

Article

Playful Metaphors for Narrative-Driven E-Learning

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Featured Application: The presented narrative-driven technique of storyfication can be used in online education to transform e-learning courses into engaging, motivating stories.

Abstract: A team of e-learning specialists was assigned the mission to design and develop seven short e-learning modules for young learners on popular topics with a prime focus on social-emotional learning. However, these courses had to be produced on a limited budget, hosted in a Moodle platform, and be delivered for free in asynchronous only mode. Hence, a playful method of meaningful storyfication was applied in e-learning to captivate attention and spark interest. In each module, a fictional story or metaphorical challenge with playful elements was introduced where learners were invited to assist the story's protagonists or become the heroes themselves by engaging with content. As the role of teachers is vital for the adoption of technology-based solutions in education, a mixed method evaluation was undertaken to assess the effectiveness of the method. Forty-two educators reviewed the courses, answered a questionnaire and participated in interviews. Results indicated that participants highly appreciated the narrative aspects, visual, and auditory elements rendering the e-learning courses effective for the target audience. This article can assist educators, distance education designers and developers to adopt a playful mindset and learn how to integrate practically storytelling elements into their classroom-based and online teaching.

Keywords: e-learning; narrative-based learning; storyfication; storytelling; gamification; playful design; playfulness; metaphor; animation; vyond; social-emotional learning; sustainability



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1. Introduction

Computer-based activities such as e-learning courses can sometimes be perceived by children as uninteresting or boring tasks when they are disconnected from their interests [1]. This issue was further amplified in the current coronavirus (COVID-19) pandemic period where all educational activities in physical spaces were canceled. Due to the social distancing measures, remote teaching became the norm globally in all levels of education and for informal professional development and life-long learning projects [2,3]. However, as emergency remote teaching has distinct differences from distance education, the effectiveness of the former was not always desired, especially in the early stages of the pandemic [4]. However, this unprecedented situation had an impact on pupils' emotional and psychological state [5] increasing, for instance, anxiety levels among students [6]. Children of all ages need more than ever social emotional competencies to analyze nascent challenges and apply empathy skills in various social contexts [7]. Social-emotional learning (SEL) competencies have been identified as important for school readiness and predictors of academic performance [8]. SEL includes intrapersonal emotional skills, e.g., self-regulation social awareness, as well as interpersonal skills, e.g., social relationships management and decision making both in the physical realm and in cyberspace [8]. Consequently, the integration of social-emotional learning into all distance education programs in formal education has been suggested as a new imperative priority [9]. This study aims to contribute

to the elimination of tedious, monotonous content production in e-learning course design through techniques that can captivate young learners' attention and interest towards SEL competence. The main hypothesis is that playful design can be acceptable by educators and deemed as an enhancing factor of e-learning. Its main contribution is the suggestion of a narrative-driven procedure of storyfication to transform online learning into an engaging, motivating story in all levels of education.

The current study is structured as follows: Section 2 delineates the theoretical background on playful learning, narrative-based learning, and the use of metaphors in education. Next, the application context and involved course activities and materials are described in depth. The research goal and the data collection methods follow in Section 4, while the results are reported next. Section 6 contains the discussion along with recommendations and pedagogical, managerial, and social implications for practice. Limitations and directions for future research are described in the concluding segment.

2. Theoretical Background: Playful and Narrative-Based Learning

Previous studies have shown that educators accept technological solutions that supplement their role respectfully and open new learning horizons to their students. Indeed, not everything in education needs to be a game. As demonstrated in various educational models such as the taxonomy of technology-supported instructional methods for Science Technology Engineering Mathematics (STEM) Education [10] and the liquid curriculum [11], students' role in education can vary from passive recipients to active actors, even curriculum co-creators [12]. Frameworks on gameful design such as RECIPE (Reflection, Exposition, Choice, Information, Play, Engagement) [13] and playful design such as TANC (Theme, Activities, Narrative, Components) [14] emphasize the meaningfulness of fun and memorable experiences that win the intrinsic interest of students. This comes in sharp contrast to gimmicky regarded applications of game-based learning where games serve as an extrinsic reward, a facade to disguise learning that would otherwise be seen as undesirable, a phenomenon coined as chocolate-covered broccoli.

Playful learning is the application of the concept of playfulness in education [15]. Playfulness is a lusory disposition and lighthearted attitude demonstrated in various situations [16]. It contains the elements of humor, joy, and spontaneity. Playful learning is one form of game-based learning, next to gameful learning (gamification) and serious games [17–19]. Frameworks for playful learning emphasize the importance of openness, curiosity, imagination, risk-taking, experimentation, and safe failure in learning [16]. Having fun through meaningful play is beneficial to children's achievement, motivation, imagination, and creativity [15]. Having fun in education goes beyond games and is associated with a passionate instructor who applies active, experiential pedagogies and creates anxiety-free, safe experimentation spaces where learners can share views and experiences [20]. Game-based learning is an effective pedagogical method for teaching SEL to children [21]. Fun in learning depends also on autobiographical and contextual factors [22]. A framework of fun in education includes exploration, positive emotions and sensations, social interactions, challenge, failure, and finally, naughty elements [22].

The TANC model for playful learning suggests applying narrative-driven actions within a theme [14]. A theme is a common semiotic domain of reference and relevance for both teachers and students. A narrative is a sequential account of events within a story. A story has characters and one or more protagonists, heroes who respond to a challenge and undertake an adventure, the hero's journey. Adding story or mythic elements to a learning experience or platform is called narrative-based learning [23]. Narrative-based learning in educational technology systems and educational material has been applied predominantly in STEM but also Humanities Arts and Social Sciences (HASS) [23,24]. Story-based learning in narrative-centered learning environments has produced significant affective outcomes such as interest and self-efficacy [25]. Storyfication is linked with emergent narrative storytelling in filmmaking [26]. In this study, the term storyfication underlies the transformation of learning into an interactive digital story that the learner can

experience in an emotionally engaging way. Stories improve fact recall in comparison to a dry, unstructured presentation form [27]. Storytelling has been an effective method for e-learning development in STEM subjects [28,29]. Stories facilitate the achievement of deeper, enduring student knowledge [28,30]. Storytelling can be achieved through visualizations with animated characters or cartoons (animated videos) and 3D virtual worlds [31,32]. Animated videos can supplement or replace other forms of knowledge generation [33]. According to the cognitive load theory, students learn better through animation with spoken text than with written text (modality effect) [34]. One powerful element of stories is the use of metaphors. Metaphors are ubiquitous in everyday communication and cognition. A metaphor is a linguistic or artistic expression that connects different concepts in a descriptive, meaningful way [35]. Metaphoric meanings can be used in education to reconceptualize situations and phenomena facilitating empathetic and critical reflection. Metaphors can be a powerful medium for elementary or primary education and teachers' education [36].

3. Materials

In our study, the used materials were designed, developed, and provided by the Municipality of Thessaloniki. More specifically, the Public Benefit Enterprise of the Municipality of Thessaloniki (KEDITH) in Thessaloniki, Macedonia, Greece has the mission to organize activities, projects, and actions for children and young people [37]. Therefore, it operates and supervises five Centers for Creative Employment of Children. In the aftermath of the COVID-19 pandemic, KEDITH designed in 2020, a new, free, distance, creative, and socially protected platform for children entitled to the e-kedith experience [37]. The e-kedith experience is a safe and fun electronic edugaming environment for young learners. The platform, based on Moodle, contained modules on SEL, sustainability, and citizenship with the following titles next to other gameful and entertaining resources:

- A1: I have the right to be a child
- A2: Stop Bullying
- A3: Recycling as a way of life
- A4: Climate Change: Be part of the solution
- A5: Diversity in the country of Solfeggio
- A6: Journey to the galaxy of Europe
- A7: Are you surfing online? Stay safe

The main intended learning outcomes of each module are illustrated in Table 1. Each module had an estimated total study time between 1 and 2 h and contained three to five levels or sub-modules as well as a section with additional activities, material, and links for further exploration and discovery. Each submodule included dialogs, narration, and interactive elements such as quizzes and branching scenarios.

Table 1. Intended learning outcomes of playful e-learning modules.

Module	Topic	Context/Rationale	Intended Learning Outcomes	Bloom's Taxonomy
A1	Human rights	United Nation's children rights	Describe human rights, children's rights and their values React in everyday challenges regarding your rights Face rights' issues with critical thinking	Know Apply Evaluate
A2	Bullying	Prevention of bullying behaviors in schools	Recognize bullying forms across time Account the multiple roles of participants in bullying Distinguish between bullying, conflict and teasing Manage a bullying issue whenever confronted	Know Comprehend Analyze Apply
A3	Recycling	Recycling of materials	Discern and handle properly various recyclable materials Manage effectively home waste Reduce plastic pollution	Know Comprehend Apply
A4	Climate change	Adopt planet-friendly everyday habits	Describe the climate change causes and effects Account ways of sustainable mobility Save energy adopting consumer-savvy habits	Comprehend Know Apply

Table 1. Cont.

Module	Topic	Context/Rationale	Intended Learning Outcomes	Bloom's Taxonomy
A5	Inclusion Diversity	Empathy disposition and demonstration	Define what sound is and how its produced Recognize and respect all facets of diversity Utilize diversity as expressive and artistic medium	Know Comprehend Apply
A6	European Union	Exploration of European Union's countries and cultures	Identify Europe's mythological origins Discover European Union's history and creation reasons Recognize each European country's culture and language Describe how European Union functions	Know Comprehend Know Know
A7	Internet safety	Prevention and of internet addiction, cyberbullying	Recognize potential dangers—hazards Name protective agencies and where to ask for help Describe cyberbullying dimensions and forms Use Internet and social media safely	Know Know Comprehend Apply

All modules were storyfied; they were constructed around a narrative with fictional elements that resulted in a tangible challenge that learners were called upon to address progressively, either in the first or third person. The narrative of each module is described in Table 2. Then, each module was divided into three to five units of specific focus. In each unit, learners engage with multimedia content and a series of learning activities. Activities are of various nature: prompting knowledge questions, exercises for learners to demonstrate the retention and comprehension of information.

Table 2. Narratives of playful e-learning modules.

Module	Topic	Narrative Plot Overview	Main Challenge
A1	Human rights	One international group of children is locked in the castle of children's rights.	Win five keys to help them escape from the castle
A2	Bullying	Paris and Claire join the friendship championship aiming to become better friends and win the title of Most Valuable Friend (MVF).	Help the children become MVFs
A3	Recycling	On his way back from school, Anastasis is followed from a stray dog and is determined to keep him and take care of his needs.	Help Anastasis build a recycled dog shed
A4	Climate change	3 superheroes with special forces set to fight climate change building an army of earth defenders and save the planet.	Join the earth defenders by earning your gear through four challenges
A5	Inclusion Diversity	An elite detective is recruited in the melody land of Solfège to restore harmony and find two missing musical notes, Dodo and Sisi who were persecuted due to their divergent features.	Become a detective assistant to locate the missing notes
A6	European Union	Penelope is contacted through radio by Galateia, a traveler from the future in a remote galaxy who is seeking missing information about Europe's history and culture.	Help Penelope provide the missing information of their identity
A7	Internet safety	Stathis is returning to his native island for summer vacations but he discovers that his friends have been influenced by an evil Internet villain.	Help Stathis rescue his three friends

All narrative components were implemented with animated characters. The animated videos were designed taking into account implications from research findings such as eliminating unnecessary visual elements [34]. They were developed primarily with the Vyond and Articulate Storyline platforms along with audio, image, and video editing software.

The story of each module contained playful and gameful elements as well as metaphors that are presented in Table 3. Metaphors are the central vehicles for meaning-making and sophisticated reflection and critical thinking within the module's narratives. In module A2

on bullying, friendship is conceived as a cooperative sport where users achieve milestones visualized in the friendship progress bar, leading to the trophy of the most valuable friend (MVF). This is a direct reference to the, most valuable player (MVP) award. The term became viral among youth, as Giannis Antetokounmpo, was the first Greek basketball player in history to win the MVP title of the National Basketball Association in 2019 [38]. In this way, the story conveys the moral message that social relationships and friendship is a desirable competence that is being acquired through mindful action and consistent, empathetic effort.

Table 3. Playful elements and metaphoric concepts.

Module	Metaphors	Playful and Gameful Elements	Cultural References
A1	A stressful situation or event as a locked tower	Collaborative escape, finding keys to unlock doors	Breakout or escape rooms, Stranger Things
A2	Friendship and social relationship as a continuous, copious process	MVF award, Friendship progress bar, Badges	Sports, Basketball, MVP award
A3	Recycling as a building action of personal responsibility and agency	Stray dog adoption, progress as building a shed from recycled materials	Pets
A4	Protecting the climate as heroic act Earth defender gear: cape of knowledge, shield of nature, mixed reality glasses, flying e-scooter	Superheroes names (e.g., Super Smaragda) and identities	Superheroes
A5	Diversity and inclusion as melody that turns into cacophony when society members are excluded	Crime fiction, Notes as citizens, Character names (e.g., Mirela, Crousteau)	Music notation
A6	Europe as galaxy, European countries as planets	Science fiction, Time travel	Space
A7	Internet as sea, helping and rescuing friends from harmful online situations	Character names (Dr Megavirus), Island name (Istopalaia), Titles of internet harmful states (internet wortex, data shark, sea lion bully)	Mystery, Sea

In module A4 on global warming and climate crisis, saving the planet from environmental catastrophe is a deed worthy to superheroes. These superheroes are, in fact, scientists: Super Smaragda, botanologist, Fantastic Filippas, oceanologist, and Tetraperatos (canny in Greek) Timos, volcano geologist. But even a squad of superheroes cannot achieve it, mass participation is needed. Hence, an army of earth defenders is called upon, where everyone can join by acquiring its gear consisting of four items: the cape of knowledge, the shield of nature, mixed reality glasses, flying e-scooter. Each of these badges corresponds precisely to the content of the module's units, e.g., on sustainable mobility. However, the real task of earth defenders against global warming and climate change is actually local, in everyday life, so the completion of the module in a first-person perspective marks the beginning of behavior and habit change; the story continues in the physical world, facilitating the transfer in the real-world.

Playful and gameful elements were introduced in multiple levels (Figure 1). In some modules, the plot unfolds around well-known themes and genres such as science fiction, time travel, mystery, superheroes, escape rooms. Module A1 takes place in a haunted castle, a metaphor for any uncomfortable situation, where an international group of children explores its rights and seeks the keys to open the unlocked doors and escape. In module A6 on European Union and its member states culture, players help a time traveler, an interstellar historian from the remote galaxy Europe-21 who needs to collect information about Europe as it relates to the re-discovery of their lost identity and origins.



Figure 1. Snapshots from modules' playful narratives: Children rights chart (A1); Collaborative escape from the haunted castle (A1); MVF depicted metaphorically as a mountain peak that students can reach (A2); Friendship progress bar and badges (A2); Superheroes against climate change (A4); Earth defender gear (A4); the dismissal of divergent persons (A5); Interstellar communication with the galaxy Europe-21 (A6); Invisible Internet threats visualized as obscure hacker Dr Megavirus machinations (A7).

On the linguistic layer of world-building, funny meaningful character and location names were introduced. For example, module A5 on plurality takes place in the melody land of Solfège where musical notes live as citizens. The story starts with the news anchorwoman Mirela (from the notes mi, re, la) Diatympanidou (from the Greek word tympanon, a type of tambourine instrument) reporting about the employment of Jacques Crousteau (homonymous with the word 'krousto', a percussion instrument in Greek) to restore harmony. Music in the land turned into cacophony when two divergent notes, disabled Sisi (female) and the overweight Dodo (male) went missing. In module A7 on internet safety, the story takes place on the island of Istopalaia, a fictional name derived from the word 'istos' (web in Greek), and Astipalaia, a real island in the Aegean Sea. Children fell victims to machinations of the devious Dr. Megavirus and are held virtually captive in the dark Diktyonisi (another composite name in Greek meaning network-island) instead of playing and enjoying the sea and their companionship.

In other modules, acts of kindness and social responsibility are used as story cornerstones modeling desirable real-life behaviors. Indicatively, in module A3 on recycling, players adopt a stray dog and have the challenge to build its shed from recycled materials while learning about recycling. This conscious design decision was made to a continuum

of awareness—Interest—Reflection—Decision—Action leading to the holistic, communal construction of SEL and sustainability competencies.

4. Methods

The adoption of various media in education depends heavily on the perceptions of adult educators who will assess its quality and appropriateness for their pupils. Educators tend to resist using a technological or pedagogical medium that is not suited to their needs or not aligned with the learning objectives and outcomes [39]. As quantitative and qualitative research methods exhibit different advantages and limitations, a mixed approach can combine their strengths to corroborate results and of deeper interpretation of data analysis. This study employs a mixed-method evaluation research design combining quantitative and qualitative data collection procedures [40]. The guiding research questions were to assess expert educators' views towards (a) instructional and affective aspects of playful e-learning course design and (b) the alignment of instructional and technological elements with content and learning outcomes.

The study was conducted between June–September 2021 and included two data sources. The primary data were educators' answers in a survey instrument, designed by the first author that combined twenty-four qualitative and quantitative data in the form of open and closed questions, respectively. The survey was divided into four sections: (i) demographics, (ii) instructional and affective elements, (iii) aesthetical visual and auditory elements, and (iv) open questions. The closed questions were structured using a 5-level Likert scale from 1 (strongly disagree) to 5 (strongly agree). The open questions were the following: how would you summarize your experience; what did you like the most or the least—What will you remember most vividly; what would you change in the narratives? The survey was validated by three university faculty members who reviewed the questionnaire and suggested improvements that were implemented. The secondary data collection source were follow-up semi-structured interviews that addressed the validation of respondents' comments. Seventeen interviews took place online with voluntary participation. The duration of the meetings was 10 to 15 min. Interview notes were processed applying thematic content analysis. The questionnaire, as well as the interviews, utilized the Greek language. The translation into English was carried out by one of the authors. Researchers had the opportunity to verify questionnaire data, make correlations and identify possible contradictions. Moreover, the potential use in formal educational settings was explored. By using a dual collection approach, data triangulation was addressed through the honesty, depth, richness, and scope of the data [41].

Participants were forty-two expert educators in primary (elementary) and lower-secondary education. Educators with expertise in the subject areas were identified through their teaching subjects and invited electronically to participate in the study. At the beginning of the survey, educators declared their expertise in the specific subject area. Participants were predominantly female (64%) and holders of a postgraduate degree (58%). They were distributed across four age groups as follows: 41–50 (36%), 31–40 (36%), 50+ (24%), and 18–30 (4%).

5. Results

Participants evaluated favorably all instructional and affective aspects of the playful storyfied modules, as illustrated in Table 4. The implemented narratives were deemed as successful and attractive. More importantly, educators evaluated the narratives as very appropriate and helpful for the achievement of the intended learning outcomes. Looking at individual courses, the highest regarded narratives were A2 (Bullying), A4 (Climate change), and A5 (Diversity).

Table 4. Descriptive statistics on the evaluation of instructional and affective elements of playful modules.

Survey Item	Mean	St. Dev.	Median	Min	Max
The modules' narrative contains surprises	3.95	0.85	4	2	5
The narrative contains appropriate visual and linguistic metaphors related to the content	4.33	0.47	4	4	5
Story characters are well developed and are clearly presented	4.12	0.90	4	2	5
The plot peaked my interest	4.52	0.66	5	3	5
I like the narrative's plot	4.26	0.73	4	2	5
Story events are emotionally touching	4.10	0.76	4	2	5
I am interested in the story's progression	4.43	0.54	4	3	5
I am able to grasp clearly the module's narrative	4.07	0.81	4	2	5
The narrative facilitates the attainment of the module's learning outcomes	4.31	0.66	4	3	5
The narrative and cut scenes create a playful experience	4.57	0.63	5	2	5

During interviews, teachers were asked explicitly about the alignment of the narratives with learning outcomes. Synthesizing thematically their expressed views, it was deduced that the alignment was indeed achieved through the following three mechanisms of raising complexity:

1. Making the abstract tangible
2. Raising stakes
3. Agency activation

The simplest method was turning an abstract concept into a tangible situation. For instance, building a dog shed from recycled materials visualizes the result of the recycling process. Moreover, it introduces the element of progress feedback to drive the task's completion. Raising stakes was a second, dramatizing technique to emphasize the importance of learning objectives. Learning about Europe becomes of vital assistance for a time traveler in need. The perils of the Internet are no longer theoretical when your friends are victims, and you have to find ways to help them. Finally, the most powerful storyfication mechanism is agency activation; players become the story's focal persons and are invited to take action so as to address an existing problem. The courses are just the beginning, and the adventure transverses from the digital to the physical world. For instance, learners are not accessing content about global warming, they are joining forces with superheroes to save the earth through their everyday behavior and habits.

Qualitative data from open questions and interviews revealed that narratives positively surprised educators who are accustomed to a more direct exposition of facts and theory. Some of the most memorable aspects were story characters (P5), artificial constructs such as the most valuable friend—MVF (P8), the plot twists, and the generated emotions (P33). The purposeful inclusion of characters from minorities such as disabled children and persons of different color, race, and religion was also noticed and commented positively (P14).

The technical development of a playful narrative is equally important so as to express aesthetically the story's vision, translating words into multimedia with animated characters. The quantitative evaluation of the technical aspects of the presented playful modules are presented in Table 5. All technical aspects received high scores regarding fitness for purpose, despite the fact that they were not of the highest fidelity in comparison to commercial games.

Table 5. Descriptive statistics on the evaluation and alignment of technical elements of playful courses.

Survey Item	Mean	St. Dev.	Median	Min	Max
I liked the graphics in the narrative's introduction and cut scenes	4.33	0.69	4	2	5
The graphics in the narrative's introduction and cut scenes match the module's mood and style	4.52	0.55	4,5	3	5
The narrative's cut scenes are and visually attractive and well-done	4.36	0.70	4	2	5
I liked the auditory elements (narration, sounds, music) in the narrative's introduction and cut scenes	4.29	0.87	4	1	5
The auditory elements improve and make the game experience more enjoyable	4.60	0.73	5	1	5
The auditory elements match the module's mood and style	4.43	0.83	4	1	5

Critical voices recommended a less theatrical audio narration as it comes across as staged or hyperbolic (P15). One interviewee (P2) suggested the addition of a short story in video format at the end of the module so as to improve memory retention. Another technical suggestion was mixing up background music instead of keeping the same track throughout the whole module (P23). Nevertheless, graphics, music, and sound effects were among the most notable elements according to three educators (P9, P20, P31).

Overall, participants characterized the overall experience as “interesting and rich with opportunities for active learning” (P1). One teacher (P6) noted that “The experience was very interesting and pleasant. It offers an attractive and original way the development of cognitive, social and emotional skills that children retain through playing and creative, entertaining engagement”. Another educator (P26) detected “a different approach to issues we experience, expressed in a pleasing and creative manner”. The following participant quotes were indicative:

“I liked the fact that my interest was maintained during the whole duration (of the module) thanks to the plot and its interactive character by which children play while simultaneously being taught how to express and think about their feelings, experiences and how to enter into another person's shoes.” (P4)

“I will remember vividly the way the story was illustrated (graphics, narrative, music, games, effects) and its meanings and also its characters who offer extra incentives through their goals for children to progress in the action.” (P6)

P17 summed up that “the module was pleasant, interesting, without sterile didacticisms and boring lectures”. In conclusion, the majority of participants were very satisfied with the end result and are willing to incorporate the e-learning courses into their teaching. More specifically, all e-learning courses have been recognized as highly relevant for the 21st-century skills labs, an innovative educational policy initiative, newly introduced in the compulsory curriculum of all Greek kindergartens, primary (elementary), and lower-secondary (middle) schools since September 2021. Skills labs link school education with a global outlook, active citizenship, democratic values, innovative mindset, and United Nations' Sustainable Learning Goals. They include four thematic modules for the construction of learning skills, digital literacy skills, social-emotional skills, life skills, soft skills, and STEM skills. These modules are entitled I live better—Well Being, I take care of the environment, I am interested and act—Social Empathy and Accountability, I create and innovate—Creative Thinking and Innovation. The alignment of the playful courses with skills labs is presented in Table 6.

Table 6. E-learning modules alignment with 21st century Skills Labs in Greek schools.

Skill Lab Module	Skill Lab Unit	Playful E-Learning Courses
1. Well Being	1.2 Mental Health	Stop Bullying (A2)
	1.4 Self-care, Safety and Prevention	Internet Safety (A7)
2. Environment	2.1 Ecological Conscience	Recycling (A3)
	2.2 Climate Change	Climate Change (A4)
	2.5 Global Cultural Heritage	European Union (A6)
3. Social Empathy and Accountability	3.1 Human Rights	Children's Rights (A1)
	3.5 Mutual Respect and Inclusion	Diversity and Inclusion (A5)

6. Discussion

This study focused on the teacher perceptions on the storyfication, the playful transformation through the storytelling of short online courses for school children on SEL skills, and contemporary topics related to environmental protection and citizenship. These are issues of highest priority and importance both for their everyday lives as well as for their future as citizens. Educators often reject gameful playful practices as frivolous or inappropriate for serious teaching [20]. In this instance, participating educators approved the approach and evaluated highly the instructional, affective, and technical implementation aspects.

Previous studies have documented positive influences on cognitive and affective outcomes from the integration of storytelling-driven multimedia in education [23,24,31]. A systematic review on narrative-based learning calls for a closer alignment of pedagogy and story, a focal point in the current study. [23]. It also highlights that fictional elements ignite subject-matter interest. Dubovi et al. [31] employed similar animated videos to promote students' reasoning. In their conclusions, they emphasize the importance of enabling students to experience stories and simulations from a first-person perspective, another common observation in this study. A mixed-method study in primary and secondary education with a blended story-powered experience in 3D virtual worlds had also recorded both high teacher praise and tangible student fascination that resulted in creative collaborative digital artifacts [32]. It confirmed the research finding that fun and student enjoyment is more influential for learning than technical visual fidelity of graphics. A qualitative study on a narrative-driven game on science ethics deployed in elementary and middle schools enabled an empathetic perspective and yielded powerful affective effects [24]. Their results corroborated our finding that effective educational narratives trigger emotional engagement are built around characters, dilemmas, decisions, and meaningful actions that model incentives and behaviors in authentic contexts. Additionally, they point out that narrative-based games are not stand-alone learning experiences; they should be part of lesson plans, supplemented by reflective and argumentative discussions to consolidate learning insights.

Consequently, this study leads to the following implications for practice. From a pedagogical perspective, educators and instructional designers can use meaningful storyfication, stories, and metaphors to place learners in the center of a problem or a challenge to activate their agency and drive their cognitive and emotional involvement. However, narratives or other game elements should not be used as a vehicle to disguise tedious tasks and push content to students. On the contrary, learning activities and content should be incorporated meaningfully in a patient way that serves and promotes the story. In this direction, open-ended scenarios can enhance the replayability of playful courses. Once the students' curiosity has been energized, a story with several branches can be replayed to experience different game resolutions. Playful e-learning courses with high replay value can facilitate spaced task repetition leading to enhanced retention.

From a technological-managerial angle, e-learning designers and developers should consider the thoughtful inclusion of multimedia elements in manners that keep cognitive load to acceptable levels. In other words, graphics' quality is not the most decisive factor

but rather the fitness for their playful purpose. In this sense, developers can enhance the e-learning quality by building mental bridges using visual and auditory fictional metaphors between the content and the story. From an educational policy point of view, playful materials can accommodate especially interdisciplinary, transversal, and horizontal 21st-century skills. Hence, their systematic incorporation in holistic and blended self- and group-reflective experiences should be explored.

7. Limitations and Directions for Future Research

The current work has several notable limitations that provide suggestions for future research and development. Teachers' approval and appreciation of e-learning materials do not necessarily translate to students' acceptance and adoption. As student-centered learning approaches dictate, students should be involved in the evaluation process. This is indeed the next step in the current project. Future work will focus on the evaluation of students' attitudes towards playful learning so as compare them with teachers' observations. Another limitation pertains to the study's sample. The sample of teacher participants cannot be regarded as representative of the entire population. The underrepresentation of younger teachers in the 18–30 demographic category was particularly noticeable. Moreover, additional research directions include the estimation of cognitive effects such as knowledge retention and the impact on values and behavior (transfer). Another future research avenue is the implementation of cross-cultural comparative studies to examine the role of humor and playfulness in online learning across different continents and cultures.

In conclusion, this study aims to contribute to the elimination of boring, fact-based learning by presenting a simple, practical method that is easy to implement: the introduction of playful elements and stories with multiple, inherent, and metaphorical connections with learning outcomes and content. This playful disposition is associated with a creative and innovative attitude and can be applied both in online and classroom-based contexts to bring excitement and passion back to both teachers and learners in all levels and modes of education.

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