Teaching Skills Involved in the Design of Immersive Digital Games from Literary Texts and Animated Films

Habilidades docentes implicadas en el diseño de Juegos Digitales Inmersivos a partir de textos literarios y películas de animación

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Abstract

The creation of Immersive Digital Educational Games (IDEG) with augmented reality, based on literary texts or animation films, involves integrating narratives with mechanics, dynamics, and aesthetics to engage students. This research aims to: 1) assess skills in collaboratively designing IDEG for early childhood education; 2) determine if narrative type affects skill development in IDEG; 3) analyze interaction effects among design skills. Implemented in the Early Childhood Education Teacher Degree (N=203) using the Gamifying Digital Storytelling with Augmented Reality model, the study used the TEaching Skills for GAmification scale to measure didactic, digital, creative, socio-collaborative, and gamification skills. Results show high levels in gamification, didactic, digital, socio-collaborative, and creative skills, with strong correlations among them. This confirms the potential of collaborative game design for teacher training.

Keywords: Hard skills, soft skills, digital game, augmented reality, teacher training.

Resumen

La creación de Juegos Digitales Educativos Inmersivos (JDEI) con Realidad Aumentada sustentada en textos literarios o películas animadas conlleva la apropiación de esas narrativas y la integración de mecánicas, dinámicas y estéticas lúdicas para propiciar el *engagement* del alumnado. Los objetivos de esta investigación son: 1) evaluar las habilidades implicadas en el diseño colaborativo de JDEI dirigidos al alumnado de Educación Infantil; 2) comparar la existencia de diferencias significativas respecto a las habilidades plasmadas en los JDEI elaborados, atendiendo al tipo de narrativa adaptada; 3) analizar el efecto de mediación o interacción entre las habilidades implicadas en su diseño. La innovación se implementó en el Grado de Maestro en Educación Infantil (N=203), siguiendo el modelo *Gamifying Digital Storytelling with Augmented Reality*, y se utilizó la escala *TEaching Skills for GAmification* para evaluar el nivel de habilidades didácticas, digitales, creativas, socio-colaborativas y gamificadoras reflejado en los juegos

diseñados. Los resultados revelan un nivel alto en las habilidades gamificadoras, así como en las *hard skills* -habilidades didácticas y digitales- y *soft skills* -socio-colaborativas y creativas-. También se evidencia una alta correlación entre las habilidades implicadas, constatando el potencial del diseño colaborativo de estos juegos para la formación de los futuros maestros.
Palabras clave: habilidades duras, habilidades blandas, juego digital, realidad aumentada, formación del profesorado.

1. Introduction

In a context infused with technologies, teacher training should prioritize the use and design of technological resources, providing didactic-methodological guidelines to develop innovative learning proposals. To this end, Røkenes and Krumsvik (2014) distinguish four levels: the adoption of ICT, their adaptation, their appropriation in teaching practice, and innovation. Similarly, Del Moral et al. (2023) indicate that teacher training should jointly develop the following competencies: didactic, to facilitate learning; digital, to understand, use, and innovate with new tools; socio-collaborative, to promote the design of collaborative projects beyond the classroom context; and creative, to foster initiative, originality, creativity, etc., in adopting innovative methodologies.

In this regard, the technique of digital-resource-based gamification is becoming consolidated as an innovative practice in various levels of education and subject areas (Fernández-Arias et al., 2020). Most studies have concluded that gamified practices promote student engagement in resolving tasks presented as fun (Aljraiwi, 2019; Nand et al., 2019) as well as increasing motivation (Liu et al., 2023; Mee et al., 2021). Along these lines, Semartiana et al. (2022) reported positive results with gamified experiences in early childhood education, while García-Hernández et al. (2021), Janković et al. (2023), and Kaplan et al. (2021) examined interventions with *Kahoot*, *Quizz* and *ClassDojo* in primary education. Faure et al. (2022) presented gamified proposals in secondary education which had positive impacts on learning achievement and task engagement.

It is observed that teachers' initial training is incorporating methodological guidelines focused on gamification in early childhood education (Lamrani & Abdelwahed, 2020) to encourage student attention and engagement during tasks, providing motivating, instant feedback to consolidate learning. Riska et al. (2021) emphasized the need to systematize tasks with different difficulty levels to involve students in collaborative tasks that reinforce healthy habits. Fadhli et al. (2020) reported some effective gamification strategies implemented in early ages to strengthen cognitive, attitudinal, linguistic, and socio-emotional abilities, influencing game mechanics and dynamics. There are various techniques, but no systematic models that guide the design of these didactic gamified proposals or formulas for evaluating them that can be extrapolated to other contexts, as all of them apply to specific scenarios (Marcillo et al., 2023).

Although there are studies that use gamified platforms and/or apps, few analyze the opportunities offered by the design of immersive digital educational games in teacher training. This innovative approach—aimed at teacher qualification—can be addressed by transforming literary texts and/or film narratives into games, adapting plots, characters, and settings, integrating activities linked to curricular content, and turning them into playful missions. It also involves incorporating rewards, prizes, and feedback that

emotionally engage students in solving the challenges presented. This design poses a challenge for future teachers, as they must demonstrate competence in various areas. On the one hand, they need to recreate or adapt the story by cohesively integrating characters and plot, creatively linking the story's ending to specific educational objectives. On the other hand, they must be able to use digital resources to enhance the narrative flow, encourage interaction with characters and settings, and promote immersion in the story.

Undoubtedly, creating a game based on literary texts or animated films for a young audience with an educational purpose constitutes an attractive didactic resource. It is important to consider that children's literary and audiovisual culture is built upon a shared imaginary, which can be leveraged to add a motivational component to these narratives by involving them in resolving the story's conflicts. Characters and plots can become key elements in structuring playful activities and educational games (Valenza et al., 2019). Thus, one of the main challenges this creative process presents for future teachers lies in demonstrating their ability to design a transmedia product that results from the convergence of different languages, media, and technologies (Betzler & Leuschen, 2021).

This leads to the need to propose a didactic model for teacher training that establishes criteria to ensure student engagement with tasks that are converted into games. In other words, to identify beforehand the educational objectives to be achieved and to use a narrative that underpins the different tasks. This study presents the *Gamifying Digital Storytelling with Augmented Reality (G-DST+AR)* model for future early childhood education teachers, aimed at the collaborative creation of digital games supported by augmented reality (AR) in order to give these future teachers the essential skills for teaching in the digital age, as laid out in the *Horizon Report, Teaching and Learning Edition* (Pelletier et al., 2023).

2. Gamifying Digital Storytelling with Augmented Reality (G-DST+AR) Model

The model adopted in teacher training is based on the design of gamified didactic units that make the most of the educational potential of literary texts or animated children's films, transforming them into games within a digital platform. More specifically, it deals with adopting videogame aesthetics and dynamics to promote adaptation and translation of original stories to virtual settings, allowing users to interact with characters and settings, making them the protagonists of the events and involving them in resolving the challenges they are presented with.

The versatility of virtual environments gives subjects an active role, facilitating both interaction with different elements as well as advancing the story and getting involved in the plot by facing the same challenges as the characters and resolving their conflicts (Dewi et al., 2022). In addition, user engagement will be key in achieving game objectives. To that end, the interactivity of the digital resources and AR are a huge help, as they promote immersion in the story and activate emotional involvement by the user taking on the role of a supporting character and/or co-star on whom the story depends (Zuo et al., 2022). The model involves systematizing tasks considering various phases for transforming original stories—whether texts or animated films—into digital games (Figure 1).

Figure 1.
Phases of the G-DST+AR model.
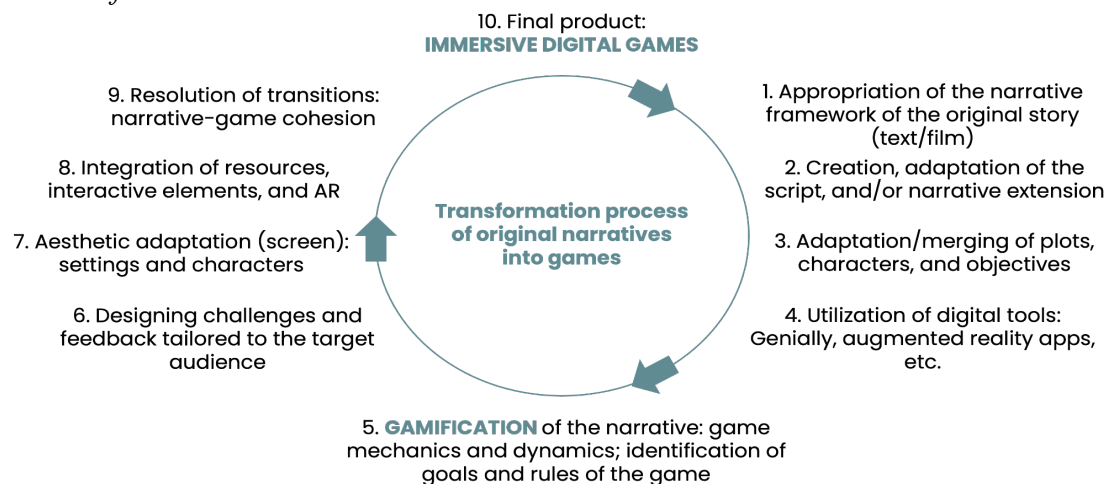
Source: authors' own work.

There is no doubt that the process of designing educationally useful immersive digital games involves the activation of various skills. This is why it is an opportunity for teachers. The process brings together hard—or technical—skills (didactic and digital) needed to create these digital resources that have didactic value, along with soft skills, linked to communication, collaboration, leadership ability, and the development of creativity that are intrinsic to the collaborative design task (Betti et al., 2022; Oliveira & de Souza, 2022).

The particular teaching skills needed to transform original stories—from other formats—into games, i.e., gamifying or gamification skills (Torres et al., 2018), involve having additional skills. These include hard skills, particularly digital skills, in this case associated with mastering applications and AR to create one's own digital resources and incorporate them into a virtual environment. They also include didactic skills, linked to transforming gamified narratives into educational resources to encourage diverse learning Díaz-Mohedo & Vicente, 2014; Perrenaud, 2004). The necessary soft skills include socio-collaborative skills, inherent to designing games in a group (Forslund & Hammar, 2011), and creative skills, related to the originality needed to convert stories to games (Edwards et al., 2015) that can invite students to immerse themselves in stories that promote engagement with the various tasks.

Figure 2.
Teaching skills involved in designing immersive digital games.
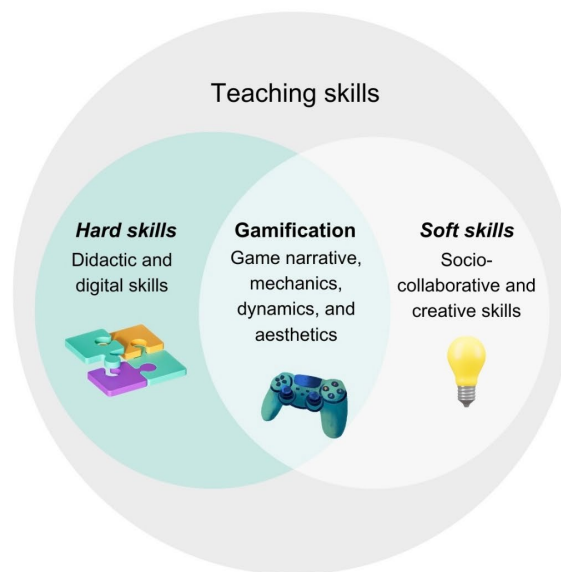
Source: authors' own work.

Adopting the *Gamifying Digital Storytelling with Augmented Reality (G-DST+AR)* model allows this creative process to be systematized and extrapolated to the various educational settings where it is implemented. In the present study, bearing in mind that it deals with an educational practice that has a notable impact on the development of hard and soft skills, the aim was to determine which are activated to a greater extent. Hence, we evaluated the skills of future teachers as manifested through using the model in the collaborative design of immersive educational games from various different stories.

3. Methodology

This study was part of the *NAGARA* research Project: *Design of Gamified Augmented Stories in Initial Teacher Training* [*Diseño de Narraciones Gamificadas Aumentadas en la formación inicial de docents*] (PINN-13-67-33), funded by the University of Oviedo. It was an empirical, descriptive, correlational, explanatory study which was exploratory and analytical, as defined by Newby (2010). The objectives were: 1) to evaluate the skills involved in the collaborative creation of immersive digital games, through adapting original stories such as literary texts and children's animated films; 2) to determine whether there were significant differences in terms of the skills displayed in the digital games produced, considering the type of story adapted; and 3) analyze the effect of mediation or interaction between the different skills involved in the design. To do that we designed and validated an instrument made up of indicators associated with the didactic, digital, creative, socio-collaborative, and gamification skills involved in producing the games.

3.1. Context and sample

The study involved the Early Childhood Education Degree at the University of Oviedo (Spain). The sampling was intentional and non-probabilistic, based on the voluntary

participation of 203 students taking the third-year subject Teaching Infants' Literature (52.2%), and the fourth-year subject Child Development, Communication, and Education (47.8%). The vast majority (85.7%) were women, with only 14.3% men, demonstrating the notable gender bias in this degree.

Adult university students voluntarily decided to participate in the research, giving their consent after being informed about the tasks to be carried out. The processing, communication, and transfer of data are regulated in accordance with Regulation (EU) 2016/679 of the European Parliament and of the Council of April 27, 2016, on the protection of natural persons with regard to the processing of personal data and the free movement of such data (GDPR), as well as Organic Law 3/2018 of December 5 on the Protection of Personal Data and the Guarantee of Digital Rights (LOPDGDD). The research team retains custody of the anonymized data to ensure its confidentiality.

3.2. Procedure

All of the students participated in training workshops that gave them an understanding of digital and AR tools, and taught them to gamify stories following the *Gamifying Digital Storytelling with Augmented Reality (G-DST+AR)* model. This model incorporates some of the guidelines for designing serious games established by Rodríguez and Molpereces (2014) and Evans et al. (2016). In addition, in order to address the specific content for each subject, we decided to start from different original stories, and so created two groups for implementing this innovative methodology for strengthening their teaching kills. The students taking Teaching Infants' Literature gamified classic literary texts (Group A), those taking Child Development, Communication, and Education started with children's animations (Group B), which allowed us to subsequently examine the differences between the two groups and infer the advantages and disadvantages of gamifying the two types of story. Figure 3 summarizes the phases of the study.

Figure 3.
Study phases.
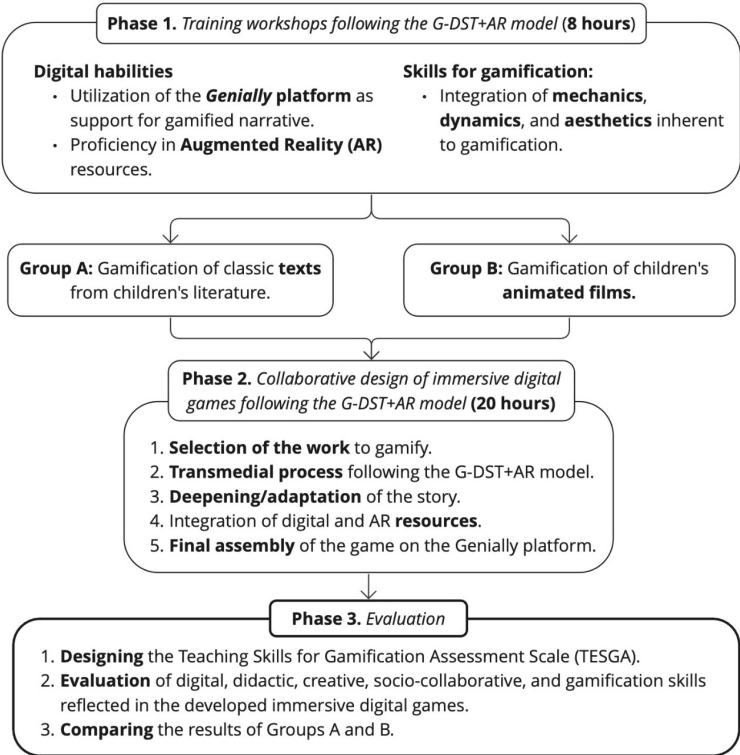
Source: authors' own work.

3.3. Instrument

We designed the *TEaching Skills for GAmification (TESGA)* scale to evaluate students' skills as demonstrated by their immersive digital games, adapting the version from AUHTORS (2023), and referring to previous studies (Díaz-Mohedo & Vicente, 2014; Edwards et al., 2015; Forslund & Hammar, 2011; Perrenaud, 2004; Tondeur et al., 2017). The scale has 32 indicators (see Table 1): 8 related to *didactic* skills, 5 to *digital* skills, 5 to *creative* skills, 6 to *socio-collaborative* skills, and another 8 related to specific skills linked to *gamification*. All of the indicators were measured on a Likert-type scale (1=very low, 2=low, 3=moderate, 4=high, 5=very high), supported by an analytical rubric (See in the Annex).

Table 1.
Assessment scale for measuring abilities shown through the products created by the student teachers.

Variables	Categories (1=very low, 2=low, 3=moderate, 4=high, 5=very high)
Digital skills associated with creating resources, adapted from Tondeur et al. (2017)	- Selection of appropriate digital and AR applications - Integration of varied AR resources - Interactivity presented - Functionality of hyperlinks and activators - Variety of own digital resources
Didactic skills inferred from Díaz-Mohedo & Vicente (2014) & Perrenaud (2004)	- Explicit reference to curriculum - Suitability of time planning - Level of interdisciplinarity - Story cohesion - Cohesion of story-activities - Identification of educational goals - Suitability of resources incorporated - Validity of assessment formula
Creative skills according to Edwards et al. (2015)	- Flexible resource use - Exploration of the different functionality of resources - Creation of original resources - Harmonious incorporation of resources - Aesthetic quality
Socio-collaborative skills, adapted from Forslund & Hammar (2011)	- Level of intercommuniction - Participation and contribution of ideas - Involvement in the project - Roles taken on - Importance of contributions - Seeking solutions for problems that arise
Gamification skills, based on Torres et al. (2018)	- Emotional immersion - Appealing storyline - Interrelated characters, plot and goals - Design of original aesthetic elements - Challenges that produce engagement - Challenges with different levels of difficulty - Assigning suitable rewards - Game progress is displayed

Source: authors' own work.

The scale was validated via exploratory factorial analysis. Bartlett's sphericity test was significant ($p < 0.000$) and the Kaiser-Meyer Olkin (KMO) test of suitability gave a high value (KMO=0.915). We chose to use the unweighted least squares (ULS) method and with Oblimin rotation for the factors produced, as suggested by Lloret et al. (2014), because despite being variables with sufficient response categories, the distribution was not normalized (Kolmogorov-Smirnov test <0.000). 80.98% of the variance was explained by 5 of the 32 items (Figure 4).

Figure 4.
Scree plot.
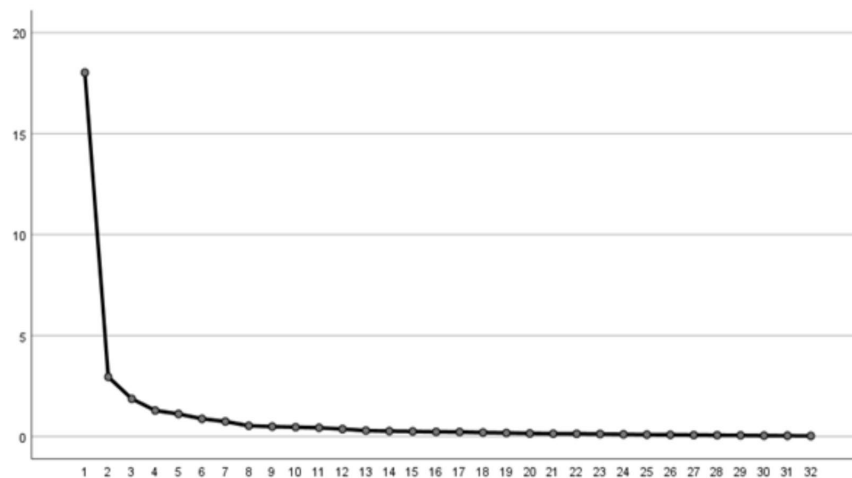
Source: authors' own work.

Looking at the communalities of extraction, most items explained at least approximately 50% of the variability in each variable, and the communalities in 27 of the 32 items were > 0.700. The variables were grouped in four factors: factor 1 referred to creative abilities, factor 2 to socio-collaborative skills, factor 3 to items defining didactic skills, and factor 4 to items linked to digital and gamifying skills (Table 2).

Table 2.
Grouping of components.

	1	2	3	4	Commonalities
1.1 Selection of appropriate digital and AR applications				.645	.846
1.2. Integration of varied AR resources				.518	.831
1.3. Interactivity presented				.578	.744
1.4. Functionality of hyperlinks and activators				.533	.779
1.5. Variety of own digital resources				.443	.782
2.1. Explicit reference to curriculum			.832		.750
2.2. Suitability of time planning			.796		.705
2.3. Level of interdisciplinarity			.836		.702
2.4. Story cohesion			.851		.734
2.5. Cohesion of story-activities			.732		.642
2.6. Identification of educational goals			.720		.650
2.7. Suitability of resources incorporated			.786		.700
2.8. Validity of assessment formula			.653		.583
3.1. Emotional immersion		.777			.804
3.2. Appealing storyline		.797			.791
3.3. Interrelated characters, plot and goals		.809			.773
3.4. Design of original aesthetic elements		.756			.797
3.5. Challenges that produce engagement		.850			.779
3.6. Challenges with different levels of difficulty		.699			.545
3.7. Assigning suitable rewards		.689			.519
3.8. Game progress is displayed		.763			.701
4.1. Flexible resource use	.760				.757
4.2. Exploration of the different functionality of resources	.748				.772
4.3. Creation of original resources	.815				.707
4.4. Harmonious incorporation of resources	.856				.859

4.5. Aesthetic quality	.886	.819
5.1. Level of intercommuniction	.884	.798
5.2. Participation and contribution of ideas	.936	.894
5.3. Involvement in the project	.913	.855
5.4. Roles taken on	.843	.735
5.5. Importance of contributions	.934	.886
5.6. Seeking solutions for problems that arise	.897	.822

Source: authors' own work.

The factorial analysis ensured a good level of validity in the instrument. Cronbach's alpha coefficient was high, at 0.977, indicating good reliability for the scale.

3.4. Data analysis techniques

We calculated descriptive statistics (frequencies and percentages) with measures of central tendency (mean) and dispersion (standard deviation). The Kolmogorov-Smirnov test indicated that the sample did not follow a normal distribution, hence we used the non-parametric Mann-Whitney U test to determine the differences between the means for groups A and B, differences were considered statistically significant when $p < 0.050$. In addition, we calculated the effect sizes for the differences between the groups using Cohen's d. We also established the correlations between the different skills using Pearson's coefficient to determine interdependence. Finally, we performed a mediation analysis to identify the effect of interaction of didactic, digital, creative, and socio-collaborative skills on the skills inherent to gamification, as proposed by Galindo and Bezanilla (2021) in a similar study. Although the study meets the minimum number of cases required for mediation analysis (200), since the number of individuals is very close to this value (N=203) and its distribution does not meet the normality criterion (KS<0.001), bootstrapping with 5000 samples has been used. For all statistical analyses, the SPSS-V26 program was used, including the PROCESS v4.2 add-on by Hayes, which was employed for mediation analysis.

4. Results

The students' participation in designing the immersive games contributed to activating their skills. Below, we analyze which ones and to what extent, bearing in mind whether they gamified texts or animated films. Figure 5 shows some of the resources they produced (Figure 5).

Figure 5.
Example screenshots of the immersive digital games designed by the students.

Source: Developed games.

4.1. Digital skills

The group that gamified animated films had a high level of digital abilities—associated with the creation of gamified digital and AR resources. The group adapting classic texts demonstrated a moderate-high level. These differences were statistically significant in three of the five variables examined (p<0.050) (Table 3), albeit with a small effect size.

Table 3.
Descriptive statistics for digital skills.

		1	2	3	4	5	x̄	DT	U Mann-Whitney	d Cohen
Selection of appropriate digital and AR applications	A	.0	11.3	23.7	44.3	20.6	3.74	.916	**.023**	.174
	B	.9	3.8	20.8	40.6	34.0	4.03	0,889		
	Total	.5	7.4	22.2	42.4	27.6	**3.89**	.911	-	-
Integration of varied AR resources	A	1.0	7.2	23.7	40.2	27.8	3.87	.942	.086	.132
	B	.9	3.8	19.8	36.8	38.7	4.08	.906		
	Total	1.0	5.4	21.7	38.4	33.5	**3.98**	.928	-	-
Interactivity presented	A	1.0	14.4	29.9	37.1	17.5	3.56	.979	**.021**	.180
	B	.9	6.6	31.1	25.5	35.8	3.89	1.008		
	Total	1.0	10.3	30.5	31.0	27.1	**3.73**	1.005	-	-
Functionality of hyperlinks and activators	A	1.0	7.2	23.7	52.6	15.5	3.74	.845	**.001**	.251
	B	.9	6.6	15.1	35.8	41.5	4.10	.955		
	Total	1.0	6.9	19.2	43.8	29.1	**3.93**	.920	-	-
Variety of own digital resources	A	3.1	13.4	17.5	37.1	28.9	3.75	1,109	.082	.135
	B	.9	3.8	28.3	24.5	42.5	4.04	.975		
	Total	2.0	8.4	23.2	30.5	36.0	**3.90**	1.048	-	-
TOTAL		.9	7.5	23.4	38.9	29.3	**3.88**	.963	-	-

Group A: Gamification of classic literary children's texts; Group B: Gamification of animated children's films; 1=very low; 2=low; 3=moderate; 4=high; 5=very high.

4.2. Didactic skills

In general, the didactic skills exhibited in the games were high (Table 4), rather higher than the digital skills ($\bar{x}$=4.10 vs. $\bar{x}$=3.88). The highest values were recorded for having a coherent story underlying the game ($\bar{x}$=4.27) and in realistically planning time for implementation in early childhood education classrooms ($\bar{x}$=4.26). Comparing means, we found that the group gamifying animated films (B) significantly more accurately defined the educational objectives and assessment formulas to check student learning, although in both cases the effect size was moderate to small.

Table 4.
Descriptive statistics for scores in didactic skills.

		1	2	3	4	5	$\bar{x}$	DT	U Mann-Whitney	d Cohen
Explicit reference to curriculum	A	.0	2.2	18.5	45.7	33.7	4.11	.777	.109	.123
	B	.0	6.6	11.3	34.0	48.1	4.24	.900		
	Total	.0	4.5	14.6	39.4	41.4	**4.18**	.845	-	-
Suitability of time planning	A	.0	.0	13.0	35.9	51.1	4.38	.709	.150	.109
	B	.0	5.7	17.9	31.1	45.3	4.16	.917		
	Total	.0	3.0	15.7	33.3	48.0	**4.26**	.832	-	-
Level of interdisciplinarity	A	.0	6.5	25.0	18.5	50.0	4.12	1.004	.390	.065
	B	.0	6.6	11.3	31.1	50.9	4.26	.908		
	Total	.0	6.6	17.7	25.3	50.5	**4.20**	.954	-	-
Story cohesion	A	.0	.0	10.9	54.3	34.8	4.24	.635	.132	.113
	B	.0	6.6	6.6	36.8	50.0	4.30	.864		
	Total	.0	3.5	8.6	44.9	42.9	**4.27**	.765	-	-
Cohesion of story-activities	A	1.1	6.6	6.6	39.6	46.2	4.23	.920	.138	.115
	B	.0	6.6	22.6	30.2	40.6	4.05	.950		
	Total	.5	6.6	15.2	34.5	43.1	**4.13**	.938	-	-
Identification of educational goals	A	.0	4.3	39.1	42.4	14.1	3.66	.774	**.000**	.375
	B	.0	5.7	16.0	28.3	50.0	4.23	.918		
	Total	.0	5.1	26.8	34.8	33.3	**3.96**	.898	-	-
Suitability of resources incorporated	A	.0	.0	12.0	56.5	31.5	4.20	.633	.455	.057
	B	.0	6.7	21.0	34.3	38.1	4.04	.929		
	Total	.0	3.6	16.8	44.7	35.0	**4.11**	.807	-	-
Validity of assessment formula	A	3.3	10.9	40.2	31.5	14.1	3.42	.975	**.000**	.313
	B	.0	9.4	16.0	43.4	31.1	3.96	.925		
	Total	1.5	10.1	27.3	37.9	23.2	**3.71**	.984	-	-
TOTAL		.3	5.4	17.8	36.9	39.7	**4.10**	.878	-	-

Group A: Gamification of classic literary children's texts; Group B: Gamification of animated children's films; 1=very low; 2=low; 3=moderate; 4=high; 5=very high.

4.3. Creative skills

The immersive digital games indicated relatively high levels of creative ability ($\bar{x}$=3.81) (Table 5), with notable scores in exploration of different functionality of the digital resources and aesthetic quality in both groups. However, group B demonstrated statistically significantly higher scores in most indicators ($p<0.050$), although the effect size for the differences was moderate-small in terms of originality and harmony and moderate in terms of flexible use of resources and aesthetic quality.

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Table 5.
Descriptive statistics for scores in creative abilities.

		1	2	3	4	5	x̄	DT	U Mann-Whitney	d Cohen
Flexible resource use	A	.0	14.4	35.1	39.2	11.3	3.47	.879	**.000**	.381
	B	.0	8.5	10.4	45.3	35.8	4.08	.896		
	Total	.0	11.3	22.2	42.4	24.1	**3.79**	.937	-	-
Exploration of the different functionality of resources	A	.0	13.4	24.7	39.2	22.7	3.71	.968	.053	.152
	B	.0	8.6	18.1	41.0	32.4	4.01	.925		
	Total	.0	10.9	21.3	40.1	27.7	**3.85**	.952	-	-
Creation of original resources	A	.0	28.9	19.6	26.8	24.7	3.47	1.156	**.000**	.295
	B	.0	5.7	17.9	38.7	37.7	4.08	.885		
	Total	.0	16.7	18.7	33.0	31.5	**3.79**	1.065	-	-
Harmonious incorporation of resources	A	.0	20.6	21.6	40.2	17.5	3.55	1.011	**.000**	.272
	B	.0	5.7	21.7	34.9	37.7	4.05	.909		
	Total	.0	12.8	21.7	37.4	28.1	**3.81**	0.989	-	-
Aesthetic quality	A	.0	17.5	39.2	26.8	16.5	3.42	0.966	**.000**	.443
	B	.0	2.8	15.1	41.5	40.6	4.20	0.798		
	Total	.0	9.9	26.6	34.5	29.1	**3.83**	0.962	-	-
TOTAL		.0	12.3	22.1	37.5	28.1	**3.81**	0.981	-	-

Group A: Gamification of classic literary children's texts; Group B: Gamification of animated children's films; 1=very low; 2=low; 3=moderate; 4=high; 5=very high.

4.4. Socio-collaborative skills

Students in both groups demonstrated high levels of the socio-collaborative skills involved in group work (x̄=4.05). They stood out for their fluid communication and active participation—essential to produce their games, taking decisions, and exchanging ideas (Table 6). In addition, comparing the means produced statistically significant differences, those who gamified literary texts shone by optimizing their intercommunication, contributing ideas, and involving themselves in the task. The effect size produced by these differences was moderate-small.

Table 6.
Descriptive statistics for scores in socio-collaborative skills.

		1	2	3	4	5	x̄	DT	U Mann-Whitney	d Cohen
Level of intercommuniction	A	.0	2.1	11.3	36.1	50.5	4.35	.764	**.000**	.294
	B	1.9	2.8	29.2	37.7	28.3	3.88	.923		
	Total	1.0	2.5	20.7	36.9	38.9	**4.10**	.881	-	-
Participation and contribution of ideas	A	.0	3.1	12.4	37.1	47.4	4.29	.803	**.002**	.239
	B	1.9	2.8	27.4	38.7	29.2	3.91	.921		
	Total	1.0	3.0	20.2	37.9	37.9	**4.09**	.886	-	-
Involvement in the project	A	1.0	7.2	10.3	33.0	48.5	4.21	.968	**.001**	.255
	B	.0	4.7	29.2	41.5	24.5	3.86	.844		
	Total	.5	5.9	20.2	37.4	36.0	**4.02**	.920	-	-
Roles taken on	A	2.1	7.2	14.4	33.0	43.3	4.08	1.027	.120	.120
	B	.0	4.8	27.6	36.2	31.4	3.94	.886		
	Total	1.0	5.9	21.3	34.7	37.1	**4.01**	.957	-	-
Importance of contributions	A	2.1	6.2	13.4	33.0	45.4	4.13	1.007	.092	.129
	B	1.9	2.8	25.5	36.8	33.0	3.96	.935		
	Total	2.0	4.4	19.7	35.0	38.9	**4.04**	.971	-	-

		1	2	3	4	5	x̄	DT		
Seeking solutions for problems that arise	A	1.0	3.1	21.6	37.1	37.1	4.06	.899	.449	.058
	B	1.9	2.8	25.5	36.8	33.0	3.96	.935		
	Total	1.5	3.0	23.6	36.9	35.0	**4.01**	.917	-	-
TOTAL		1.2	4.1	21.0	36.5	37.3	**4.05**	.922	-	-

Group A: Gamification of classic literary children's texts; Group B: Gamification of animated children's films; 1=very low; 2=low; 3=moderate; 4=high; 5=very high.

4.5. Skills associated with gamification

The students demonstrated a high level (x̄=3.98) of skills for gamifying their stories (Table 7). Their ability to incorporate achievable challenges for their infant audience stood out (x̄=4.26), as did the cohesion of character, plot, and game objectives (x̄=4.06). Comparing the means showed that group B stood out significantly for incorporating an appealing storyline and including original aesthetic elements, although with a small effect size. Group A stood out for producing challenges with a range of difficulties, with a moderate effect size.

Table 7.
Descriptive statistics for gamification-related skills.

		1	2	3	4	5	x̄	DT	U Mann-Whitney	d Cohen
Emotional immersion	A	.0	12.4	24.7	37.1	25.8	3.76	.977	.522	.049
	B	.0	3.8	29.2	42.5	24.5	3.88	.825		
	Total	.0	7.9	27.1	39.9	25.1	**3.82**	.900	-	-
Appealing storyline	A	5.2	4.1	27.8	39.2	23.7	3.72	1.038	**.006**	.212
	B	.0	6.6	12.3	45.3	35.8	4.10	.861		
	Total	2.5	5.4	19.7	42.4	30.0	**3.92**	.967	-	-
Interrelated characters, plot and goals	A	.0	8.2	20.6	39.2	32.0	3.95	.928	.071	.138
	B	.0	6.6	11.3	40.6	41.5	4.17	.878		
	Total	.0	7.4	15.8	39.9	36.9	**4.06**	.907	-	-
Design of original aesthetic elements	A	.0	10.3	25.8	40.2	23.7	3.77	.930	**.004**	.221
	B	.0	3.8	18.1	38.1	40.0	4.14	.848		
	Total	.0	6.9	21.8	39.1	32.2	**3.97**	.905	-	-
Challenges that produce engagement	A	.0	5.2	22.7	46.4	25.8	3.93	.832	.813	.018
	B	.0	6.6	22.6	40.6	30.2	3.94	.893		
	Total	.0	5.9	22.7	43.3	28.1	**3.94**	.862	-	-
Challenges with different levels of difficulty	A	.0	.0	4.1	26.8	69.1	4.65	.560	**.000**	.463
	B	.0	9.4	19.8	41.5	29.2	3.91	.931		
	Total	.0	4.9	12.3	34.5	48.3	**4.26**	.859	-	-
Assigning suitable rewards	A	9.3	11.3	6.2	14.4	58.8	4.02	1.399	.075	.135
	B	4.7	6.6	12.3	40.6	35.8	3.96	1.086		
	Total	6.9	8.9	9.4	28.1	46.8	**3.99**	1.243	-	-
Game progress is displayed	A	12.4	7.2	6.2	39.2	35.1	3.77	1.335	.635	.037
	B	2.8	8.5	18.9	31.1	38.7	3.94	1.085		
	Total	7.4	7.9	12.8	35.0	36.9	**3.86**	1.211	-	-
TOTAL		2.1	6.9	17.7	37.8	35.6	**3.98**	.982	-	-

Group A: Gamification of classic literary children's texts; Group B: Gamification of animated children's films; 1=very low; 2=low; 3=moderate; 4=high; 5=very high.

4.6. Mediation analysis

The level of interrelation between the study variables was positive and highly significant (Table 8). In addition, the correlation between the skills involved in the design of immersive digital games with AR was strong.

Table 8.
Pearson correlations between the skills.

Skills	Digital (HDig)	Didactic (HDid)	Creative (HC)	Socio-collaborative (HSC)	Gamification (HG)
Digital	1				
Didactic	.639**	1			
Creative	.752**	.749**	1		
Socio-collaborative	.758**	.708**	.791**	1	
Gamification	.658**	.563**	.670**	.540**	1

Source: authors' own work.

Given the strong correlation between the five skills, it was interesting to determine the nature of the relationship between these variables. More specifically, following Hayes (2022), we performed a mediation analysis using two independent variables, the creative skills (CS) and the socio-collaborative skills (SCS). First, we examined whether the creative skills (independent variable -X-) had an effect on didactic skills (mediating variable 1 -M1-) or digital skills (mediating variable 2 -M2-), and whether they in turn influenced gamification skills (dependent variable -Y-).

In terms of the results (Table 9), the direct effects of creative skills were statistically significant both for the didactic skills mediating variable ($\beta=0.596$; $p<0.001$) and the digital skills mediating variable ($\beta=0.578$; $p<0.001$), as well as for the gamification skills dependent variable ($\beta=0.294$; $p<0.001$). In addition, there was also a significant relationship between the two mediating variables ($\beta=0.267$; $p=0.001$) and between each of them and gamification skills (DidS Vs GS: $\beta=0.358$; $p<0.001$; DigS Vs GS: $\beta=0.242$; $p<0.001$).

The indirect effects of creative skills on gamification skills, considering didactic skills ($\beta=0.213$; LL=0.129; UL=0.291) and digital skills ($\beta=0.140$; LL=0.073; UL=0.217) as mediating variables, were statistically significant in both cases, given that the value of 0 was not within the range between the lower and upper limits. In addition, the indirect effects of the independent variable together with the two mediating variables also produced statistically significant changes in the gamification skills ($\beta=0.038$; LL=0.009; UL=0.086).

Based on that, it is reasonable that the determination coefficient produced by the model allows an explanation of the high percentages of the effects on the dependent variable ($R^2=0.601$). Hence the total effects have high, significant values ($\beta=0.685$; $p<0.001$).

Table 9.
*Results of the mediation analysis with the independent variable creative skills (CS).*

		Route	β	p	EE	LE	UL
Direct effect	CS to DidS	a1	.596	<.001	.042	.512	.679
	CS to DigS	a2	.578	<.001	.065	.449	.707
	DidS to GS	b1	.358	<.001	.059	.241	.474
	DigS to GS	b2	.242	<.001	.053	.138	.346
	CS to GS	c'	.294	<.001	.057	.181	.406
	DidS to DigS	d	.267	.001	.078	.114	.420
Indirect effect	CS to GS for DidS	a1*b1	.213	-	.041	.129	.291
	CS to GS for DigS	a2*b2	.140	-	.037	.073	.217
	CS to GS for DidS and DigS	-	.038	-	.020	.009	.086
Total effect	CS to GS for DidS and DigS	-	.685	<.001	.040	.606	.764

*Creative skills=CS (X); Didactic skills=DidS (M1); Digital skills =DigS; Gamification skills =GS (Y); **
β=Coefficient; p=Level of significance; EE=Error of estimation; LL=Lower limit; UL=Upper limit; ***
We used the bootstrapping technique with 5000 samples.

The results are presented graphically in Figure 6.

Figure 6.
Mediation analysis taking creative skills (CS) as an independent variable.
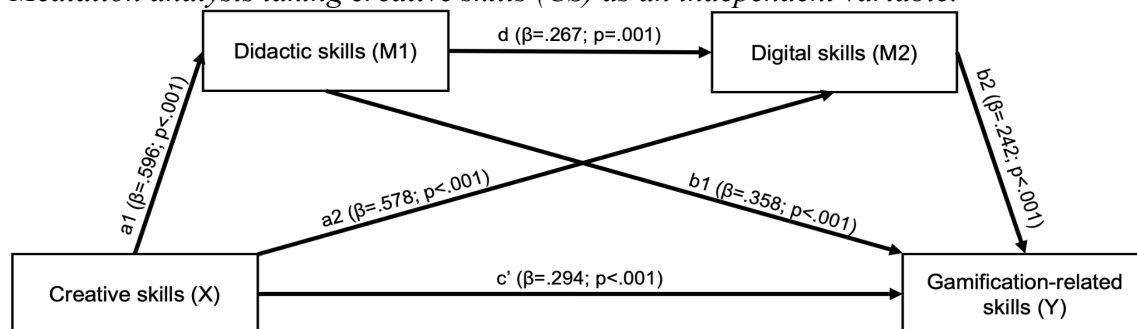
Source: authors' own work.

We can say, therefore, that high levels of creative skills imply better performance in the gamification task (r_{xy}=0.670**), and in turn, gamification skill levels are mediated by both didactic and digital skills.

Subsequently, we found that socio-collaborative skills (independent variable -X-) also affected didactic skills (mediating variable 1 -M1-) and digital skills (mediating variable 2 -M2-), which affect the level achieved in gamification skills (dependent variable -Y-) (Figure 7).

Figure 7.

Mediation analysis taking socio-collaborative skills as the independent variable.
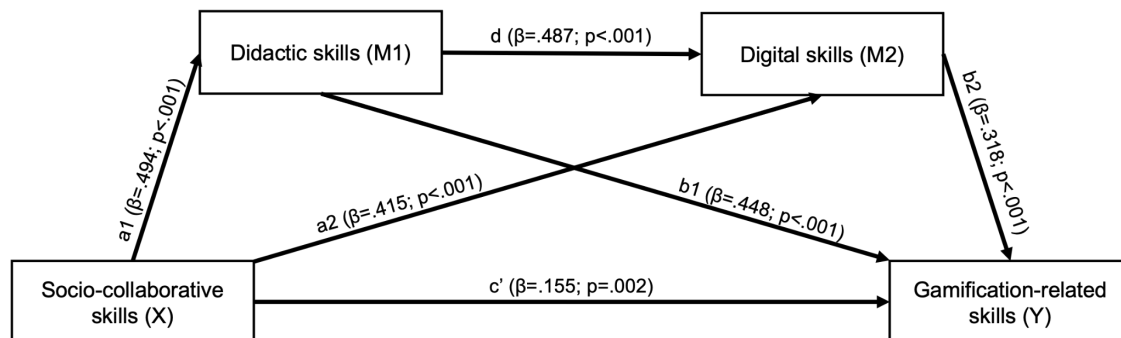
Source: authors' own work.

Looking at the results (Table 10), the direct effects of socio-collaborative skills were statistically significant both for the didactic skills (β=0.494; p<0.001) and digital skills mediating variables (β=0.415; p<0.001), and for the dependent variable of gamification skills (β=0.155; p=0.002). In addition, there was a significant relationship between the two mediating variables (β=0.487; p<0.001) and between each mediating variable and gamification skills (DidS Vs GS: β=0.448; p<0.001; DigS Vs GS: β=0.318; p<0.001).

The indirect effects of socio-collaborative skills on gamification skills, considering didactic (β=0.221; LL=0.144; UL=0.311) and digital skills (β=0.132; LL=0.078; UL=0.202) as mediating variables, were statistically significant in both cases, as the value 0 was not within the interval between the LL and the UL. In addition, the indirect effects of the independent variable together with the two mediating variables also produced statistically significant changes in skills for gamification (β=0.077; LL=0.042; UL=0.123).

The coefficient of determination produced by the model allows explanation of a large part of the effects produced on the dependent variable (R^2=0.402). Hence, the total effects exhibit high, significant values (β=0.585; p<0.001).

Table 10.

Results of the mediation analysis with the independent variable socio-collaborative skills (SCS).

		Routa	β	p	EE	LL	UL
Direct effect	SCS hacia DidS	a1	.494	<.001	.052	.392	.596
	SCS to DigS	a2	.415	<.001	.062	.292	.537
	HDid to GS	b1	.448	<.001	.057	.336	.560
	HDig to GS	b2	.318	<.001	.051	.217	.420
	HSC to GS	c'	.155	.002	.049	.057	.252
	HDid to DigS	d	.487	<.001	.071	.347	.627
Indirect effect	SCS to GS for DidS	a1*b1	.221	-	.042	.144	.311
	SCS to GS for DigS	a2*b2	.132	-	.032	.078	.202
	SCS to GS for DidS and DigS	-	.077	-	.021	.042	.123
Total effect	SCS to GS for DidS and DigS	-	.585	<.001	.051	.484	.685

*SC skills=SCS (X); Didactic skills=DidS (M1); Digital skills =DigS; Gamification skills =GS (Y); ** β=Coefficient; p=Level of significance; EE=Error of estimation; LL=Lower limit; UL=Upper limit; *** We used the bootstrapping technique with 5000 samples.

We can say, therefore, that high levels of socio-collaborative skills imply better skills for gamification (r_{xy}=0.540**), which are in turn mediated by both didactic and digital skills.

5. Discussion and conclusions

The *Gamifying Digital Storytelling with Augmented Reality (G-DST+AR)* model implemented in teachers' initial training transformed the process of creating immersive digital games into an opportunity to activate future teachers' hard and soft skills. More specifically, systematically planning the process of gamifying stories with AR allowed them to produce games for early childhood education students that had notable didactic potential, by facilitating knowledge acquisition, assimilation of content, and stimulation of a range of skills. Without a doubt, this innovative practice has provided multi-competence learning that we were able to analyze using the *TEaching Skills for GAmification (TESGA)* scale to assess the skills involved in the process of transforming literary and animated stories into games, using indicators associated with digital, didactic, creative, socio-collaborative, and gamification skills, in a similar way to the study by Adams et al. (2023).

Our results demonstrate that in designing their games, the student teachers demonstrated a high level of digital skills. Both groups made use of the knowledge they gained in their initial workshops, which gave them the skills to design and incorporate digital and AR resources to encourage user immersion, as noted by Jaller and Serafin (2020). The group that gamified animated stories produced more interactive games and provided more functionality to hyperlinks and AR activators than those who started from texts. Despite the overlapping and shared characteristics of the two story forms, incorporating animated sequences cinematically increased the games' interactivity, as indicated by Arsenopoulou et al. (2022).

In addition, the design of these educational games also showed high levels of didactic skills in both groups. The student teachers exhibited knowledge of the early childhood education curriculum (3-6 years) through associating game objectives with educational objectives and through incorporating learning content linked to fun AR-based activities. However, it was more of a challenge for them to establish assessment formulas to check whether the learning associated with the game had been achieved. Doubtless, this experience was an opportunity for them to apply their theoretical knowledge and explore new resources for promoting student motivation, attention, and engagement, as Aydoğdu (2022) concluded about similar practices.

The student teachers also demonstrated high levels of creative skills through selecting and incorporating digital and AR resources into the missions they planned, and even creating their own high quality resources (characters, scenes, videos, holograms, 3D elements, etc.). Those who gamified animated films in particular provided more versatility in the resources they used or designed, enriching their games with animated sequences that contributed to underpinning their stories by assimilating videogame logic

and the patterns of cinema storytelling, as noted by Arsenopoulou et al. (2022). In general, the creative process was a group process, which meant a high level of socio-collaborative skills was on display, realized through active participation and fluid intra-group communication, both of which were necessary to produce the games, take decisions, and exchange ideas.

It is worth noting that gamifying classic texts required more involvement from the student teachers and was more complex than converting animated films into games, where the verb-iconic component facilitates contextualization of an enjoyable new story. According to the literature on narratology (Bobes, 1993), both transfers involve changing aspects of the story, both in the content narrated and the artistic form adopted in the semiotic background or the language used. Nonetheless, converting literary texts into games means not only changing the language and appropriating and reinterpreting the original, it also requires the design of the characters, scenes, visual actions, etc.

In any case, both groups exhibited high levels of gamifying skills, related to assimilating the proposed gamification model which systematized the process of designing and incorporating videogame mechanics, dynamics, and aesthetics. More specifically, the group that gamified classic texts stood out for creating challenges with different ramps of difficulty, while the group that gamified animated films included more appealing storylines and incorporated original aesthetic elements. This might be because gamifying films makes it easier to incorporate missions, rewards, and feedback, etc., linked to fragments of the films. This means a simpler process and allows greater emotional involvement for the potential audience the game is aimed at.

This practical undertaking involved the activation of various interrelated skills, which was clear from the mediation analysis. The student teachers' skills in gamification were related to their creative skills, as greater creativity has an impact on the design of original immersive games made up of properly structured missions. In addition, gamification skills were linked to student teachers' didactic skills to give their games an educational purpose beyond just being entertaining. They were also linked to digital skills, demonstrated in suitable design and management of digital resources that underpinned the different missions. Socio-collaborative skills promoted group engagement and participation in tasks, and therefore in the co-design of the game. These skills promoted synergies and interconnections between members of the groups, each one contributing their know-how, resulting in the quality of the finished product. We determined that a high level of socio-collaborative skills meant greater gamification skills, which were in turn mediated by both digital and didactic skills.

Lastly, it is clear, as García-Hernández et al. (2021) concluded, that the experience of designing games or gamified materials offers great opportunities for initial teacher training, and produces very positive results in terms of activating hard and soft skills. The contribution of our study in particular revolves around systematizing the process with a methodology for gamifying stories, specifically the *Gamifying Digital Storytelling with Augmented Reality (G-DST+AR)* model which can be extrapolated to other educational contexts. The other main contribution is the incorporation of the *TEaching Skills for GAmification (TESGA)* scale which can be used to assess the skills involved in the design of immersive digital games, and which may also be used to determine future teachers' levels of competency.

The main limitations of the study are that the sample could be expanded and it could be implemented in other subjects within teachers' initial training in order to design gamified resources that relate to content in different areas of the curriculum, supported by stories that promote student engagement and emotional involvement in tasks or missions. Future lines of research will be aimed at giving future teachers methodological guidelines and digital resources with which they can design immersive games that are applicable to other levels such as primary and secondary education, and different educational areas such as physical education, therapeutic teaching, learning difficulties, etc.

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ANNEX: Analytical Rubric

Table 1.
Evaluation Criteria for Digital Competence (DC) Reflected in Augmented Gamified Narratives.

DC	1=Very Low	2=Low	3=Medium	4=High	5=Very High
1.1	AR resources unrelated to the narrative.	Insufficient AR resources, few relevant to the narrative.	Sufficient AR resources, most relevant to the narrative.	Quite a variety and quantity of AR resources, relevant to the narrative.	Great variety and quantity of AR resources. Full relevance.
1.2	No tools or techniques used.	Only QR code editors used.	At least a QR code editor and the Metaverse app used.	QR code editor, Metaverse app, marker sheets, and/or flashcards used.	QR code editor, Metaverse app, marker sheets, flashcards, and Merge Cube used.
1.3	No interactivity.	Little interactivity, fewer than 3 AR triggers.	Basic interactivity, between 4 and 6 AR triggers.	Quite interactive, with 7-10 AR triggers.	Highly interactive, with more than 10 AR triggers.
1.4	Activators do not associate content.	Only 2 activators have associated content and function.	3 activators are associated with functional content.	Most activators are associated with relevant content and function properly.	All activators are associated with content and function properly.
1.5	No own resources included	Includes 1 own resource.	Includes 2 own resources (videos, images, or audio).	Includes 3 or 4 own resources (videos, images, or audio).	Includes 5 or more own resources.

Source: author´s elaboration.

Table 2.
Evaluation Criteria for Didactic Competence (DC) Reflected in Augmented Gamified Narratives.

DC	1=Very Low	2=Low	3=Medium	4=High	5=Very High
2.1	No reference to the curriculum.	Located in the curriculum but not adapted to it.	Located in the curriculum in general terms.	Fairly well-aligned with the curriculum.	Very well aligned with the curriculum.
2.2	Not appropriate, poorly planned.	Poorly planned, requires improvement.	Acceptable, with basic elements, should be further developed.	Well planned.	Excellent, well-planned, and complete.
2.3	Unrelated to the curriculum.	Covers objectives of only one curricular area.	Covers and relates objectives of 2 curricular areas.	Covers and relates objectives of 3 curricular areas.	Covers and relates objectives of all curricular areas in an integrated way.
2.4	Very incoherent.	Various internal inconsistencies.	Some minor internal inconsistencies.	Coherent.	Totally coherent.
2.5	No design of activities consistent with the narrative.	Poorly designed activities.	Acceptable activity design.	Well-designed activities aligned with the narrative.	Excellent activity design aligned with the narrative.
2.6	No specific objectives related to the didactic proposal.	Few specific objectives included.	Acceptable inclusion of specific objectives.	Good inclusion of specific objectives linked to the proposal.	Excellent inclusion of specific objectives linked to the proposal.
2.7	Completely inadequate	Poor selection of resources.	Acceptable selection of resources.	Quite appropriate selection of resources.	Excellent selection of resources.

	selection of resources.				
2.8	No evaluation strategies.	Poorly formulated, incoherent, and inappropriate strategies.	Some minor issues in formulation, but coherent.	Well-formulated and coherent strategies.	Perfectly formulated strategies with full coherence.

Source: author´s elaboration.

Table 3.
Evaluation Criteria for Creative Competence (CC) Reflected in Augmented Gamified Narratives.

CC	1=Very Low	2=Low	3=Medium	4=High	5=Very High
3.1	Not flexible. Does not integrate diverse resources.	Little flexibility, few diverse resources.	Somewhat flexible, integrates several resources.	Flexible, integrates a fair variety of resources.	Very flexible, integrates a wide variety of resources.
3.2	Does not explore functionalities.	Explores only one function of integrated resources.	Explores two functions of integrated resources.	Explores various functionalities.	Explores all functionalities of integrated resources.
3.3	Not innovative, copies models.	Little innovation, includes few self-created materials.	Somewhat innovative, contains some self-created materials.	Innovative, with a significant amount of self-created content.	Highly innovative, most material is self-created.
3.4	No balance, proportion, or correspondence between parts.	Poorly balanced and disproportionate, lacking harmony.	Balanced and proportionate.	Well-balanced and proportionate with good harmony.	Maximum balance and proportion. Total harmony between parts.
3.5	Resources and platform lack aesthetic quality.	Resources and platform have poor aesthetic quality.	Aesthetically acceptable resources and platform.	Resources and platform have fairly good aesthetic quality.	Resources and platform have high aesthetic quality.

Source: author´s elaboration.

Table 4.
Evaluation Criteria for Socio-Collaborative Competence (SC) During the Design of Augmented Gamified Narratives.

SC	1=Very Low	2=Low	3=Medium	4=High	5=Very High
4.1	Does not communicate or interact with peers.	Little communication and interaction.	Communicates and interacts regularly with the group.	Encourages communication, interaction, and participation in debates.	Dynamizes communication, fostering interaction and debate.
4.2	Does not contribute ideas.	Contributes some ideas but disregards those of others.	Contributes relevant ideas but does not integrate those of others.	Contributes relevant ideas, integrating those of others.	Contributes many valuable ideas, combining them with others.
4.3	No involvement in organization or task distribution.	Sporadic involvement, causing task overlap.	Involvement in organization and task distribution by consensus.	Active involvement in organization and responsible task allocation.	Optimal involvement in organization and equitable task distribution.
4.4	No interest in completing assigned tasks.	Low motivation and interest. Does not keep up with the group.	Motivated and interested in the task but overly dependent on the group.	High motivation and valid execution without meeting deadlines.	Great motivation and interest. Well-executed tasks within the deadline.
4.5	Neither collaborates nor complements the group.	Minimal group contribution. Prefers individual work.	Collaborates with the group but offers few ideas.	Actively collaborates, contributing interesting ideas or proposals.	Fully collaborates, offering original and valuable ideas.

4.6	Creates problems or hinders resolution.	Does not contribute to solving problems.	Provides ideas for solving problems but does not seek agreements.	Offers solutions and attempts mediation to reach agreements.	Effectively resolves problems and negotiates agreements.

Source: author´s elaboration.

Table 5.
Evaluation Criteria for Gamification Skills (GS) Reflected in Augmented Gamified Narratives.

GS	1 = Very Low	2 = Low	3 = Medium	4 = High	5 = Very High
5.1	No narrative script.	Disorganized narrative script.	Narrative script without clear structure.	Narrative script with a clear internal structure.	Well-structured and coherent narrative script.
5.2	No cohesion in the narrative.	Characters have little cohesion with the plot and objectives.	Characters are cohesive with the plot but disconnected from objectives.	Characters are cohesive with the plot and objectives.	Characters are well integrated with the plot and objectives.
5.3	No distinctive aesthetics.	Poor aesthetics, replicates online prototypes.	Own aesthetics but not very original.	Own original aesthetics.	Very original and creative aesthetics.
5.4	No immersive capacity.	Only invites following game rules.	Encourages participation within the narrative.	Promotes empathy with characters and the story.	Fully immerses the player in the narrative.
5.5	No missions or challenges.	Missions and challenges are disconnected from the narrative and unattractive.	Missions and challenges are linked to the narrative but not very engaging.	Missions and challenges are engaging and associated with the narrative.	Missions and challenges are highly engaging and deeply integrated with the narrative.
5.6	No challenges included.	Challenges are too simple or too complex.	Challenges included but lack difficulty progression.	Challenges are engaging with progressive difficulty.	Challenges are engaging and motivating with well-balanced difficulty progression.
5.7	No points or rewards assigned.	Points and rewards assigned in a disproportionate way.	Points and rewards assigned equitably.	Points and rewards aligned with the narrative and task difficulty.	Points and rewards aligned with the narrative and task difficulty in an engaging way.
5.8	No game progress shown.	Progress is only displayed at the end of the game.	Progress is displayed at the beginning and end of the game.	Progress is shown after each level completion.	Progress is displayed after completing each mission in every level.

Source: author´s elaboration.