Gamification narratives and competency assessment in initial teacher training

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Abstract

Gamification is being used both as a learning tool and as a resource to enhance the motivation and involvement of learners, but it can also be used as a means for narrative creation. Thus, a methodological strategy based on the design of gamified storytelling to simultaneously address several competencies is presented. The aim of the present study was to examine the narrative, digital, creative and didactic competencies during the design of a gamified storytelling. Possible gender differences in these competencies were analysed and to what extent digital, creative and didactic competency can predict narrative literacy. An instrument (COMP-NDCDD) was developed to assess the achievement levels of the aforementioned competencies in the 176 university students who participated in the study. The main results reveal that males obtained higher scores in narrative and digital competencies compared to females. However, no significant differences were found in the creative and didactic competencies between both genders. Likewise, it was evident that digital literacy presented a significant weight when predicting the level of achievement of students in terms of narrative literacy.

Keywords: Gamification; narratives; narrative literacy; digital literacy; creative literacy; teaching literacy; Higher Education.

Narraciones gamificadas y evaluación de competencias en la formación inicial del profesorado

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Resumen

La gamificación está siendo utilizada tanto como una herramienta de aprendizaje como un recurso para potenciar la motivación e implicación de los discentes, pero también puede ser utilizada como medio para la creación narrativa. Así, se presenta una estrategia metodológica basada en el diseño de narraciones gamificadas para abordar simultáneamente varias competencias. El objetivo del presente estudio fue examinar las competencias narrativa, digital, creativa y didáctica durante el diseño de una narrativa gamificada. Se analizaron las posibles diferencias de género en estas competencias y en qué medida la competencia digital, creativa y didáctica pueden predecir la competencia narrativa. Se diseñó un instrumento (COMP-NDCDD) que permite evaluar los niveles de logro de las mencionadas competencias en los 176 estudiantes universitarios que participaron en el estudio. Los principales resultados revelan que los hombres obtuvieron puntuaciones más altas en las competencias narrativa y digital en comparación con las mujeres. Sin embargo, no se encontraron diferencias significativas en las competencias creativa y didáctica entre ambos géneros. De igual modo, se evidenció cómo la competencia digital presentó un peso destacado a la hora de predecir el nivel de logro de los estudiantes en cuanto a la competencia narrativa.

Palabras clave: Gamificación; narraciones; competencia narrativa; competencia digital; competencia creativa; competencia didáctica; Educación Superior.

INTRODUCTION

The current needs of 21st century classrooms require the use of technology, which has become an additional resource for teachers. The use of digital resources and innovative teaching strategies has long been recognised as necessary to prepare the current generation of student teachers for the future. The integration of gamified storytelling is one of the tools that can be used to promote and enhance learning. In this sense, for Zichermann (2012), gamification is based on the use of video game elements in other non-game contexts to make an activity, product or service more fun, attractive and motivating. For their part, Roldan et al. (2022) add that the use of game designs and techniques in formal contexts allows the development of different kinds of skills and competences.

In education, gamification is used both as a learning tool and as a resource to increase learner motivation and engagement. Some authors (Surendeleg et al., 2014; Dicheva et al., 2015) state that the integration of gamification in education is presented from three approaches:

- the design of a gamified structure;

- the modification or adaptation of an existing one;

- the evaluation and analysis of gamified proposals.

This paper focuses on the design of a gamified proposal by university students and its subsequent evaluation in order to distinguish different levels of achievement in the development of the competences involved in its design, specifically narrative, digital, creative and didactic competences. In this context, most of the studies conducted focus on the impact of gamification on learning. For example, Amin and Wahyudin (2022) analysed the effect of the video game *Age of Empires II* on reading comprehension and concluded that there was a significant increase after using the video game. While Kirginas (2022) compared students' discourse skills while playing digital games or watching a film, he found better results with the former, especially in terms of cohesion and coherence of discourse.

Narrative creation through the use of digital technologies expands the notion of text by incorporating diverse linguistic codes, both visual, sonic and iconic, and generates stories that increase their potential for transmission and reception. For example, there are many studies that analyse the ability of technology to improve the processes of writing and reading. Fauzi et al. (2021) conducted a study to improve the narrative skills of primary school teacher training students through the use of short films, and found a significant increase in writing skills. Azmi-Zakaria and Abdul-Aziz (2019) developed an experiment to improve learners' narrative writing by integrating digital storytelling. The results showed a significant improvement, with participants stating that the integration of technological media motivated them to write and improve their writing. Undoubtedly, education is a sphere where technologies are growing exponentially by integrating digital elements into the teaching-learning process.

The design of gamified storytelling can be addressed in the classroom through methodological strategies that allow students to develop their creative skills. In this line, storytelling can contribute to the development of these skills by strengthening imagination to create original and disruptive stories. For example, Syarifah and Emiliasari (2019) analysed the creative skills developed by students writing narrative texts through project-based learning and concluded that this methodology helps to increase understanding of the subject matter, knowledge of the narrative genre, and creative skills. From the experience of using a digital game, Lee (2019) found an increase in students' creativity and creative writing.

However, this study defines and presents a methodological strategy, based on the design of gamified storytelling, to simultaneously address several competences, specifically narrative, digital, creative and didactic, and to carry out a process of evaluation of the levels of achievement of university students in relation to these competences. Similarly, the aim is to highlight the differences between the different levels of competence depending on the genre and to identify how narrative literacy is influenced and can be

predicted by the digital, creative and didactic competences brought into play in the creation of gamified storytelling.

## GAMIFIED STORYTELLING: NEW ECOSYSTEMS IN INITIAL TEACHER EDUCATION

Narrative literacy involves the comprehension and production of narratives using one's own cognitive strategies, which are related to specific cognitive processes. These are meaning-making oriented, reinforcing the value of narrative as a fundamental tool for adequate literacy, audio-visual or media literacy focused on communication (Spencer & Peterson, 2020). From this perspective, new narrative formats emerge, associated with audio-visual literacy, where interactivity takes precedence and the reader becomes the main character or author of the narrative discourse in different formats.

New narrative formats have intertextuality with other stories. In them, reading, decoding and relating the knowledge covered to other knowledge is challenging and becomes an activity very similar to traditional reading (Reyes & Avello, 2021). In this regard, several studies (Del-Moral et al., 2018; Harahap et al., 2019; Handayani et al., 2020; Aditiya, 2022, among others) find that designing a digital narrative not only enhances media literacy, but also promotes student engagement and motivation. Pegalajar-Palomino (2021) considers that the gamification of a story involves a challenge in which numerous skills are put into play, and in particular the acquisition of competences, through a narrative that enriches the learning experience, the existence of immediate feedback and the presence of incentives through challenges and tasks.

In this context, the university students who formed part of the study sample had to develop a narrative to promote values among minors (tolerance, equality, loyalty, etc.), in which they progressed in the game by passing a series of tests. Thus, a design model was established, taking into account the contributions of Lim and Noor (2019) and Orellana-García et al. (2022), which revolve around the structural elements of both the narrative and the gamified process, as shown in figure 1.

Figure 1

Design model for gamified storytelling
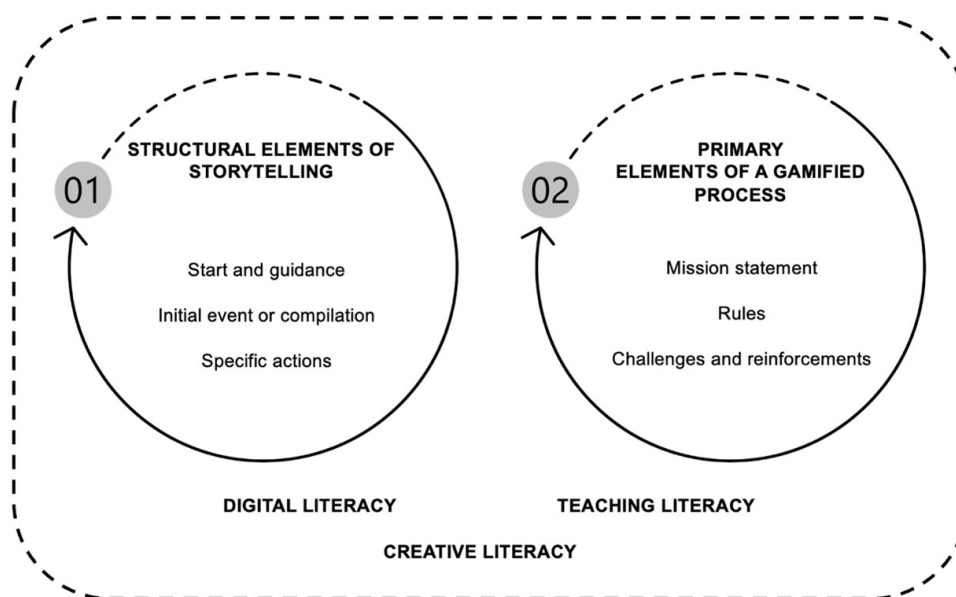
There are two main elements to the design of gamified storytelling.

On the one hand, the basic structural elements that contribute to the coherence of the narrative. In them, the following is taken into account:

- the beginning and the orientation, which provide the context and the presentation of the characters, and which are intended to give the plot the event, the orderly sequence of action and the clear identification of the characters and their relationships;

- the initial event or complication, which refers to the situation that triggers the story and produces a definition of the problem that generates the action;

- the specific actions to be taken to achieve the objective, setting out the *raison d'être* of the story and the solution to the problem posed.

On the other hand, the main elements of the gamified process, which include:

- the mission of the gamified activity, i.e., the purpose of the game, and the rules that must be followed to participate are defined;

- the presentation of the challenges and the reinforcement system, which defines the different levels that must be overcome in order to progress in the game-based narrative, as well as the rewards that can be obtained by reaching certain statuses.

In short, this study presents a methodological strategy based on the design of gamified storytelling to simultaneously address several competences, specifically narrative, digital, creative and didactic, while seeking to highlight the differences between the different levels of competences depending on the genre, and to identify how narrative literacy is influenced and can be predetermined by the digital, creative and didactic competences brought into play in the creation of these narratives.

METHOD

Participants

A total of 176 university students from the Bachelor of Early Childhood Education and the Bachelor of Primary Education participated in the study, of whom 94 were female (53.5%) and 82 were male (46.5%). In terms of age, 83.9% were between 18 and 20 years old, 12.3% were between 21 and 25 years old and the remaining 3.8% were over 26 years old. The selection of the sample followed a purposive procedure according to the criteria of convenience and accessibility (Etikan et al., 2016).

Instrument

The Narrative, Digital, Creative and Didactic Competences (COMP-NDCDD) instrument, designed by *ad-doc* based on the contributions of Torrance (1990), Røkenes and Krumsvik (2014) and Orellana et al. (2022), aims at measuring the level of achievement of competences developed by university students based on the design of gamified storytelling. It consists of 16 items grouped into four dimensions, with four indicators in each dimension:

1) Narrative Literacy (CN):

- space and narrative coherence;

- characters;

- time and plot;

- narrative structure.

2) Digital Literacy (CD):

- integration of audiovisual elements;

- creation of augmented reality resources;

- editing and layout;

- digital information management.

3) Creative Literacy (CC):

- fluency;

- originality;

- flexibility;

- creation.

4) Teaching Literacy (CDD):

- planning;

- components;

- methodology;

- evaluation.

Each indicator is measured on a Likert-type scale with five options from 1 to 5 (where 1 is very low and 5 is very high) to determine the level of student performance on each indicator.

As for the psychometric properties of the questionnaire, the corrected item-total correlation (ri-t) was positive for all items with values between .329 and .673, indicating that they all contributed to the measurement of the general construct measured by the instrument and in the same direction. In addition, Cronbach's alpha was high (.804). The Kaiser-Meyer-Olkin measure of sampling adequacy was .765 and Barlett's test of sphericity was significant (p = .001) with a chi-square value of 282.876 with 6 degrees of freedom.

Procedure

The study was conducted in two phases as part of the Information and Communication Technologies subject in the Bachelor's Degree in Early Childhood Education and the Bachelor's Degree in Primary Education.

First, interactive and gamified storytelling were designed. The participating students created a story to promote the chosen value and established a structure within the story to introduce the game mechanics (mission, rules, challenges, etc.). The narrative itself and the characters within it presented the different challenges throughout the story in the form of digital games, through the inclusion of QR codes or augmented reality elements that the reader had to scan with a mobile device. Playing these games correctly meant scoring points that allowed the reader to continue reading the story. The stories could also be presented in print or digitally in video format using the stop-motion technique. In both cases, the player

who completed all the challenges in the gamified storytelling was rewarded with the opportunity to choose the end of the story from two possible outcomes that had to be considered within the narrative structure devised by the students. Finally, at the beginning of each gamified storytelling, the students had to present some basic development guidelines, as well as the rules that readers had to commit to before starting to read.

Figure 2

"Una noche en el circo", a gamified storytelling developed by university students and aimed at pre-school children.

In the example shown in figure 2, the students created a stop-motion video narrative about a boy who was afraid of everything but wanted to be braver. One night, in a dream, he plunges into a circus where a variety of characters present him with numerous challenges to help him overcome his fear. In this case, it is a lion that, through a QR code, presents a challenge to be solved in order to earn points and progress in the gamified storytelling.

Together with the gamified storytelling, the students had to create a guide detailing its didactic integration in the kindergarten or primary school classroom. They had to specify the objectives to be developed, the content to be covered, the methodology to be used, the specific activities to be carried out and the evaluation to be conducted.

The next phase of the study focused on the evaluation of the gamified storytelling designed by the students. Thus, data collection was carried out by subject teachers using a tool that allowed for the aggregation of the gamified storytelling's ratings in order to determine the students' level of achievement in relation to four basic competences: narrative, digital, creative and didactic.

Data analysis

The data was digitally collected, sorted and analysed. First, a descriptive analysis was carried out, analysing the correlation matrix and the distribution of the variables. A univariate analysis of variance (ANOVA) was then conducted to determine the differences between students according to gender in the four skills analysed (narrative, digital, creative and didactic).

Finally, a linear regression analysis was carried out to determine how narrative literacy is influenced and can be predicted by the didactic, digital and creative literacy involved in the creation of gamified storytelling.

The data obtained were analysed using SPSS v.27, with a p-value < .05 and a reliability level of 95% as the reference for significance. Effect sizes were assessed by partial eta squared, taking into account that the effect size is small when $\eta p2 = 0.01$, medium when $\eta p2 = 0.059$, and large when $\eta p2 = 0.080$ (Cohen, 1988).

RESULTS

Firstly, the percentages for the attainment levels of university students were analysed (table 1). The average score is at the intermediate level. However, the best results were achieved in the area of narrative literacy, where 18.9% and 16% of students achieved high and very high levels, respectively.

Table 1

Percentage distribution of study variables, mean and standard deviation.

	Levels of achievement						
	1	2	3	4	5	M	DT
CN	7.5	19.8	37.7	18.9	16.0	3.16	1.148
CD	6.6	28.3	35.8	17.0	12.3	3.00	1.104
CC	6.6	23.6	39.6	18.9	11.3	3.05	1.072
CDD	7.5	25.5	36.8	13.2	17.0	3.07	1.173

Note. CN = Narrative Literacy. CD = Digital Literacy. CC = Creative Literacy. CCD = Teaching Literacy.

A preliminary analysis of the correlation matrix and the distribution of the variables was also conducted (table 2). According to the skewness and kurtosis values, the study variables are within the limits indicating a normal distribution (between -2 and +2; George and Mallery, 2010). The correlation matrix shows that the four competences analysed (narrative, digital, creative and didactic) are positively and significantly correlated.

Table 2

Pearson correlation and skewness and kurtosis values.

	CN	CD	CC	CDD
CN				
CD	.556**			
CC	.535**	.563**		
CDD	.544**	.515**	.671**	
Skewness	.026	.260	.141	.230
Kurtosis	-.663	-.591	-.465	-.730

Note. **Correlation is significant at .01 level.

CN = Narrative Literacy. CD = Digital Literacy. CC = Creative Literacy. CCD = Teaching Literacy.

Univariate analysis of variance (ANOVA) was carried out for each of the skills in order to identify differences in the development of the skills analysed by gender. Results showed that differences between males and females were statistically significant for narrative literacy, $F(1,104) = 7.360$, $p = .008$, $\eta p2 = 0.066$; and for digital literacy, $F(1,104) = 4.673$, $p = .033$, $\eta p2 = 0.043$; with medium effect sizes.

The results showed that males reported higher levels of achievement in narrative literacy (females M = 2.90, SD = 1.078; males M = 3.49, SD = 1.159) and digital literacy (females M = 2.80, SD = 1.078; males M = 3.26, SD = 1.093).

On the other hand, and according to the study objectives, we analysed how narrative literacy can be influenced and predicted by teaching, digital and creative literacy in the creation of gamified storytelling. A linear regression analysis was conducted for this purpose. First, the Durbin-Watson statistic was examined, which yielded a value of 1.931, verifying the independence of the errors. Also in terms of collinearity, tolerance indicators were above 0.10 in all cases, while VIF values were below 10 in all cases, confirming the assumption of non-collinearity (table 3).

Table 3

Collinearity statistics

Model	Collinearity statistics	
	Tolerance	VIF
CD	.649	1.541
CC	.485	2.061
CDD	.522	1.915

Note. CD = Digital Literacy. CC = Creative Literacy. CCD = Teaching Literacy.

The results of the regression model, through t-tests and their significance levels, identify the significant variables that contribute to explaining the dependent variable (table 4). In this case, they showed that didactic and digital literacy are variables that contribute to explaining narrative literacy, and in a positive way. The standardised coefficients show which variables are more important, in this case digital literacy. On the other hand, Creative literacy seems not to play any essential role at all. Therefore, those students who develop more teaching and digital literacy in the creation of gamified storytelling are more likely to put narrative literacy into practice.

Table 4

Linear regression model for predicting narrative literacy in the design of gamified storytelling.

Model		Non-standardised coefficients		Standardised coefficients		
		B	Standard Error	Beta	t	Next
1	Constant	.795	.292		2.1717	.008
	CD	.334	.098	.322	3.426	.001
	CC	.196	.116	.183	1.683	.095
	CDD	.250	.102	.255	2.439	.016

Note. CD = Digital Literacy. CC = Creative Literacy. CCD = Teaching Literacy.

The regression model was statistically significant (F(3, 102) = 24.203, p = .001) and predicted 41.6% of the variance in the dependent variable (table 5). In this respect, and with regard to R-squared, Anderson et al. (2001) suggest that in the case of social sciences, R2 values above 0.25 would be considered useful. Our model can therefore be considered adequate, yielding a value of 0.416.

Table 5

ANOVA significance model

Model		Squared sum	lf	Root mean square	F	Next
1	Regression	57.500	3	19.167	24.203	.001
	Residue	80.774	102	.792		
	Total	138.274	105			

All in all, the linear regression model is based on the following equation:

$$NCN = .795 + (.250 * NCDD) + (.334 * NCD)^1$$

DISCUSSION AND CONCLUSIONS

The use of gamified storytelling in this study allowed for the development of different competencies in university students, including digital, creative, didactic and narrative literacy. To improve digital literacy, the students created a technological space that supported the game-based activity, using multimedia elements such as animations, sounds and videos. They also designed tests using digital tools such as augmented reality. Creative literacy was developed by creating different scenarios and implementing effective game mechanics that engaged the reader and increased their motivation to interact with the story. Teaching literacy was also improved by planning and organising the teaching-learning process on the basis of the designed activity. Finally, narrative literacy was developed through the creation of complex stories and compelling characters capable of structuring the narrative in a coherent way.

The aim of this study was to investigate the narrative, digital, creative and didactic literacy involved in the design of gamified storytelling. Possible gender differences in these literacies and the extent to which digital, creative and didactic literacy can predict narrative literacy were explored. For example, the results of the study showed that men scored higher than women in narrative and digital literacy. However, no significant differences were found between the two genders in terms of creative and teaching literacy.

There are many variables that can influence the development of these literacies, including cultural, educational, social, etc. factors. However, some studies have found differences in levels of digital and narrative literacy between men and women. For example, the study by Prieto and San-Martín (2002) showed that women had a greater communicative and expressive capacity than men in direct discourse. In the same vein, the studies by Brozo et al. (2014) and Artola-González et al. (2017) show that women's attitudes towards narrative literacy are more favourable. In contrast, in terms of digital literacy, the study by Pérez-Escoda et al. (2021) found that men were more digitally literate than women. For example, Fernández-Sánchez and Silva-Quiroz (2022) identify critical areas in initial teacher education where gender can have an impact. From this point of view, it is necessary to develop training actions with a gender approach that allow for non-stereotyped professional development of teachers.

Finally, the ability of the analysed competences to predict narrative literacy was also analysed. Creative literacy was found to have no significant impact on the prediction of narrative literacy. The link between creative literacy and narrative has been widely explored. Some studies (Cahyani & Nurjanah, 2019; among others) suggest that creative competence can influence storytelling, as creativity is a key component in generating new ideas and creating an original and engaging narrative. However, in this

study, this competence did not have any impact on the development of the gamified storytelling, which invites reflection on the role of the students' creative skills in the creation of the narrative in the study.

On the other hand, digital literacy was found to have a significant weight in predicting students' achievement levels in narrative literacy. For example, some studies (Amin & Wahyudin, 2022; Kirginas, 2022; among others) suggest that digital literacy can positively influence narrative literacy, as digital technologies such as augmented reality provide new tools for creating interactive and multimedia storytelling. In addition, digital literacy can improve the way narratives are presented, which can increase learners' motivation and involvement in their creation, using visual and sound effects that can make the narrative more memorable and increase its impact and effectiveness.

In short, gamified storytelling can be an effective tool for developing digital, didactic, narrative and creative literacy. However, it should be noted that this study focused on university students, so it is not known whether the results can be extrapolated to other levels of education. It is also possible that the sample size may have influenced the results and larger samples would need to be considered to confirm the conclusions drawn. However, based on the results obtained, gamified storytelling can be a powerful tool for learning and skill development, but their potential and limitations need to be further explored to determine their impact on teaching-learning processes.

NOTES

[1.] NCN = Narrative Literacy Level NCDD= Teaching Literacy Level (ranging from 1= very low; 2= low; 3= medium; 4= high and 5= very high). NCD= Digital Literacy Level (ranging from 1= very low; 2= low; 3= medium; 4= high and 5= very high).

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