAL offer (Ramada, 2018), the analysis of these proposals brings to light other ways to integrate AR into the practices focused on literary education and reading promotion at early ages. The cases examined offer an innovative method which permits to design activities and resources specifically adapted to the source literary text, which could be reproduced in various contexts. Needless to say, it becomes essential to have the technological devices and resources required both for the design of ILEs and for their implementation in the classroom available.

From the teacher training perspective, collaborative ILE production firstly served to familiarise future teachers with the use of digital and AR tools and applications. They additionally learned not only to select resources (marker sheets, Internet videos…) but also to create their own (character animations, online games, AR activators and QR codes) with different applications, incorporating them in an original fashion. Even though AR applications can have a variety of uses, participants mostly chose to utilise them for a fun purpose through associations with games, although they also harnessed them to introduce texts of several types and to carry out online reading and writing activities. Thirdly, our study showed participants some of the opportunities that AR offers for literary education at early ages. It also deserves to be highlighted that they expressed a high degree of satisfaction and assessed the activity quite positively in relation to the usefulness of the learning acquired.

Without a doubt, ILE production has helped the training of future infant education teachers in the knowledge and use of AR resources, allowing them to come closer to its applications for literary education, while simultaneously activating the digital, literary, didactic, creative and socio-collaborative competences which become essential for the teaching practice. One of the lines of research —still in progress— derived from this project, is the study of its impact on the competence training of undergraduates from the degree in Infant Education Teacher Training.

Finally, the enquiry can also be completed through the practical implementation of these ILEs with infant education pupils. That will enable us to check minors' reaction when exploring the

Ocnos, 20(3), 2021. ISSN: 2254-9099
https://doi.org/10.18239/ocnos_2021.20.3.2440

ILE, in addition to ascertaining the extent to which these innovative AR-supported strategies help boost their reading and literary competence.

References

Abas, H., & Zamanb, H. B. (2009, June 24-25). Reading discrepancy and the promise of computer technology [Paper presention]. *International Conference on Computing and Informatics (ICOCI 2009)*. Kuala Lumpur, Malaysia. http://repo.uum.edu.my/13523/

Al-Yaqout, G., & Nikolajeva, M. (2015). Re-conceptualising picturebook theory in the digital age. *Barnelitterært Forskningstidsskrift, 6*(1), 1-7. https://doi.org/10.3402/blft.v6.26971

Arellano, V., & Sbriziolo, C. (2020). Posibilidades de la Realidad Aumentada en obras de ficción dirigidas a prelectores (0-6 años). *Diacrítica, 34*(1), 199-224. https://doi.org/10.21814/diacritica.346

Arroyo-Vázquez, N. (2016). Experiencias de realidad aumentada en bibliotecas: estado de la cuestión. *Textos universitaris de biblioteconomia i documentació,* 36. https://doi.org/10.1344/BiD2016.36.4

Cantero, F. J., & Mendoza, A. (2008). Conceptos básicos en Didáctica de la Lengua y la Literatura. En A. Mendoza (Coord.), *Didáctica de la lengua y la literatura* (pp. 33-78). Pearson Education.

ChanLin, L. J. (2018). Bridging children's reading with an augmented reality story library. *Libri, 68*(3), 219-229. https://doi.org/10.1515/libri-2018-0017

Cawood, S., & Fiala, M. (2008). *Augmented Reality: A practical Guide*. Pragmatic Bookshelf.

Cheng, K. H. (2017). Reading an augmented reality book: An exploration of learners' cognitive load, motivation, and attitudes. *Australasian Journal of Educational Technology, 33*(4), 53-69. https://doi.org/10.14742/ajet.2820

Cieza, E., & Lujan, D. (2018). Educational mobile application of augmented reality based on markers to improve the learning of vowel usage and numbers for children of a kindergarten in Trujillo. *Procedia Computer Science*, 130, 352-358. https://doi.org/10.1016/j.procs.2018.04.051

Colomer, T. (1996). La didáctica de la literatura: temas y líneas de investigación e innovación. In C. Lomas (Coord.), *La educación lingüística y literaria en la enseñanza secundaria* (pp. 123-142). ICE/Horsori.

Colomer, T. (2010). *Introducción a la literatura infantil y juvenil.* Síntesis.

Colomer, T., & Duran, T. (2007). La literatura en la etapa de educación infantil. In M. Bigas, & M. Correig (Eds.), *Didáctica de la lengua en la educación infantil* (pp. 213-249). Síntesis.

Colomer, T., Manresa, M., Ramada, L., & Reyes, L. (2018). *Narrativas literarias en educación infantil y primaria*. Síntesis.

Deaton, B., Herron, J., & Deaton, C. C. (2018). Mobile Technology and Learning. In V. C. Bryan, A. T. Musgrove, & J. R. Powers (Eds.), *Handbook of Research on Human Development in the Digital Age* (pp. 87-108). IGI Global. https://doi.org/10.4018/978-1-5225-2838-8.ch005

Del Moral, M. E. (Dir.) (2018). *Proyecto ITINER-AR: Evaluar competencias en futuros docentes mediante itinerarios aumentados dirigidos al desarrollo de Inteligencias Múltiples.* Universidad de Oviedo. https://gitecna.wixsite.com/proyectoitinerar

Díaz-Plaja, A., & Prats, M. (2016). Conversar sobre los libros. In M. Fons Esteve, & J. Palou Sangrà (Coords.), *Didáctica de la lengua y la literatura en educación infantil* (pp. 65-74). Síntesis.

Dong, C., & Si, Z. (2018). The Research and Application of Augmented Reality in 3D Interactive Books for Children. In P. Zhao, Y. Ouyang, M. Xu, L. Yang, & Y. Ren (Eds.), *Applied Sciences in Graphic*

Communication and Packaging (pp. 293-299). Springer. https://doi.org/10.1007/978-981-10-7629-9_35

Eisenlauer, V. (2020). Digital Literacies in Virtual Reality Learning Contexts. In T. Jung, M. Tom Dieck, & P. Rauschnabel (Eds.), *Augmented Reality and Virtual Reality* (pp. 269-281). Springer. https://doi.org/10.1007/978-3-030-37869-1_22

Fons, M. (2009). *Leer y escribir para vivir. Alfabetización inicial y uso real de la lengua escrita.* Graó.

García-Rodríguez, A., & Gómez-Díaz, A. (2016). Contenidos enriquecidos para niños o las nuevas formas de leer, crear y escuchar historias: una propuesta de clasificación. *Revista Chilena de Literatura,* 94, 173-195. https://doi.org/10.4067/S0718-22952016000300009

Goikoetxea, E., & Martínez, N. (2015). Los beneficios de la lectura compartida de libros: breve revisión. *Educación XXI, 18*(1), 303-324. https://doi.org/10.5944/educxx1.18.1.12334

Gong, Z., Wang, G., & Wu, Q. (2019). Grey Island: Immersive tangible interaction through augmented reality. In *IEEE Fourth International Conference on Data Science in Cyberspace (DSC)*, (pp. 656-661). IEEE Computer Society. https://doi.org/10.1109/DSC.2019.00107

Herpich, F., Nunes, F. B., Petri, G., & Tarouco, L. M. R. (2019). How Mobile Augmented Reality Is Applied in Education? A Systematic Literature Review. *Creative Education, 10*(7), 1589-1627. https://doi.org/10.4236/ce.2019.107115

Kumar, B. A., & Chand, S. S. (2019). Mobile learning adoption: A systematic review. *Education and Information Technologies*, 24, 471–487. https://doi.org/10.1007/s10639-018-9783-6

Leiva J. J., & Moreno, N. M. (2015). Tecnologías de geolocalización y Realidad Aumentada en contextos educativos: experiencias y herramientas didácticas. *Didáctica, Innovación Multimedia (DIM), 11*(31), 1-18.

Lim, C., & Park, T. (2011). Exploring the Educational Use of an Augmented Reality (AR) Book. In *Proceedings of the Annual Convention of the Association for Educational Communications and Technology (AECT)* (pp. 172-182). Hyatt Regency Jacksonville Riverfront. https://bit.ly/30dwOMz

Lluch, G. (2014). Jóvenes y adolescentes hablan de lectura en la red. *Ocnos*, 11, 7-20. https://doi.org/10.18239/ocnos_2014.11.01

Manresa, M. (2009). Lecturas juveniles: el hábito lector dentro y fuera de las aulas. *Textos de didáctica de la lengua y de la literatura,* 51, 44-54.

Manresa, M., & Real, N. (2015). *Digital literature for children: texts, readers and educational practices.* Peter Lang.

Margallo, A. M., & Mata, J. (2015). La lectura: práctica social y formación escolar. Lectura, sociedad y escuela. In J. Mata, P. Núñez, & J. Rienda (Coords.), *Didáctica de la lengua y la literatura* (pp. 179-202). Pirámide.

Mendoza, A. (1999). Función de la literatura infantil y juvenil en la formación de la competencia literaria. In P. Cerrillo, & J. García-Padrino (Coords.), *Literatura infantil y su didáctica* (pp. 11-53). Universidad de Castilla-La Mancha.

Moreno, N., & Onieva, J.L. (2017). Herramientas y propuestas de innovación basadas en la tecnología de realidad aumentada aplicadas a la literatura infantil y juvenil. *Tejuelo,* 25, 217-244. https://doi.org/10.17398/1988-8430.25.217

Mowafi, Y., Abumuhfouz, I., & Redifer, J. (2019). A Play-Based Interactive Learning Approach for Fostering Counting and Numbers Learning Skills for Early Childhood Education Using QR Codes Mobile Technologies. In *International Conference on Mobile Web and Intelligent Information Systems* (pp. 16-26). Springer. https://doi.org/10.1007/978-3-030-27192-3_2

Munita, F. (2017). La didáctica de la literatura: hacia la consolidación del campo. *Educação e Pesquisa, 43*(2), 379-392. https://doi.org/10.1590/s1517-9702201612151751

Neira-Piñeiro, M. R., Del Moral, M. E., & Fombella, I. (2019a). Aprendizaje inmersivo y desarrollo de las inteligencias múltiples en educación infantil. *Magister, 31*(2), 1-8. https://doi.org/10.17811/msg.31.2.2019.1-8

Neira-Piñeiro, M. R., Fombella, I., & Del Moral, M. E. (2019b). Potencialidad didáctico-creativa de un álbum ilustrado enriquecido con recursos digitales y realidad aumentada. *EDMETIC, Revista de Educación Mediática y TIC, 8*(2), 108-128. https://doi.org/10.21071/edmetic.v8i2.11567

Onieva, J. L. (2016). Los libro tráiler y la geolocalización como recursos innovadores para el fomento de la lectura y la difusión de la literatura en las aulas de educación primaria. In *Edunova TIC 2016, Conference Proceedings* (pp. 698-700). REDINE.

Oranç, C., & Küntay, A. C. (2019). Learning from the real and the virtual worlds: Educational use of Augmented Reality in early childhood. *International Journal of Child-Computer Interaction, 21*, 104-111. https://doi.org/10.1016/j.ijcci.2019.06.002

Paladines-Paredes, L V., & Margallo, A. M. (2020). Los canales booktuber como espacio de socialización de prácticas lectoras juveniles. *Ocnos, 19*(1), 55-67. https://doi.org/10.18239/ocnos_2020.19.1.1975

Palomares-Marín, M. C. (2014). La realidad aumentada en la comunicación literaria. El caso de los libros interactivos. *Ensayos, 29*(2), 79#94. http://www.revista.uclm.es/index.php/ensayos

Papadakis, S., Kalogiannakis, M., & Zaranis, N. (2018). Educational apps from the Android Google Play for Greek preschoolers: A systematic review. *Computers & Education*, 116, 139-160. https://doi.org/10.1016/j.compedu.2017.09.007

Pascual-Díez, J. (2004). El desarrollo de actitudes hacia la lectura en educación infantil. In M. S. Santos, & M. P. Soler (Coords.), *Investigaciones sobre el inicio de la lectoescritura en edades tempranas* (pp. 207-224). MEC.

Peña, W. (2009). El estudio de caso como recurso metodológico apropiado a la investigación en ciencias sociales. *Educación y Desarrollo Social, 3*(2), 180-195.

Prado, J. (2004). *Didáctica de la lengua y la literatura para educar en el siglo XXI.* La Muralla.

Prats, M. (2016). Los primeros pasos de la educación literaria. In M. Fons Esteve, & J. Palou Sangrà (Coords.), *Didáctica de la lengua y la literatura en educación infantil* (pp. 53-64). Síntesis.

Puig, M., & Gómez, S. (2016). Realidad Aumentada en las Novelas de Misterio de Arthur Conan Doyle y Agatha Christie. In L. Villalustre, & M.E. Del Moral (Coords.), *Experiencias interactivas con realidad aumentada en las aulas* (pp. 121-133). Octaedro.

Ramada, L. (2018). Infantil, digital, aumentada y virtual: los mil y un apellidos de una realidad literaria. *Diablotexto Digital, 3*, 8-31. https://10.7203/diablotexto.3.13565

Rodari, G. (2002). *Gramática de la fantasía.* Del Bronce.

Suh, A., & Prophet, J. (2018). The state of immersive technology research: A literature analysis. *Computers in Human Behavior, 86*, 77-90. https://doi.org/10.1016/j.chb.2018.04.019

Tabernero-Sala, R. (2016). Los epitextos virtuales en la difusión del libro infantil: Hacia una poética del book-trailer. Un modelo de análisis. *Ocnos, 15*(2), 21-36. https://doi.org/10.18239/ocnos_2016.15.2.1125

Wang, L., Lee, H., & Ju, D.Y. (2019). Impact of digital content on young children's reading interest and concentration for books. *Behaviour & Information Technology, 38*(1), 1-8. https://doi.org/10.1080/0144929X.2018.1502807

Zeng, Y. (2017). Anything New Here in Story Apps? A Reflection on the Storytelling Mechanism across Media. *Libri & Liberi 5*(1), 55-76. https://doi.org/10.21066/carcl.libri.2016-05(01).0003