

Article

Digital Storytelling in Education: A Transmedia Integration Approach for the Non-Developers

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Abstract: The present paper focuses on digital storytelling in education, emphasizing the teachers' needs for familiarization with the new technological conditions. A transmedia integration approach is deployed to make productive, blended learning values while utilizing the availability of tools and reusable media assets in a component-based software engineering kind of framework. The topic is inspired by social studies and humanities, which seem to be marginalized, usually failing to make effective technological facilities, benefits, and contemporary findings. It is, therefore, necessary to modernize the approach to literary things and integrate digital means into the educational process, even in cases where a sole educator on humanities and social studies lacks multidisciplinary support in multimedia authoring and software engineering. This modernization can be made possible by introducing user-friendly tools into the process, representing not just a fashion of the time but mostly a renewal trend, aiming at revitalizing the course to attract and engage learners. Undoubtedly, today's pupils have grown up with technological means, becoming familiar with their use so their implication causes undiminished interest in most daily activities, including schooling. In this high-tech generation, it is absurd to address the transmission of knowledge and values in outdated ways. Apart from adapting to the timely students' needs, lesson plans on transmedia storytelling practices can also satisfy tutors, triggering their inspiration and co-creation potentials. Overall, the project aims to attract the trainees' interest with the help of digital tools, which will be embodied in the educational processes by teachers without technical know-how, while continuously adapting to the audience's needs. Research hypothesis and questions are formed as part of the deployed human-centered interactive design, aiming at modeling best practices for teaching classical topics, such as the "Odyssey".

Keywords: digital storytelling; transmedia; education; non-developers; multimedia in education; blended learning



Citation: Palioura, M.; Dimoulas, C. Digital Storytelling in Education: A Transmedia Integration Approach for the Non-Developers. *Educ. Sci.* **2022**, *12*, 559. <https://doi.org/10.3390/educsci12080559>

Academic Editor: James Albright

Received: 9 July 2022

Accepted: 13 August 2022

Published: 16 August 2022

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1. Introduction

Undoubtedly, the effort to constantly modernize the educational process, making it more attractive and efficient for students, was and remains of great importance, receiving outstanding attention from all involved actors in schooling practices. An innovative and multidimensional way of renewing learning procedures is the incorporation of "new technology." There has been a lot of discussion and research that has proven the usefulness of digital tools in schooling, turning the whole process into a new, exciting experience that engages students [1–5]. However, some educators, especially the ones coming from fields of theoretical studies, seem skeptical and wary of the latest tendencies while maintaining traditional teaching methods. To these doubts comes the answer to the research on the effectiveness of technological means integration in teaching philological courses [4]. The diversity of the world, as expressed through traditions and events, is endangered by the rapid pace of modern life, technological and economic development, and globalization [5,6]. That is why the entire research community must protect classical studies and cultural

heritage by understanding and integrating dedicated digital tools without falling, neither into overwhelming haste nor to groundless hesitations or unjustified doubts.

The hesitation can be explained by the lack of specialized knowledge and associated experience, causing inadequate digital literacy, which can further trigger inhibitory defense mechanisms. This denial attribute might also fade the teachers' interest in keeping up with the new blended learning trends, neglecting the consideration of graphical and user-friendly tools and services, mainly delivered through light-weight drag-and-drop interactions [1–4,7]. The current project aims at demonstrating the availability of media assets and interactive learning tools that educators can easily, quickly, and effectively deploy, even if they do not possess developing skills. Engaging the schooling community in seeking modern methods of digitally assisted learning is a challenge that, among others, will familiarize both teachers and students with the recent technological developments. Such a course can bring forward a multitude of innovative approaches and practices to meet the different needs of various educational topics and audiences.

The main hypothesis is that interactive media have not been fully productive yet in the educational process, especially in cases where teachers lack media authoring expertise and learning software fluency. Related findings on the adoption of game-based studying, gamification practices, online learning and management systems, and transmedia storytelling approaches have shown a significant impact on the schooling procedures and outcomes, including the cases of traditional, social or humanoid disciplines, such as history, language, art, culture, sports, and others [1–5,7–17]. Transmedia education and blended learning methods have also emerged and, in many cases, have dominated as new pedagogy trends [7,18–23]. However, less progress is observed in scenarios like the one dealing with, i.e., meeting the listed conditions of reduced technological expertise and familiarity with digital/non-linear storytelling [24]. The current research aimed at elaborating on the above perspectives through the logical user-centered interactive design (LUCID) principles and component-based software engineering (CBSE) models [5,24–28], making productive, less complicated and/or accessible authoring services and reusable media assets to value audience engagement and enhance the mediated learning experience. Hence, the stated hypotheses about the availability of user-friendly storytelling tools that non-experts and non-developers can operate in learning are questioned and verified.

The rest of the paper is organized as follows. The following section discusses related work while highlighting the targeted innovation. Then, Materials and Methods illustrates media production and authoring processes through the phases of analysis, design, development, and evaluation. Next, Experimental Results and Discussion demonstrates the implemented outcomes and their corresponding assessment, which are analyzed to answer the stated hypotheses and questions. Finally, Summary and Conclusions outlines the introduced novelties and the contribution of the conducted research, indicating future directions of elaboration and deployment in broader domains.

2. Related Work and Targeted Innovation

Emanating from the fact that younger people are frequently involved in playing digital games (on a computer or mobile device), serious gaming and gamification practices have emerged to be utilized in the educational context [1–8,29]. Teaching becomes efficient when implicating entertainment as part of the process, creating comfort and motivation for the students, therefore engaging them in the learning procedures. The fundamental contribution of fun is to provide relaxation, willingness, and inspiration. Comfort activates the class to take things in more successfully, while motivation triggers participants to do their best without bitterness [28–30]. While gaming features and potentials have been analyzed in different theoretical views and perspectives [1–8], their main advantages lay in their amusing character, stimulating users to participate actively and enjoy the offered interactions, thus making the most of their engagement. Such utilities can be vital components of digital storytelling and, particularly in transmedia learning, keeping students' interests undiminished. They can have either the form of serious games, used to fuel knowledge

acquisition and testing in more pleasant ways (within a game world), or as gamification paradigms, borrowing gaming features (control, challenge, curiosity, leveling, leaderboards, etc.) to trigger healthy competition and emulation between participants (even if a digital game is not involved at all). As further documented in the following paragraphs, such modalities can be combined in multiple ways within a transmedia narration, motivating users' attention while also augmenting the deployed communications into richer media experiences.

The entertainment industry has found new ways to engage the public by merging media with marketing and amusement strategies. In addition, this content delivery approach has been extended to the educational process. The range of phenomena referred to by the term "transmedia storytelling" includes many different aspects that combine the new cultural context, social media, the exchange of information on the Internet, promotion and dissemination campaigns, and user connectivity models [31,32]. Among others, the use of multiple media can encompass cross- and transmedia access or interactions, thus linking audiences in rich media experiences and collaborations of shared and semantically enhanced digital assets [32–34]. Such features are considered favorable within the targeted blended learning framework, allowing for the combination of the availability of tools and resources on the one hand with the non-linear storylines and the engaging navigation/interfaces on the other. In the same context, computer gaming could become even more practical for training and teaching, representing alternative/advanced multimedia applications that mix education with challenge and entertainment. Thus, learning becomes more enjoyable, effective, and efficient [1–8,28–30]. The most exciting part is that transmedia storytelling can syndicate the serious gaming advantages with the rest of the technology-assisted learning benefits in an organic and integrated infotainment adventure.

Learning by example is another paradigm that has gained popularity with time. Many users prefer developing their skills based on multimedia content, which encloses the archetypal audiovisual presentation and perception of information through which human beings are accustomed to communicating with each other (and learning) [25,27]. Hence, this type of mediated interaction is considered more informative and vivid, so it is advantageous to acquire knowledge through practice without needing guidance from theory textbooks. At the same time, the use of learning platforms facilitates the process of memorizing the interface while also making use of automated suggestions, customization, and users' and/or topics' adaptations. Story-driven content (e.g., novels, movies, computer games, etc.) is efficiently converted to diverse and interconnected media, easily digested by the audience. Diversified media nodes are involved as the informatory streams are sizably linked to transmedia ecosystems. They can offer alternative navigation routes, presenting subjects and topics from different angles, techniques, means of interaction and levels of complexity, thus allowing users to form their preferred path and pace of learning. Mobile devices enable users to receive time-, location-, and context-aware prompt information, while abundant sensing technologies activate various innovative services and an ambient co-existence between the digital and the physical worlds. For instance, mobile terminals can be viewed as interfaces to retrieve further (related) information when visiting a place, triggered by wireless sensors, quick response (QR) codes, or photos of characteristic landmarks that phone cameras can capture. In the same context, they can augment the physical world by superimposing additional multimedia or 3D content onto paper-printed material, i.e., maps, books, newspapers. A characteristic example in this direction is the augmented reality book (AR-book), a trend that attempts to restore the relation of readers to the printed media without lacking access to web and multimedia resources [32]. These tools can be utilized in self-learning and experiential learning modes, including teamwork-exploring activities where gaming elements can also bind (e.g., treasure hunt games). Audiovisual narrations are further offered as non-linear storytelling through desktop terminals or extended reality (XR) experiences, conveying the central part of the learning resources to be comprehended [32–38].

More explicitly, storytelling is a messaging system that reveals a narrative or creates an experience through various environments and interfaces, activating all students' senses

in the lesson process to successfully transmit information. This narrative approach becomes effective because it uses a variety of means and tools that trigger the receiver's attention to receive information. It achieves this by using diverse media channels and/or technology platforms that retain their own characteristics. Still, multiple media can tell different stories, though they explore a basic or common theme that one can experience through multi-angled storyline perspectives. It is also essential to consider the lifestyle and the habits of the receivers and the environment to adapt to the needs of the concerned learning interaction [31,39].

Transmedia storytelling involves creating a new set of interconnected tales/events that go beyond traditional narrations and require new user engagement terms. These stories manifest themselves less as unique plots, viewed mainly by readers and viewers as architectural portrayals of universes inhabited by many characters, articulating complex temporalities and conflicting perspectives. Transmedia stories can be filtered through different prisms, with changing narrators and transformations in focus [18,19,31,32,39]. Combined with gaming and gamification elements, storytelling interactions shape the assumption of blended learning effectiveness compared to typical schooling. Undoubtedly, traditional learning in its simplest form, namely using textbooks, whiteboards, human instructors, and face-to-face classroom communication, seems to achieve its goal of conveying skill or knowledge over time. However, it provides limited engagement, relying exclusively on physical communication with the teacher and classmates, thus being inadequate, in many cases, to keep the students' concentration and fulfill its learning aims [40]. Yet, the traditional way's effectiveness, being solid and stable within class environments, can be further enhanced and assigned a continuous value by combining primary gaming features, such as fantasy, control, challenge, curiosity, leveling, leaderboards, etc. [1,29,41]. It is worth noting that digital storytelling succeeds in bequeathing knowledge, experiences, performances, customs, artifacts, and testimonies from one generation to the next, thus shaping common educational cultures and bonding the communities [16]. Using interactive functions, the provision of experiences with enriched media is achieved, ensuring the steady growth of literacy, and learning mechanisms, thus augmenting the teaching experience, especially for the traditional disciplines that are less attached to the technology. Overall, technology offers alternative routes to practical training activities, exhibiting increased engagement prospects by utilizing digital media that younger people have been accustomed to (thus, making them feel more comfortable in their own digital world). In all cases and especially when quality and/or creative teachers are involved, these tools offer a multitude of different options to trigger students' attention and active participation.

The institutionalization of blended learning models takes advantage of a range of traditional face-to-face teaching with online activities, offered through a diverse mix of educational resources (seminars, lectures, self-regulated study, mediated communication, and interactive multimedia simulations) [42]. In sum, it combines the advantages of both classroom and digital learning, offering ease of use, removing time and space restrictions, increasing student efficiency, and extending comprehension capacities in the physical interaction with the participants. Indeed, research has shown that well-designed blended learning enhances the experience and extends thinking through messaging technology [43]. For instance, using online educational videos to supplement physical lessons can substantially fuel students' motivation and learning outcomes [44].

However, there is a lack of agreement on the ways that various institutions define, measure, and apply blended learning [45], an issue that somewhat increases creativity and freedom of choice. Nonetheless, the pandemic COVID-19 situation has made digital media and technological solutions a necessity in the educational process, with higher education students exhibiting remarkably adapting and engaging attitudes [46]. At the same time, well-designed examples can positively impact technology acceptance, further enhancing learning potentials by individualizing practice [47]. Nowadays, set plans gaining popularity rely on a combination of multiple teaching methods to maximize effectiveness [48]. Overall, blended learning seems to be a promising solution that has attracted the interest of many

researchers and educators, making the most of the various elements to design frameworks that are equally effective for students and teachers [48,49].

Such technology-enhanced learning methods have become very popular and effective when it comes to disciplines involving digital technology [14–17,25] and contemporary media literacy needs [1,32], which demand multidisciplinary topics [2], cultural heritage projects stimulating audience entertainment and participation [6,8,16,24] and serious games triggering infotainment and experiential education to elementary school users and older groups [3,5,29,30]. Popular examples of game-based and blended learning approaches are frequent in the fields of science, technology, engineering, and mathematics (STEM) [50–52], where art is also gaining popularity and acceptance, forming the STEAM education paradigm (as an extension to STEM) [53]. To the best of our knowledge, related efforts are limited in such an integrated manner for teaching classical topics, such as the “Odyssey” [4].

3. Research Aims and Project Motivation

A transmedia storytelling framework can enable productive hybrid and blended education values by utilizing (mainly) from-the-shelf learning resources and reusable media assets through a component-based software engineering approach. Thus, educators who cannot develop or customize their own learning software are left with the option of relying on the available tools and environments that they are able to operate. In this context, the heterogeneity of techniques and interfaces may be considered a disadvantage, usually urging teachers to leave aside some of the wanted functionalities, i.e., the ones offered by tools that do not match the rest of the selected applications, their primary functions and aesthetics. However, what might seem like a weakness can be turned into an advantage when a proper transmedia integration is deployed. Multiple media channels, content types, processes, and computing terminals can be properly interlinked, authored (when possible), and combined into an integrated entertaining experience, engaging the audience to seek all the conveyed information through different learning paths and interactions. Furthermore, apart from appealing to the students’ interests, lesson plans on transmedia storytelling practices can also satisfy teachers, triggering their inspiration and co-creation potentials.

This work aimed to investigate the availability of tools and learning resources that could become applicable in transmedia storytelling, deployed by teachers with non-developing skills, seeking best-practice solutions to questions that concern the modern educational community. The primary research hypothesis (RH) is that multimedia technologies are not fully utilized in teaching philological courses, so there is vital room to cover essential perspectives, improving audience engagement, learning outcomes, and the educational process as a whole. Based on this hypothesis, the following research questions (RQ) are specified. (RQ1) Can teachers seek, find, and combine appropriate learning resources and reusable media into an integrated transmedia storytelling experience, favoring blended and game-based learning, even if they lack core programming and technological skills? (RQ2) Are the students interested in such technology-enhanced teaching scenarios, and what is the expected impact on their learning engagement and efficiency?

As already explained, the topic representing the vehicle for the attempted investigation is a classical philological course, which will be digitally enhanced and delivered through a web-based platform, contributing to the acquisition of the cognitive object in a modern and technological process. This will offer students the opportunity to view the “Odyssey” and the “Iliad” not as outdated areas of reflection but as timeless works. Since modern society bases its structure and thinking on technological developments, the philological lessons must not ignore this trend of the time but react by keeping up with it. In this way, it is possible for both philological themes in general and the Homeric epics, in particular, to have a place in societies over time and their value to remain unchanged over the years. The ultimate goal of the project is to achieve a modern and innovative technological approach to the “Odyssey” lessons that raises students’ awareness, inspires teachers, and modernizes the educational practice to deliver the needs of the times. It has to be noted that, in contrast to mainframe studies on social sciences, research surveys are not considered the primary

means to answer hypotheses and questions here. The main concern of the approach is to deploy an interactive design integration towards transmedia storytelling in education, which will point out best practices in developing blended learning resources. The project follows a standardized UX design and application development methodology, in which audience engagement and reinforcement are required as parts of the analysis and validation procedures. Therefore, significant research findings are sought in content-/service- and user-aware perceptions, considering the roles of both trainers and trainees involved in this process. Further insights are made available through the quantitative and qualitative data provided by the analysis and assessment procedures of the multimedia production project.

Overall, the organization of the current research goes as follows. Elaborating on the theoretical analysis that validates the appropriateness of digital storytelling and transmedia integration (broadly in education), philology, and more specifically, the “Odyssey” course example, are treated as the case study for the experimental validation of the stated aims and goals. The selection of this specific domain has three-fold grounds. First, there are very few related applications, and second, associated teachers are less familiarized with the implicated technologies (both expectations were confirmed during the initial analysis, shaping the project idea, and overall, during the project execution phases, as further justified in the respective Sections 4.1 and 5.2). The third and even more critical reason emanates from the urgent need to protect classical studies and their cultural heritage, preserving and documenting their value through digital narrative technologies. In this context, this pilot project can have a pioneering character, providing the foundation for other teachers (and students) to extend the current research in multiple directions. Educators can utilize the crafted services in real-world situations, in actual classrooms, and also monitor how students’ performance is affected within this new setting. Others can further elaborate on the formed transmedia content, producing additional resources while customizing them to their classes’ needs. Different communication and schooling utilities can be set on top of the available storytelling components to trigger engagement and/or gamify knowledge acquisition. Finally, the deployed UX design and development practices can be adopted by others who would like to repeat the entire procedure, either for selecting alternative configuration and focus (e.g., use of different tools, modalities, presentation methods, etc.) or for employing them to other domains (e.g., broader STEAM courses, including geography, civics, culture, and others).

4. Materials and Methods

The current work elaborates on an interactive UX design methodology, assembling learning resources into a transmedia storytelling integration to supplement the teaching of classical or philological topics through hybrid or blended education. The main target set for the proposed framework is to be easily deployed and handled by educators with limited technological know-how and without possessing substantial software and/or multimedia developing skills. Therefore, to test the validity of the approach, it is vital to investigate the availability of appropriate resources and tools that can be productive during the authoring process, involving people with the above capacities. In this context, the CBSE model is considered the most applicable, combined with the human-centered LUCID implementation scheme, structured in the phases of analysis, design, development, and evaluation [1–5,27–29]. Figure 1 incorporates the above parameters into a spiral rapid prototyping layout to serve the raised challenges and needs. Specifically, the blueprinted configuration allows all the involved actors (teachers, students, technologists, and subject matter experts) to be part of this co-creation process, shaping novel collaborative ideas and best practices in transmedia learning organization and management.

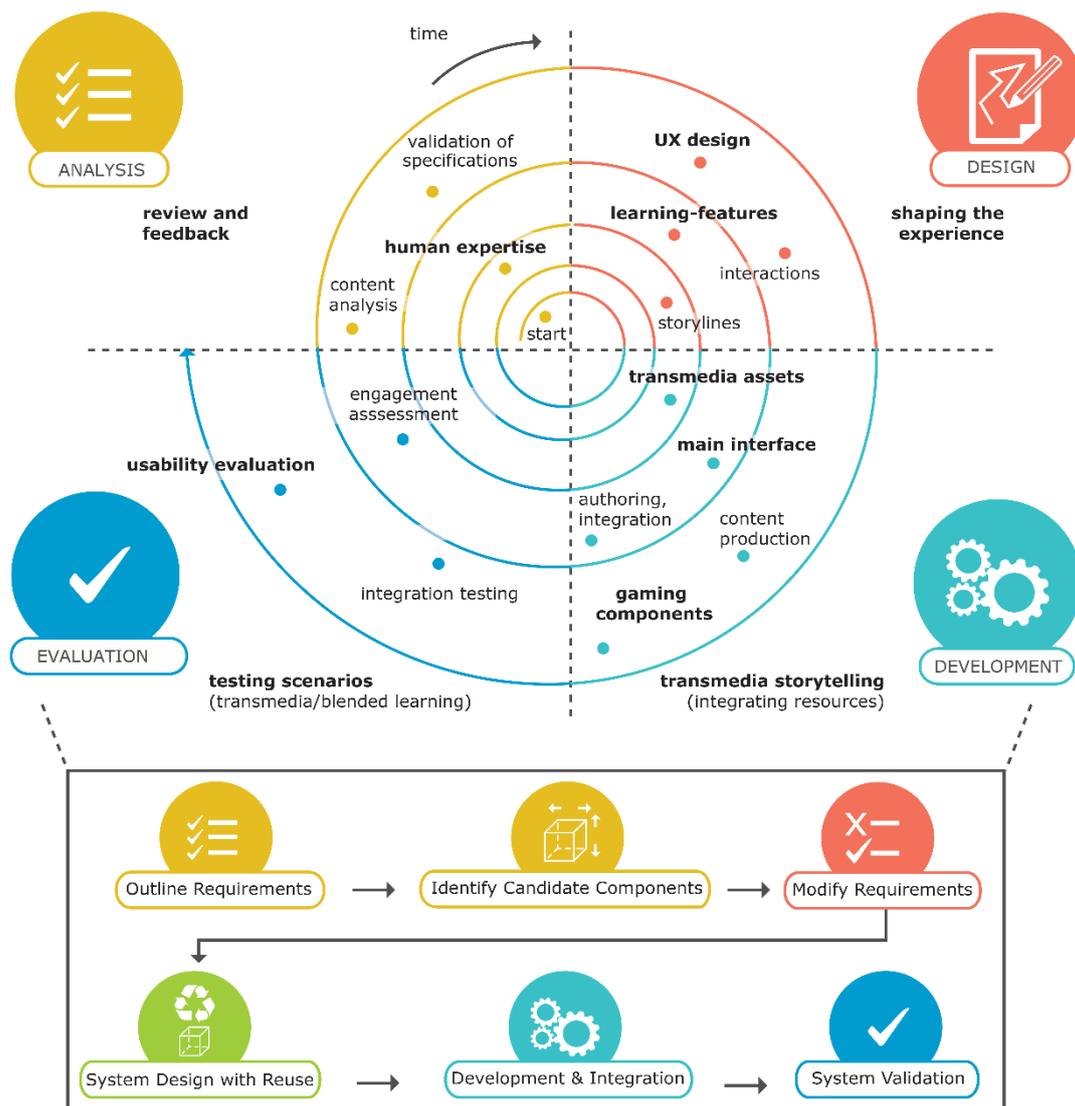


Figure 1. The configured rapid prototyping spiral model combines component-based software (and multimedia) engineering (CBSE) with logical user-centered interactive design (LUCID) techniques, so it is considered suitable to serve the needs of the current project [27].

4.1. Analysis

The initial hypothesis is that multimedia provides multiple informatory channels to users and, in the context of teaching, it can be very encouraging for students, helping them master the subject in new ways. The combination of text, audio, image, and video allows the students to observe real situations in ways that are not possible with more conventional teaching methods while offering a high level of interaction and stimulating engagement. Most multimedia training programs expect individual trainees to choose how to proceed with the provided resources and work through the content, turning them from passive to active participants. In addition, interactive media can theoretically tackle different learning strategies, allowing participants to set their own studying pace. Thus, selecting the most suitable content entities and communication methods is considered very important and has to be essayed during the analysis tasks. The initial assumptions were investigated through studying and constructive deliberations within the production (and paper authoring) teams, resulting in the formation of an audience analysis questionnaire, further used to test the validity of the shaped expectations, as described below.

Starting the analysis with the suitable content types, large texts are not preferred by the users and can also trigger defensive attitudes, such as considering it to be “a book that

has been converted” and “not real multimedia design”. Therefore, technically speaking, while textual data is easy to handle and store, as a rule (as a principle), the text should be short and the font should be legible on the computer screen. Storytelling producers should keep textual information to the minimum possible level (which may vary depending on the topic or the application), preferring visual and multimedia elements that make the presentation more vivid and attractive. In case that text holds an essential part of the process (such as in the case of education), it would be better to add an extra channel (i.e., PDF, HTML) just for these documents [1–3,27,28,32–34]. In the current approach, we suggest that textbooks maintain their unique and vital educational role. Their digital counterparts (e-books) can supplement the process, offering easy distribution and sharing options. These textual components can be considered peripheral to the proposed transmedia storytelling (but critical in the implicated educational procedures), claiming that producers should concentrate on the remaining audiovisual and multimedia assets. The direction here is to confine textual elements to the utter necessary in the crafted screens and interfaces, utilizing the peripheral textual channels for delivering the associated teaching documents.

Though graphics are considered more complex and demanding than text, they also shape the design and aesthetics of a multimedia title, adding visual appeal and expressing concepts that text alone cannot easily communicate. In addition, photos, animations, and visual effects can make things clearer and more attractive to the students, thus helping them comprehend complex concepts. In sum, while textual and imaging assets do not represent the strongest part of today’s digital storytelling, they can certainly not be left aside, especially where education applications are concerned. Moreover, apart from the inforamatory content itself, these entities can have a significant role in interfaces, supplementary reading material, gaming, and other interactive elements. In all cases, the above practical rules still apply, suggesting text lengths of a reasonable extent and with sans serif fonts of appropriate sizes to assist screen readability, while avoiding mixing too many different font styles, sizes, colors, etc. [20,27,28].

Moving to the core audiovisual elements that are considered more paramount in multimedia frameworks, audio can be in the form of speech (ascribing narration or dialogues), music, or sound effects (natural or synthetic). Native sounds can have a diegetic nature, representing actual sources from the story world, visible or not. Furthermore, music and sound effects can form an ambient background, used to set the rhythm of the movie and the pace of the action, shaping the atmosphere and the entire aesthetics of the storytelling [54]. In education, spoken words may complement written text with sound tracks being capable of creating a mood, adding emphasis or realism, or enhancing multimedia interactions [4]. Furthermore, video offers a level of authenticity similar to TV movies and documentary shows, with some performance limitations. Hence, audiovisual material can efficiently represent tasks and events that words and graphics are insufficient to explain.

Audio and predominantly video streams represent the core storytelling ingredients that offer the desired immediacy and vividness, which, along with interactions, are intended to engage the audiences. However, both assets are more demanding regarding storage capacity, network delivery bandwidth, and processing power needs. In all cases, audiovisual quality cannot be sacrificed over fast processing, operation, or navigation conveniences. Especially in education uses, low standards of mediated communication can trigger quality-of-learning (QoL) degradations or other unpleasing side effects, i.e., poor aesthetics and improper emotional framing that moderates the quality of experience (QoE), thus lowering attraction and engagement dynamics [55–57]. Making high-quality clips is not an easy task. Although there have been advancements in video transmission and playback services, you should have a clear idea of the performance of users’ standard devices when incorporating motion pictures and “filmed” material in a multimedia application. A typical approach is to compromise between video screen size, resolution, color pallet, clip length, file format and sizes [4]. Responsive design attributes should be engaged when possible, allowing content to adapt according to the users’ terminals and screens.

The conducted investigation emanated from studying related publications and textbooks [20,27,28,54–57] while also discussing these matters within the production team with an orientation towards the targeted transmedia storytelling educational approach. In addition, the presented findings were further validated by reviewing related applications to acquire a clearer picture of today’s landscape in the field. It is worth noting two such educational tools falling in the online game category, namely “The Odyssey: Winds of Athena” (https://store.steampowered.com/app/416080/TheOdyssey_Winds_of_Athena/ (accessed on 8 July 2022)) and “The Odyssey” (https://store.steampowered.com/app/516560/The_Odyssey/ (accessed on 8 July 2022)), as they both deal with the theme of the “Odyssey” [4]. Additional learning applications were indicated, even if they focused on different subjects, to identify accessible assets and reusable resources that could be utilized in the current approach (furthermore, this was among the set goals from the early beginning of the project). Overall, it revealed the lack of transmedia applications that encompass many of the desired functionalities in an integrated manner, thus confirming the drawn directions while also providing valuable insights to validate the applicability of content entities, communication means, and desired interactions.

The outlined suggestions can be thought of as rules of thumb or best practices that educators with similar concerns should have in mind. Yet, apart from this qualitative analysis approach, a related questionnaire was also formed to examine the needs and preferences of the targeted audiences. Table 1 lists the main questions incorporated in this study, in which high-school students, graduates, parents, and educators participated, following all of the procedures and rules suggested by the “Committee on Research Ethics and Conduct” of the Aristotle University of Thessaloniki. Furthermore, the declaration of Helsinki and MDPI directions for the case of pure observatory studies were also adopted. The questions were shaped and hosted online to be fully anonymized, explaining to candidate subjects that they would agree to the stated terms upon sending their final answers, with a persistent indication that they could quit anytime without submitting any data. In the case of underage people, the above directions were presented both to children and associated parents, who gave their full consent. Overall, the conducted studies followed standard and well-tested procedures, as established in previous research [3] (the same methodological approach was also applied in the associated processes of the evaluation phase).

Table 1. The formed audience analysis questionnaire. Presentation of the main questions through simplified/reduced-length sentences, compiled from the Greek language.

Question	
A	Are you familiar with the plots and the heroes of Homer’s epics, Odyssey and Iliad?
B	Do you think that Odyssey, and broadly classic studies, can be assisted by multimedia content and transmedia storytelling approaches?
C	Do you think today’s teaching approaches on such classic topics can be efficiently and effectively combined with multimedia tools?
D	Do you think that Odyssey courses, in specific, can be supported with multimedia resources? Are you interested in that perspective?
E	Have you ever used digital storytelling technologies for studying theoretical courses?
F	Are you using digital storytelling technologies in any of your classes or self-training?
G	How effective do you think blended learning, combining traditional teaching with digital means, could be as a hybrid approach in theoretical courses?
H	For what age/educational stage do you think such hybrid learning would be more appropriate?
I	How often do you play knowledge games?
J	Do you think that the content quality and aesthetics of multimedia learning resources are crucial for comprehending the associated topics?
K	Do such hybrid approaches promote fruitful teamwork/cooperation in the classroom?
L	Apart from mastering the topic, do such self-learning approaches promote other skills or engage students to seek additional knowledge?

The audience analysis survey was conducted between 15 October 2020, and 11 November 2020, receiving a total of 102 answers, with targeted candidates randomly recruited, having an age distribution of 10–12 years (12.5%), 13–14 years (26.9%), 15–17 years (14.4%), and >18 years (46.2%). The role of the participants was also varied between students (57.4%), teachers (16.8%), parents (4%), and other graduates i.e., (last-year) philology students and educators (21.8%). The involved subjects were recruited in a best effort approach, i.e., trying to involve as many representative users as possible. Since participants should have been familiarized or involved with the “Odyssey” course, a purposive sampling frame was used. As already argued, these measures are meant to validate the representativeness of the test population with regard to the targeted audience, to be further utilized in the interactive UX design approach (and not to seek deeper statistical correlations that social science studies would emphasize). The received answers are analyzed with the rest of the acquired data in the corresponding results and discussion section.

Elaborating on the obtained content and audience analysis insights, the next step was to investigate tools and resources that could handle the indicated media entities (text, image, audio, video, gaming or interactions, etc.). Overall, all of the stated multimedia types were considered most helpful for the current application needs, as long as the associated processing and authoring environments can be accessed and easily operated by educators exhibiting limited technological familiarity and developing skills. Therefore, the need for image, audio, and video creation and editing was initially emphasized, followed by tools for authoring audiovisual narrations, multimodal presentations, gaming interactions, and spatiotemporal or mapping navigation elements. Once baseline tools and platforms were found, they were more carefully investigated in the design phase while setting up a more detailed implementation plan, as presented in the following sub-section.

4.2. Design

Project analysis is very important for elaborating on an initial idea, determining the needs and expectations of the users, and listing related tools and applications that can be productive, either by mimicking useful interactions or by utilizing reusable media within the adopted CBSE model. The role of the design phase is to gather these inputs and proceed with a more detailed organization plan, taking the initial functional and aesthetic decisions to the next level while also projecting the crafted ideas onto more specific blueprints of low- and high-fidelity prototypes [4,27]. Another essential task is investigating suitable candidate tools that feature the set criteria of easy (less demanding), accessible, and user-friendly operation. As already explained, transmedia education is based on telling stories via many different media, flowing across multiple platforms, and adapting to the participants’ devices, space, and time. Hence, diverse multimedia elements, e.g., comics, novels, video games, mobile applications, interactive videos, etc., work as a standalone story experience that becomes complete and satisfying. In this context, a bundle of media assets becomes available, each one containing learning resources on the discussed/taught subject(s) from a different/sole focus or perspective, which students can access on demand to educate themselves on these specific (sub-)topics. At the same time, transmedia browsing and interaction mechanisms allow navigation across the entire multimedia storyline through predefined or users’ selected routes, thus assembling the entire course material into a “storytelling syllabus”. Each of these forms contributes to the performance of a greater narrative in a cumulative process, while also projecting the necessity of different editing and authoring tools. The benefits of storytelling fuel amusement through engagement, dedication, interaction, and audiences’ cooperation. Thus, it involves the advantage of fast media and consumers’ connectivity in prodigal virtual (and physical) environments that have been proven to enhance true emotional commitment [58].

In summing up the desired features and functionalities of the learning resources as they were extracted in the analysis phase, students’ engagement and motivation are considered prominent [59]. Hence, audiovisual and spatiotemporal activities of interaction favor the targeted edutaining storytelling by stimulating vivid and rich-media experiences [13–16,24,54,60].

Specifically, multimedia presentations and interactions are beneficial to convey the desired messages, while mapping games and utilities allow users to match with time and place landmarks. Such modalities can take the form of a digital mapping activity, i.e., using Google Maps or similar services to explore story routes, import further data, or test the acquired knowledge through respective educational games. In more sophisticated scenarios, mobile devices can be used to associate physically accessed places with the associated events (i.e., when visiting an area of interest, when involved in space exploration activities through treasure hunt gaming approaches, etc.). Such interactions pursue deeper audience engagement, enriching the mediated communication experience. Similarly, broader gaming and gamification elements can further trigger interest, thus keeping users' attention tireless [1–4,8,18,29,30]. Film/video and audio-only serious games have become very popular in this context, being broadly employed in modern education applications [61–63], with the audio track being considered critical in shaping the pace and the atmosphere of the digital narrations and interactions [54,62–64]. Nonetheless, seamless interactivity is nowadays granted and deployed through the Web, allowing students to pick up and control their own learning pace and space [47,65]. Overall, to serve the above functionalities, someone needs access to audiovisual capturing and editing software along with gaming and web authoring tools. It is rather needless to point out the importance of scheduling and prototyping kits, especially within the plethora of channels and modalities of transmedia storytelling, thus requiring careful design and planning. Table 2 presents an overview of software platforms investigated and evaluated for the current project's needs, indicating their use with the associated accessing/licensing rights. Further details concerning the role and impact of selected tools are given in the subsequent development section, illustrating their contribution to the "Odyssey" project.

Table 2. List of software platforms and tools, investigated for the multimedia production and authoring needs (the listed tools are categorized and sorted in alphabetical order within each category).

Design Mockups: UI Design, Wireframing, and Prototyping Tools
Adobe XD: Fast & Powerful UI/UX Design & Collaboration Tool (commercial product with discount plans for students and educators)
Axure (www.axure.com/): Wireframing environment for designing low-/high- fidelity UIs/interactive prototypes with practical scripting/coding and sharing utilities (commercial product, Free Subscriptions for Students & Teachers: www.axure.com/edu)
Balsamiq (https://balsamiq.com): Wireframing environment for designing low-fidelity UIs/interactive prototypes (commercial product with free educational programs: https://balsamiq.com/givingback/free/classroom/ (accessed on 8 July 2022))
Figma (www.figma.com): Wireframing environment for designing low-/high- fidelity UIs/interactive prototypes with useful sharing utilities (commercial product with free use for education: www.figma.com/education/ (accessed on 8 July 2022))
InVision App/Studio (www.invisionapp.com , www.invisionapp.com/studio (accessed on 8 July 2022)): Online and desktop/studio wireframing environments for designing high-fidelity UIs/interactive prototypes with useful collaborating/sharing utilities (commercial product with free education use, for teachers and students: www.invisionapp.com/education)
Design graphic/visual content and editing tools
Adobe Photoshop: Among the most popular and convenient in use image editing software (commercial product with discount plans for students and educators)
Canva (www.canva.com): Online/desktop design tool for vector and raster graphics, favoring the cooperative creation and sharing of diagrams, images, animated presentations, and broadly visual material (free in the base release, also offering pro and enterprise plans)
GIMP (www.gimp.org): Free and Open-Source Image Editor for creating, processing, and editing visual content (photos, graphics, diagrams, etc.)
Storyboardthat (www.storyboardthat.com): Online environment started as a storyboarding tool, now offering digital storytelling and authoring utilities, cooperating with many relevant tools: Canva, Google Class, etc. (commercial product with discount education programs, freely accessible to educators at previous releases/plans, i.e., the time this project was being implemented: https://www.storyboardthat.com/education/learn-more-about-classroom-edition (accessed on 8 July 2022))

Table 2. Cont.

Audiovisual content production and editing tools
Adobe Audition: Among the most popular and convenient in use audio/DWA software (commercial product with discount plans for students and educators)
Adobe Premiere: Among the most popular and convenient in use NLE video software (commercial product with discount plans for students and educators)
Audacity (www.audacityteam.org): Free, open source, cross-platform audio software (Digital Audio Workstation -DAW) for recording, processing, and editing audio tracks
DaVinci Resolve (www.blackmagicdesign.com/products/davinciresolve (accessed on 8 July 2022)): Free Non-Linear video Editing (NLE) software, combining editing, color correction, visual effects, motion graphics and audio post-production (DaVinci Resolve is the free edition of the commercial version, known as DaVinci Resolve Studio)
Kdenlive (kdenlive.org): Open-source video editor initially developed for Linux OS, considered professional enough for a free tool (and for most people) for serious editing works, including keyframe color corrections, 2D animated titles, and recently multi-cam editing, etc.
OpenShot (www.openshot.org): Open-source and free video editor, providing basic/adequate editing functionalities. To some users, free access comes with some disadvantages, such as unstable performance, limited editing features, less powerful hardware acceleration, and obsolete interfacing. Nonetheless, improvements are constantly conducted, resulting in winning several open-source video editing software awards
Shotcut (shotcut.org): Free, open-source, cross-platform video editor, claiming to offer wide format support, device and transport options, sleek and intuitive interface. Though it is not intuitively and professionally presented like its competitors, Shotcut offers resolutions as high as 4K with wide formatting support, thus highlighting its suitable functionality
Multimedia authoring, gaming, and map-driven storytelling tools
Adobe Captivate: Authoring tool used for creating eLearning content in HTML5 format, such as software demonstrations, simulations, branched scenarios, randomized quizzes, etc. (commercial product with discount plans for students and educators)
ArcGis StoryMaps (www.esri.com/en-us/arcgis/products/arcgis-storymaps (accessed on 8 July 2022)): Professional authoring tool for transforming and enhancing digital storytelling with custom maps (commercial product with multiple price plans, including a free version)
Genially (https://genial.ly/): Web-based authoring tool for creating interactive presentations, animated infographics, and even escape games, relying on the use of templates and visual communication (available in multiple price plans, including a free version)
Google Classroom: Web and mobile app offering a suite of online tools that incorporate learning management services, making it easy to host multimedia learning resources (including transmedia assets), while boosting collaboration and fostering class communication
Google Maps: Well-known and free web-based service by Google that provides detailed information on geographical regions and sites worldwide. Through the My Maps utility, Google Maps allows users to set up their own maps, enhanced with geographical information, relevant media, and links (offering map-driven storytelling authoring)
H5P (https://h5p.org/): Open/free HTML-5 editor for authoring interactive web content, i.e., interactive videos, presentations, quizzes, and gaming solutions. It has some restrictions concerning content hosting, which are overcome when using it with Content and Learning Management Systems (CMS/LMS), i.e., WordPress, Moodle, etc.
Klynt (klynt.net): A user-friendly desktop software for authoring interactive storytelling examples, like news reports, documentaries, e-learning, immersive/experimental environments, etc. (commercial product available in multiple price plans, including discounted education editions for students and teachers)
Lumi (https://lumi.education/): A desktop app that allows to create, edit, view, and share interactive content useful in education, with dozens of different content types (it is free and open source)
Quizlet (quizlet.com): Free web and mobile app offering a number of study tools, including flashcards and game-based quizzes. Teachers can use Quizlet as an authoring tool, to create classes and interactive learning resources
Storymap JS (https://storymap.knightlab.com/ (accessed on 8 July 2022)): Free and friendly storytelling authoring tool for creating web stories that highlight the locations of a series of events, enhanced with the incorporation of relevant multimedia assets
Twine (https://twinery.org/): Open-source tool for telling interactive, nonlinear stories. Publishes directly to HTML, so you can post your work nearly anywhere (completely free to any use, including commercial purposes)

Table 2. *Cont.*

Thinglink (www.thinglink.com): Education technology platform for authoring interactive images, videos, and virtual tours, augmenting them with additional information and links (available in multiple price plans, having low costs for education purposes, and also including a free version)
Venngage (venngage.com): Web-based authoring tool for creating interactive presentations, infographics, reports, diagrams, timelines, data visualizations, etc., relying on the use of templates and visual communication (available in multiple price plans, including a free version)
Wix (www.wix.com): Visual web authoring environment, working under the principle “What You See Is What You Get” (WYSIWYG), offering user-friendly operation through pre-crafted templates and layouts, including education themes (available in multiple price plans and a free version, standing as a free website builder)
Wordwall (wordwall.net): Web-based authoring tool for creating interactive learning resources to support custom classroom activities for your presentations, like Quizzes, match-ups, word games, and more (available in multiple price plans, including a free version)

Apart from their utilization in the present work, the materials and applications listed in Table 2 can help other educators (and researchers) with similar concerns search for and apply the right solutions for their mission. However, it is worth noting that the above list reflects the time and the conditions during project implementation. Constant monitoring is necessary when it comes to the investigation of available tools and learning resources due to the liquidity of the educational software market (i.e., new tools appear and disappear constantly). This searching process also aligns with the dynamic nature of the produced multimedia content being available for further use (i.e., education communities are active and, in many cases, learning resources are continuously produced and made available online). Therefore, educators who want to be involved in such production activities cannot entirely rely on the provided results, which might not serve their needs and align with their personal capacities, so they have to repeat the UX design procedure to some extent. For instance, many of the presented tools might have altered their offered functionalities or their accessing and licensing plans since they were last accessed. Hence, the investigation is necessary each time a new production starts, in which the above categorization (and indicative solutions) can facilitate and speed up the process at the beginning. In all cases, such interactions pursue deeper audience engagement, enhancing awareness about the offered technological capabilities while enriching the mediated communication experience, so this analysis practice is thoroughly recommended. It should also be clear that the preceding analysis focused only on easy-to-operate tools, with cost-free plans or considerable discounts for educational use. In this context, popular and mature software, listed among the industrial standards in the field, was also included, especially when they have had a long tradition and usage in education programs and associated releases (e.g., Adobe Photoshop, Audition, Premiere). No doubt, there are additional (professional) products applicable to the ultimate needs of the current work, but with increased demands on costs or background skills.

For instance, proficient (3D) creation and authoring engines like Unity, Unreal Engine, and Blender [3,5,27], utilized for developing sophisticated gaming and virtual navigation experiences, were left aside. Regardless of their free-use or open-source options, their quite complicated operation and nature results in relatively slow learning curves, thus making them not convenient for average educators (i.e., without essential coding experience). It is worth noting that nowadays, limited tools offer visual communication means to set fundamental scripting, interactions, and behaviors that are suitable for designers (and not developers). Adobe Flash, the last platform that embodied such design-oriented programming mechanisms, dominated multimedia authoring for decades. Many new products appeared in the market to cover that gap left behind when Flash vanished. However, most enticed small audiences without reaching the required stability and maturity, so they were quickly abandoned [27]. Within the last few years, low-code platforms [66,67] have emerged and elaborated to cover this perspective, i.e., to support average users in building their web interfaces. Specifically, the aim is to help individuals customize their front-end prototypes by selecting predefined user interface (UI) components, from which back-end

code is automatically generated. While these solutions seem very promising, they are not yet full-grown enough to become suitable for educators without development skills.

Regarding the specific needs of the design phase, Figma was selected for the tasks of prototyping and wireframing. At the same time, visual elements such as logos and graphical user interfaces (GUIs) were designed in Canvas and further processed in GIMP, where the necessary image treatment and editing were deployed. Finally, Storyboard that was used for drawing and depicting the graphic visualization of scenes and stories (i.e., storyboards) to serve the planning needs at the pre-production phase, taking advantage of the offered free-use plan (at that time). Additionally, it helped to design and elaborate on digital figures and characters involved as heroes in the plot of the story. Another critical aspect considered during the analysis and selection of tools was their cooperation and cross-platform operability dynamics, i.e., to maintain a high level of easy and flawless exchange of content (and functionalities) with limited format restrictions. Figma, Canvas, and Storyboard that satisfied such criteria, not only for their integration in the design process but also in relation to the other candidate development platforms.

4.3. Development

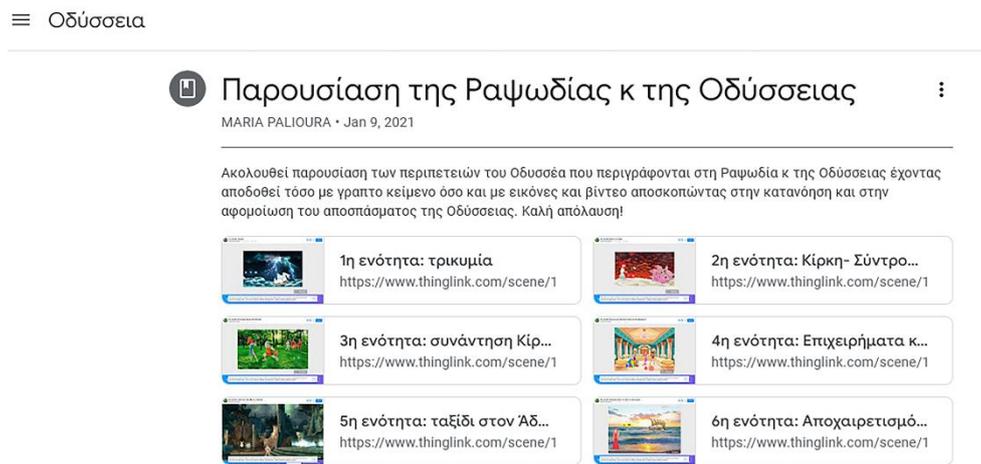
Extending the above analysis, Figure 2 provides a conceptual diagram of the approach with some details on the adopted implementation plan, expanding on the design and development aspects associated with the main tools and platforms selected for the needs of the production. Hence, elaborating on the initial planning on storyline structure and organization, the “Odyssey” (rhapsody K) is decomposed into short-duration narrative sections, each containing videos and images supplemented with text, audio, and interactions, thus favoring easy audience attendance and engagement. Thinglink was selected as the prior choice for these utilities, making productive its simple interfacing and use while also allowing easy extraction, linking, and embedding of the crafted interactive assets to other hosting services and applications. Google Maps and Wordwall represent the main authoring tools for employing map-adapted presentations and gaming elements, again because of their simplicity and easy operation by average users. Finally, Google Classroom was selected to serve as the starting front end (launching page), utilizing its convenient deployment and configuration with the offered multidisciplinary learning functionalities [47] while controlling access to avoid misuse of the implicated educational resources. A more specific materialization of this plan is shown in Figure 3, which is accordingly analyzed in the associated results section.



Figure 2. The conceptual diagram of the adopted implementation plan, elucidating the design and development aspects associated with the used tools and platforms.



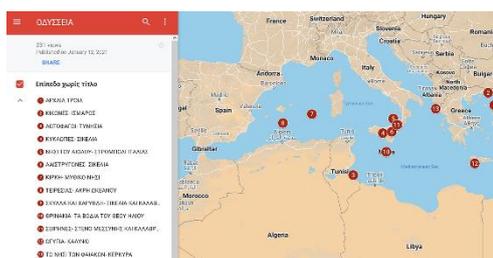
(a)



(b)



(c)



(d)



(e)

Figure 3. Representative screens of the “Odyssey” channels and learning resources: (a) the main page and (b) the presentations page, listing sections with audiovisual/interactive stories, both served by Google Classroom; (c) the sea storm caused by the Aeolus winds incident and the arrival to Circe’s island (interactive Thinglink presentations using text, image galleries, voice-over, and embedded YouTube video links); (d) a map example with important events in the “Odyssey”, implemented in Google Map; and (e) a Wordwall map-matching game, questioning the location of key sites in the “Odyssey”.

Google Maps gave us the opportunity to not only accurately place the areas where Odysseus traveled in numerical order, but also to present some critical information about his passions and how they were triggered in the associated locations. Creating a map is of great educational interest, being subjected to changes and modifications, thus engaging

students to effectively interact and recognize the actual areas of the implicated journey. Moreover, material-based knowledge games can be part of the digital storytelling twist, weaving maps and/or other resources in the process. Wordwall was selected for this purpose, utilizing its template-based authoring for both types of physical (printable) and online (interactive) activities, with the latter to be accessed by any web-enabled device, i.e., desktop and portable computers, tablets, smartphones, or interactive whiteboards. For instance, quizzes, crossword puzzles, and map matching exercises can test students' performance and their response time, while they can also initiate teamwork efforts with in-person or distant class collaborations. Multiplayer mode challenges can also be drawn, letting students participate in the same game at the same time, with each on their own device. Such featured utilities can be used in the classroom, accessing the game world through mobile (personal) terminals, or as a way of assigning homework, allowing teachers to control the game flow and the associated dialogues. Wordwall services can be hosted and made public on any web server or other LMS platform by embedding HTML code, thus permitting playback from any site. Additional events and communications can be set by sharing links on social media, via email, or other channels, with levels, leaderboards, and other gamification contests stimulating users' active participation.

Regarding multimedia assets production, imaging content was initially investigated, gathered, and adapted to the specific needs of the scheduled educational narrations. Thus, search engines and royalty-free photo repositories (Google Search/Images, Pixabay, Free pics, etc.) were used, seeking samples that satisfy both the aesthetic and the thematic context of the whole project. Typical processing and editing functions (color correction, cropping, noise removal, superimposing titles, etc.) were deployed in GIMP. Likewise, royalty-free music and sound effects were sought on respective sites (i.e., bensound) to cover needs in audio track themes. Audacity was used to record narrative speech (voice-over), apply ambient sound effects, and deliver the necessary processing and editing tasks. High-quality digitization parameters (44.1 kHz sampling, 16-bit) were selected for the main audio format, with recordings scheduled to take place in dedicated studios in the Laboratory of Electronic Media of Aristotle University of Thessaloniki, with the aim to avoid reverb and background noise contaminations [54]. However, because of the COVID-19 pandemic, many audio recordings had to be conducted in typical home environments, with compromised room acoustics and sound insulation standards. While this situation is initially considered a disadvantage, at the same time, it represents a real-world scenario, given that most educators do not have access to professional studio infrastructures. Thus, careful accommodations had to be followed, i.e., utilizing close-miking techniques, making recordings during silent periods, or using rooms with the lowest possible reverb (e.g., in bedrooms with open closets so that clothes would offer additional sound absorption) [27,54,64]. Furthermore, typical post-processing operations had to be incorporated and standardized in the procedure, i.e., checking the noise levels and overall dynamic range of the captured signals so that background noise removal (restoration) and mastering techniques would be applied once needed [54]. The adopted configurations led to the establishment of best practices to be followed as a roadmap in all relevant situations.

Videos were also produced, in the form of image sequences and animations, and enhanced with audio tracks (i.e., narrative speech, music, or even sound effects). Published material can also be linked using the associated URL addresses of the hosting platforms (i.e., YouTube, Vimeo, etc.). This adaptation aligns with the CBSE approach, allowing already available cartoon productions to tell the story of Odysseus in small sections. These short and concise segments do not tire students, allowing a better comprehension of the associated topics or even letting them express their own questions. The targeted rich media experience aims at exciting and engaging attendees in the storytelling, thus offering a more playful feeling by escaping from the strict context of the school lesson. In case use rights are not violated, content modifications can be applied, especially when the crafted learning resources are strictly used for educational purposes and set out of the market (which is quite

common in relevant classroom applications). The required video editing and processing can be employed through the cost-free DaVinci Resolve NLE software, combined with the associated image processing (GIMP) and DAW (Audacity) solutions. Furthermore, commercial and proprietary products can be implicated for more demanding processes, being available with an educational license at academic institutions like Aristotle University. For instance, popular programs such as Adobe Premiere, Photoshop, or Audition offer convenient operations with prevalent presets, easy to deploy for ordinary creative or technical tasks.

The prepared multimedia assets could be part of multiple sessions, i.e., interactive videos and presentations, knowledge games, map activities, etc. A question that has not been fully answered yet concerns the web hosting of the crafted services. Initially, the dilemma that arose was whether creating a new site or utilizing existing educational environments would be more appropriate. Elaborating on the outcomes of the project analysis and the evaluation of candidate tools during planning, the idea of creating a new website was rejected. Specifically, it was not found to be fully aligned with the proposed transmedia concept (and it would not serve any other role in the educational process). For instance, such an approach would probably create setup and management difficulties for the targeted educators, who are missing technical expertise. Furthermore, the public nature of a common solution (not focused on learning) would also weaken the personalization required by the envisioned (digital) classroom environment. Hence, the presented multi-sited storytelling dictated the use of multiple (parallel) channels, ensuring that resources would be accessible to all class members (or even their parents) and the involved teachers. Adaptation to the specific needs of each audience was also pointed out as vital to forming a “small society,” enhancing team collaboration with material and knowledge exchanges. Sharing the learning resources through multiple complementary media would also serve personalization, letting users select their preferred access points for each different activity. Combining the above argumentation with the already stated use-rights aspects and the learning management perspectives, Google Classroom was chosen as the main front end. In this central educational environment, all pages and services would be accessed.

Google Classroom is an online platform that facilitates online courses. The aim is to create an order through short procedures, in which it is possible to post tasks and material appearing in the students’ diaries while augmenting communication between class members (both synchronous and asynchronous) [47]. Services include sharing codes, assets, or links with which the whole class can participate in the lesson, communicating with parents and guardians (to whom updates are automatically sent), and storing frequently used comments in the comments bank for quick, personalized responses. Another specific advantage lies in the Greek language support and the availability of (Google) translation tools for adapting to any other language (hence, Greek). Moreover, Google Classroom is free of charge to all without being deprived of the services of all other educational platforms. Thus, you can access it exclusively with your electronic account and the corresponding codes, saving time and effort from overheads or other complicated procedures. Finally, Classroom represents an impressive and rapidly evolving initiative, with the support of a technological giant like Google, while ensuring the wanted modular architecture. In this context, educators could add further learning services, regardless of the involved authoring environments, i.e., Thinglink, Wordwall, YouTube, or others.

4.4. Evaluation

Evaluation is indispensable and irreplaceable in software and multimedia productions, especially when interactive UX design and rapid prototyping models are deployed [1–5,27–29]. In such approaches, which represent the case of the current project as well, assessment is continually applied at every development spiral iteration, both within the production team and with the help of external collaborators, i.e., experts of various topics and specialties. Apart from baseline usability testing procedures, education perspectives and students’ engagement measures should also be part of the process, given the nature of the transmedia

storytelling application at hand that encompasses blended learning principles. Further particularities arise concerning the specific topic of classical studies and the lack of significant relevant experience in the field.

Overall, two different and supplementary assessment approaches were followed, the formative and the final or summative evaluation. The former was deployed throughout the entire duration of the project and it was mainly conducted in qualitative terms. Hence, examinations, oral presentations, and discussion groups regularly took place, using both physical and distant communication sessions. The so-called “experts’ group” was formed, comprising thirteen people in total, including members of the production team. Specifically, the assembly consisted of six (junior) high school students, two literature high school teachers, three final-year university students in literature departments (displaying the roles of both teachers and learners), and two supervising university professors, i.e., academics with expertise in multimedia technology and UX design. All of the members were thoroughly informed about the project and their roles, agreeing to voluntarily participate in this informal board (high school students’ parents were also formally notified and gave their consent). The purpose of the formative evaluation meetings was to monitor the progress of the entire undertaking, provide valuable feedback and comments for corrective actions, and prepare the forms for the quantitative assessment approach. Hence, among others, they had to investigate relevant application testing questionnaires, adapting them to the needs of the current transmedia education approach and combining them with the set questions to explore the research hypotheses behind this initiative.

The latter approach, i.e., the final or summative evaluation, elaborated on the formed questionnaires and was realized in quantitative terms. Table 3 lists the primary questions incorporated in this study, categorized by basic usability criteria and education-related measures. As in the analysis phase, high school students, graduates, and educators participated. Again, the survey was organized and executed with respect to the procedures and rules suggested by the “Committee on Research Ethics and Conduct” of the Aristotle University of Thessaloniki (with all the associated details provided in the relevant 4.1 section). The assessment was conducted between 20 December 2020 and 10 January 2021, receiving a total of 103 answers. Participants were randomly recruited, having an age distribution of 10–12 years (21.8%), 13–14 years (28.7%), 15–17 years (15.8%), and >18 years (33.7%). The role of the participants also varied between students (67.7%), teachers (11.1%), parents (1%), and other graduates, i.e., (last-year) philology students and educators (20.2%). Parents had a smaller portion in this study (compared to audience analysis) which is logically explained, i.e., not all of them are able to attend a high school course. However, they are concerned about how classes are supported by technological means, so their more impacted role in audience analysis is justified. Overall, the questionnaire was distributed to students, teachers, and people who were taught the “Odyssey” lesson in previous years, thus causing minor limitations in the population ranges. As in the analysis phase, these demographic measures are meant to show the representativeness of the population, validating the whole assessment approach (and are not meant to seek deeper statistical correlations that social science studies would emphasize). The received answers are analyzed with the rest of the acquired data in the corresponding results and discussion section.

In sum, the questions were adapted to the “Five Es of usability” (from the initials of the words Effectiveness, Efficiency, Engagement, Error Tolerance, Ease of Learning), also combined with the Nielsen metrics and measures or perspectives adapted to the educational impact of the approach [1–5,27–29]. Given that error tolerance is not suitable here (or, at least, does not depend on the deployed authoring but rather on the respective transmedia channels and platforms), the associated label was set aside. Furthermore, the easy super-class was formed, containing learnability and simplicity insights, both valuable in assessing learning applications (Table 3). Multiple questions were initially set, some of them being somewhat similar or correlated, among others, to allow checking the validity of the answers. For instance, D1 (easy to learn) and D2 (memorization load) are strongly correlated in a negative way, i.e., an easily comprehended interface is not heavily attached to the need to

recall navigation paths and interactions (at least in most cases). This method also allowed us to inspect whether the formation of the questions (i.e., positively or negatively oriented) is biased to the subjects and the received answers. Potential inconsistencies were detected and thoroughly discussed in the qualitative assessment sessions and, in some cases, led to the exclusion of the corresponding (paired) asking items (as part of the data curation process). In all cases, careful treatment is needed to avoid cumulating data with different meanings without proceeding to the necessary pre-processing (i.e., reordering scales where required), as explained in the analysis of the results in the next section.

Table 3. Main/categorized questions of the formed questionnaire for the final assessment.

Question (# of Items): [Range]
A. Effectiveness questions (9 items): Likert Scale [1–5]
A1. Effective in teaching
A2. Effective for students
A3. Effective (as gamified learning)
A4. Effective (comprehensive content)
A5. Effective (self-learning)
Impact of individual modalities/components
A6. Effective (images and visualizations)
A7. Effective (mapping elements)
A8. Effective (video material)
A9. Effective (game elements)
B. Efficiency questions (6 items): Likert Scale [1–5]
B1. Efficient in teaching
B2. Efficient for students
B3. Efficient for teachers
B4. Efficient in promoting skills
B5. Promoting collaborations
B6. Too technological—Misleading students [negative meaning-reverse range]
C. Engagement questions (6 items): Likert Scale [1–5]
C1. Engaging for students
C2. Engaging in classroom
C3. Appealing to students
C4. Recommend framework
C5. Unnecessary playful—disorienting [negative meaning-reverse range]
C6. Over-engaging/discomforting teachers [negative meaning-reverse range]
D. Easy: Learnability—Simplicity (6 items): Likert Scale [1–5]
D1. Easy to learn
D2. Memorization load [negative meaning-reverse range]
D3. Easy/comprehensive language
D4. Bad/misleading language [negative meaning-reverse range]
D5. Oversimplified/inadequate language [negative meaning-reverse range]

5. Experimental Results and Discussion

This section presents the results of the implemented project, comprising the produced transmedia storytelling assets, with the crafted services and their educational impact, the outcomes extracted by the conducted analysis and usability evaluation procedures, and the overall research findings concerning the stated hypothesis and questions with their answers.

5.1. Implemented Storytelling Services and Educational Contribution

As already stated, multiple assets were created and organized to deploy a plurality of navigation paths, storylines, and interactions. Google Classroom has been selected as the starting point of the narration, i.e., the main interface for delivering all of the individual resources (Figure 3a,b). This approach aligns with the transmedia storytelling concept, integrating all individual media in a modular way. Hence, the formed Google Classroom can host all the crafted material, i.e., embed web and browsable content, share links and other useful pages, set “meeting rooms” and communication methods, etc. Therefore, users (teachers and students) can combine the different modalities (content types, interactive services, topics, etc.), mixing multiple learning modules in innumerable ways, thus making the most out of a modular assembly scheme. Alternatively, the offered educational components can be communicated and/or browsed directly through the implicated channels, according to the users’ preferences and/or their contextual situation (i.e., accessing time, place, device, purpose, etc.). Multimedia content and functionalities can also be updated in the associated implementation platforms when needed (with quick links’ refreshing being entirely adequate) or removed, if necessary (i.e., if they do not serve the learning aims anymore). Likewise, they can be transferred and updated to other environments that better face the set requirements (i.e., if fresh tools have appeared, expanded, or altered their use and licensing status). In this perspective, Google Classroom can also be substituted by a different site (LMS program, webpage, etc.), which would become the new starting point of the story. Therefore, services can be easily updated if this is dictated by changes in intellectual properties, personal data regulations, or users’ rights policies, or when the market urges the immigration to a different technology or communication medium. The Adobe Flash paradigm, already discussed in a previous section, is an excellent example of experiencing how such changes can affect procedures, putting aside some old work and quitting past efforts. For instance, multitudes of educational applications developed in Flash and delivered as SWF (/’swif/) files have become obsolete since they can no longer be normally distributed through the web.

Extending the above analysis, given the lack of authoring tools intended for designers, educators who want to elaborate on digital storytelling have two main options: either work explicitly on prototyping (using Balsamiq, Figma, etc.) and seek collaborations with broader multidisciplinary production teams (if available and applicable) or adopt practices like the proposed one, integrating easy-to-operate tools in a transmedia concept. The latter seems more beneficial, on the one hand, because it offers autonomy in case developing cooperators are hard to find (and especially voluntarily) and, on the other hand, because it buys some time until low-code programming platforms become mature and suitable to plenary individuals lacking development skills. In that way, users also get familiarized with software and multimedia production procedures, such as the processes of analysis, design, development, and evaluation. Hence, they prepare themselves to work in team efforts (as instructional designers, training specialists and educators, subject-matter experts, etc.) while getting ready for the anticipated low-code approaches or other similar initiatives. Returning to Figure 3 and the provided services, the starting node of the “Odyssey” journey points to interactive audiovisual presentations, implemented in Thinglink, highlighting scenes and remarkable events of the rhapsody K. Hence, images, animations, video narrations, audio and music tracks are easily crafted and served along with other (external) links through simple interactions, enhancing the media experience while fetching informatory data that delivers complete and comprehensive knowledge for the user.

In the present status of the environment, as depicted in Figure 3b, six main sections of the “Odyssey” have been organized. They highlight the sea storm adventure, the meeting of Circe with Odysseus’ companions and Odysseus himself, her effort to convince Odysseus to stay on the island, the trip to Hades seeking advice from the prophet Tiresias, the farewell, and the beginning of the return journey. These interactive presentations have been implemented in Thinglink (Figure 3b,c), encompassing text, image galleries, voice-over, and embedded YouTube video links to enhance the narrative experience by

covering multiple learning requirements. Hence, audio and video material augment directness and vividness with text representing clearer and firmer descriptions that can also initiate literature exercises. Apparently, the choices for this content are limitless (i.e., different combinations of modalities can be set), with additional pieces easily crafted and incorporated into the storyline, depending on the educational needs and focus of the associated teachers. Such links can also be part of story maps (Figure 3d) that geographically depict the implicated events, involving similar media representations (i.e., text, images, audiovisual streams, etc.). These location-driven storytelling services can be easily set on Google Maps (or other related utilities), while they can also be combined with simple games that can be quickly crafted in relevant online environments like Wordwall (Figure 3e).

The implemented services offer some baseline functionalities while also allowing teachers to set their preferred interactions. Educators can use the offered modalities to customize and manage their classes by engaging in different teaching or communicating activities. Diverse learning procedures can now be feasible through the shaped utilities, exhibiting high levels of innovation and audience engagement dynamics, as explained below. Students can be challenged (as part of an exercise or activity in the class) to supplement the crafted maps, elaborate on the given information or test the acquired knowledge through the gaming elements (Figure 3e). Educational games can reinforce new teaching methods in the classroom, simultaneously forcing self-learning efforts. Such interactive experiences can increase students' participation, accelerating the schooling process and mission, which can be accomplished easier and with more astonishing results. Apart from receiving information and comprehending topics, engaging mechanisms can concurrently cultivate more skillsets, such as problem-solving, strategic thinking, and decision making. For the educator, not only is the way the lesson is presented important but his alertness and dedication are required too. Lots of scholars and philologists claim the need to preserve the ancient text so as not to be deprived of the grandeur and literary value that distinguishes it. On the contrary, many scientists consider the ancient text inaccessible, repelling learners from engaging and delving into it. The two controversial positions can be combined within the multimedia and transmedia storytelling paradigms, with each claiming its essential part. Hence, the narrative language can be simple and accessible to deliver comprehensible content and meaning, with links portraying and highlighting the ancient character to preserve its greatness. In this context, a broader multidimensional edification is achieved, activating multifaceted skillsets beyond the narrow boundaries of the school curriculums, which aligns with modern pedagogical research argumentation.

Overall, storytelling across multiple platforms allows content of the right size, timing, and location to create a bigger, more profitable, cohesive, and satisfying experience. Thus, it logically follows that the transmedia narrative places the audience at the center of the educational process, enhancing the interest in the classroom environment while boosting freedom of choice in utilizing the offered resources. Stimulating students' interest is listed among the most essential and remarkable results, as it attracts their full attention, engages them, and improves their behavior and performance. Especially in language courses, where most learning difficulties are faced, it is important to encourage the participation of weak students. Indeed, more appealing and convenient multimedia interfaces can offer information in a more understandable and creative way, thus helping them improve their performance. Constant modifications should be linked to the tools and methods students use in their daily activities, so the right integration of technologies, communication means, and methods can keep the concerns and interests of all the scholars involved in the process undiminished. From the teachers' point of view, content in digital form can be easily modified, updated many times, and supplemented with feedback and notes, which is very constructive and functional in delivering essential and effective teaching organization and management. The intricacy of existing computer games, in the current context of graphics, interactions, and narrations, might discourage educators from crafting their own digital material (interactive presentations, gamification components, etc.) because of the lack of know-how and technical language. However, online notations and training resources can

reduce the gap between the theoretical context and the required digital skillsets, making the production of quality designs easier. By finding reusable items and adopting best practices (such as the presented one), pedagogues can shift closer to media and technology innovations. Hence, they can stimulate their creativity with the opportunity to enhance their tutoring and communicative role in favor of the learning process. In doing so, they can find more pleasant ways to perform their duties while fortifying their literacy and confidence. Consequently, it becomes easier to meet the digital habits of younger people (their audiences), which can be turned into wholly new inspiring edutainment experiences.

5.2. Analysis and Usability Pilot Evaluation

Elaborating on the information given in the Materials and Methods section, two individual studies were directed to answer analysis ($n = 102$) and assessment ($n = 103$) inquiries in quantitative terms. The process was also supplemented by qualitative perspectives from the experts' group, who facilitated this UX design project from its early beginning. As already explained, the two surveys did not intend to seek statistical correlations and deeper data relationships, but they were conducted as part of a standard procedure followed in software and multimedia productions. Due to the adopted rapid prototyping model, analysis and evaluation sessions (especially the subjective qualitative ones) were continuously expanded along the evolution of the spiral iterations (Figure 1). Hence, the quantitative measures for the audience monitoring and the final application testing were carefully planned and executed after the associated development phases significantly progressed to an adequate maturity level. The qualitative feedback provided by this multidisciplinary advisory board was extremely important in this process, with its members actively and substantially participating through constructive comments and remarks to improve the scheduled and crafted experiences. Essential interventions were made for preparing the questionnaires and executing these experiments, with discussion sessions following analysis responses to validate the expectations and correct the set course. Vital debugging and summative notes were also received while assessing the formulated services, as further presented later in this section.

Figures 4 and 5 represent the findings produced by the analysis survey. It is essential to notice that most participants were familiarized with the epos of the "Odyssey" (98%), sharing similar concerns with the ones already analyzed for both viewpoints of teachers and students, thus validating the whole approach (and their selection in this experimental process). More specifically, the vast majority agreed that multimedia is inadequately used in classical studies (>60%), though they seem to have the potential to support the "Odyssey" in broadening today's teaching (100%). Moreover, a considerably high percentage claimed to have such previous experience of technology-assisted learning in classical studies (52%) and, generally, in any class (60%), indicating a good balance of the samples in that perspective. High scores were also received for the significance of the content quality and the aesthetics of the anticipated narrations (97%), with most subjects agreeing the targeted hybrid teaching promotes collaboration (93%) while cultivating more skills and engaging students to seek additional knowledge (97%).

Figure 5 provides more profound insights, indicating that multimedia-assisted learning is expected to be "effective" (23.5%) and "very effective" (64.7%). Small percentages were counted for the votes "not effective" (9.80%), "ineffective" (0.98%), and "very ineffective" (0.98%), with the last two tiny estimates implying a negative impact (i.e., multimedia would have worsened learning outcomes). Furthermore, participants agreed that the proposed hybrid teaching approach would be appropriate to all ages and educational stages (77.45%), with smaller groups expressing their preferences in senior high school (13.73%), high school (6.86%), and elementary school (1.96%) levels. Finally, most subjects voted that they play knowledge games regularly (87.25%) or sometimes (1.96%), with the remaining minority (10.78%) stating that they never had such an edutaining experience. It can be justified that the audience analysis results confirmed the initial expectations, validating once again the soundness of the approach.

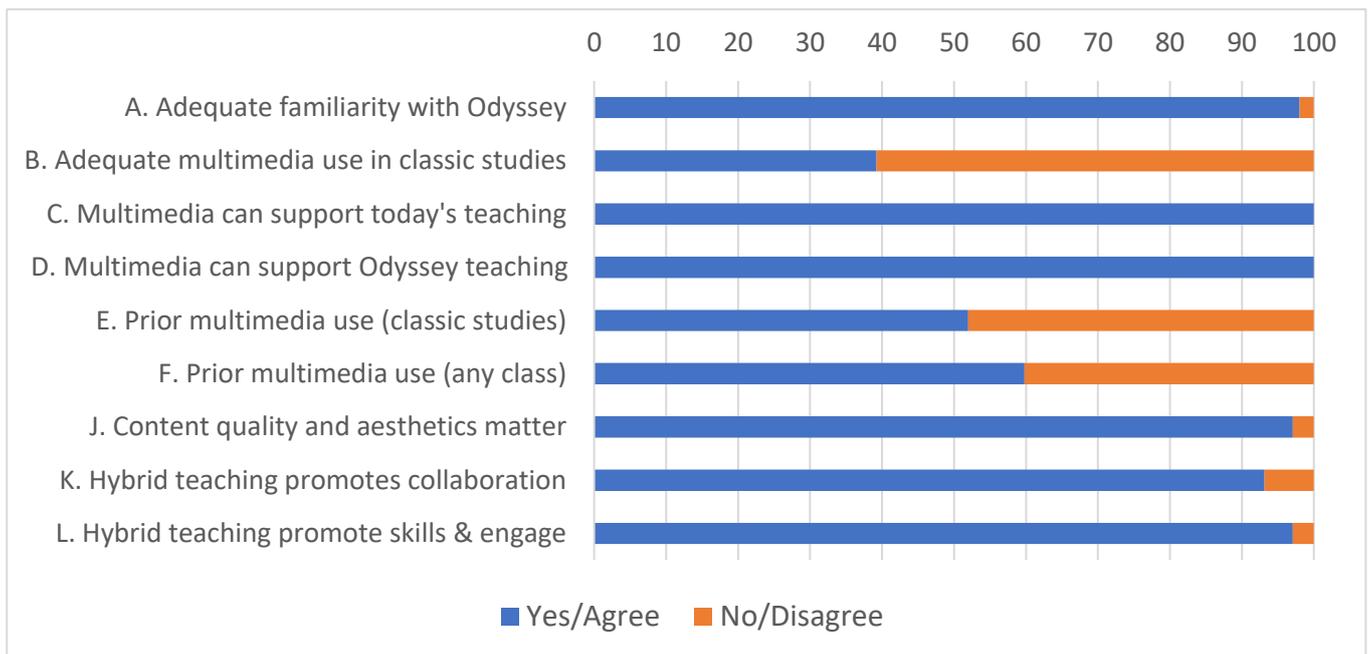


Figure 4. Audience analysis results for the use of multimedia storytelling in education (questions A, B, C, D, E, F, J, K, and L).

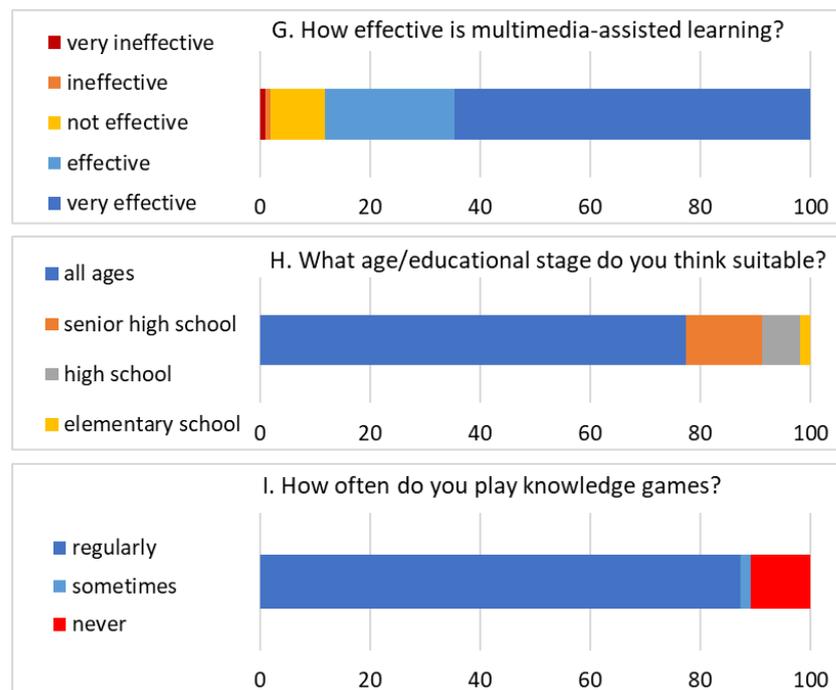


Figure 5. Audience analysis results for questions (G) multimedia effectiveness (top graph), (H) suitable age (middle graph), and (I) knowledge games (bottom graph).

Following the conducted audience analysis, the experts’ team was involved in sessions to interpret the results in qualitative terms. Specifically, the panel discussed these matters, driven by the framed questions, with all members expressing their opinion (qualitatively, not only by simply selecting a closed-form answer) and stating their associated experiences, thus triggering further discussions (through asynchronous, synchronous, and physical communication sessions). At the same time, arguments were also stimulated by the quantitative results, with participants being asked to provide their subjective interpretations and further

elaborate on the initiated discussions. As a result, indicative or interesting justifications were provided and further debated. Thus, a quick explanation regarding the educational stage preferences for the suitability of multimedia-assisted learning is that participants mainly responded based on their own concerns. For instance, parents with children at the elementary school are more likely to be positive on such a perspective, a finding that was indicatively validated within the specialists' group, as members with similar positions or experiences confirmed. In all cases, hypermedia structures of the targeted transmedia storytelling approach allow for the organization of content through layering and adaptation mechanisms so that different assets can be formed and offered to different ages and school levels. At the same time, the assembled board started evaluating the implementation of the idea and examining its impact on their expectations, proceeding with the inspection of the crafted material and the prescribed interactive services in qualitative terms. The first observations concerned the original form of some images that seemed sketchy and outdated, without satisfactorily serving the true purpose of the work, and with the risk of creating contextual, misleading, and aesthetic inconsistencies. Thus, emphasis was placed on post-processing and proper visual formatting to project a professional and decent result that better reflects the project identity. Simultaneously, special attention was paid to the demand for high-quality voice-over (i.e., reaching high speech intelligibility levels) and carefully selected background music to shape the soundtrack and atmosphere of the narration. Hence, audio recordings and post-processing sessions had to be repeated until satisfactory results were obtained (validated through subjective listening tests).

It is worth noting that high school students, who encompass the interests and preferences of the primary target audience, were very positively impressed, emphasizing the fitting colors, the playful mood of graphics and pictures, and the vivid audiovisual narrations. In addition, they expressed their anticipation that these features would attract their concentration in order to more efficiently comprehend the conveyed messages and meanings. Many pointed out the need for a simple language to be most accessible and easily conceived by all students in the class, aligning with many of the set criteria, as argued in the previous section. In fact, most were thrilled with the idea of gamified knowledge tests to validate the learning outcomes, transforming a typical lesson session into a playful experience, thus arousing interest and engaging trainees. Overall, they highlighted the utmost aim for assembling digital assets into comprehensive and meaningful courses to shape an exciting journey of knowledge with the help of technology. Growing up in the age of images, media, and computers, audiences expect new educational methods to abandon older and obsolete plans, which rely on memorizing or storing information through endless texts, and anticipate a better match to their learning needs. Moving forward to interactive presentations containing photo galleries (Figure 3), multiple group members brought forward the idea of supplementing the voice-overs with audio controls (play, pause, stop, etc.). This would be very practical, especially when longer audio recordings are involved, also facilitating situations where repeated play is needed for better comprehension.

Similarly, some people detected the way YouTube links are shown in the embedded videos, often hiding the reproduction controls, thus creating difficulties in their handling. However, others opposed this perspective, debating the current arrangement that drives users to open the connected streams to their source environment, more properly attributing the producer and pointing to the associated use rights. Production team representatives also argued about this settlement, explaining it as a conscious choice. Another interesting idea was to allow students to retrieve and insert their preferred external video links so as to serve different aspects of the learning topics. Almost all group members agreed that such a practice would allow useful content to be detected and ingested through crowdsourcing techniques, with the option to combine gamification strategies to enhance active participation and audience engagement. On the contrary, this settlement would require moderation to ensure that unfitting or inappropriate material could be immediately recognized and excluded before being shared with the whole class. Hence, a compromised solution would be to put teachers in the center of this process, to mediate the "recommendation" activ-

ities and control the “incorporation” actions while also allowing them to set their own preferences, augmenting their communicative role.

The final task of the experts’ group was to help prepare the questionnaire for the quantitative summative assessment. A multi-parameter approach was adopted to measure the usability criteria and the educational impact of the delivered storytelling services (Table 3). As already explained, the utilized factors elaborated on the Five Es of usability and the Nielsen metrics. Specifically, four (4) distinct categories (A, B, C, D) were formed to evaluate effectiveness (A), efficiency (B), engagement (C), and learnability—simplicity (D). Effectiveness refers to the level of completeness and accuracy in that the desired goal is achieved using the interface at hand (how satisfactory the learning outcomes are in the current case). Efficiency is coupled with the productivity of the application, i.e., the time needed to achieve the set goals (how quickly educational earnings are obtained). Engagement accounts for the degree of pleasantness and satisfaction offered to the users to draw their interest and spur enjoyable interactions (the appeal of the educational resources to engage students in the learning process). Learnability shows how easily the interface can be operated without prior experience and the need to memorize interactions (how quickly someone can comprehend the succession of the educational nodes to access the offered knowledge). It often depends on the simplicity that diminishes overhead, facilitating easy navigation (simple options and data can expedite the learning process). Figure 6 presents statistical values (mean-standard deviation) of all the categorized assessment variables, with Figure 7 summarizing the results in a radar diagram with the formed categories.

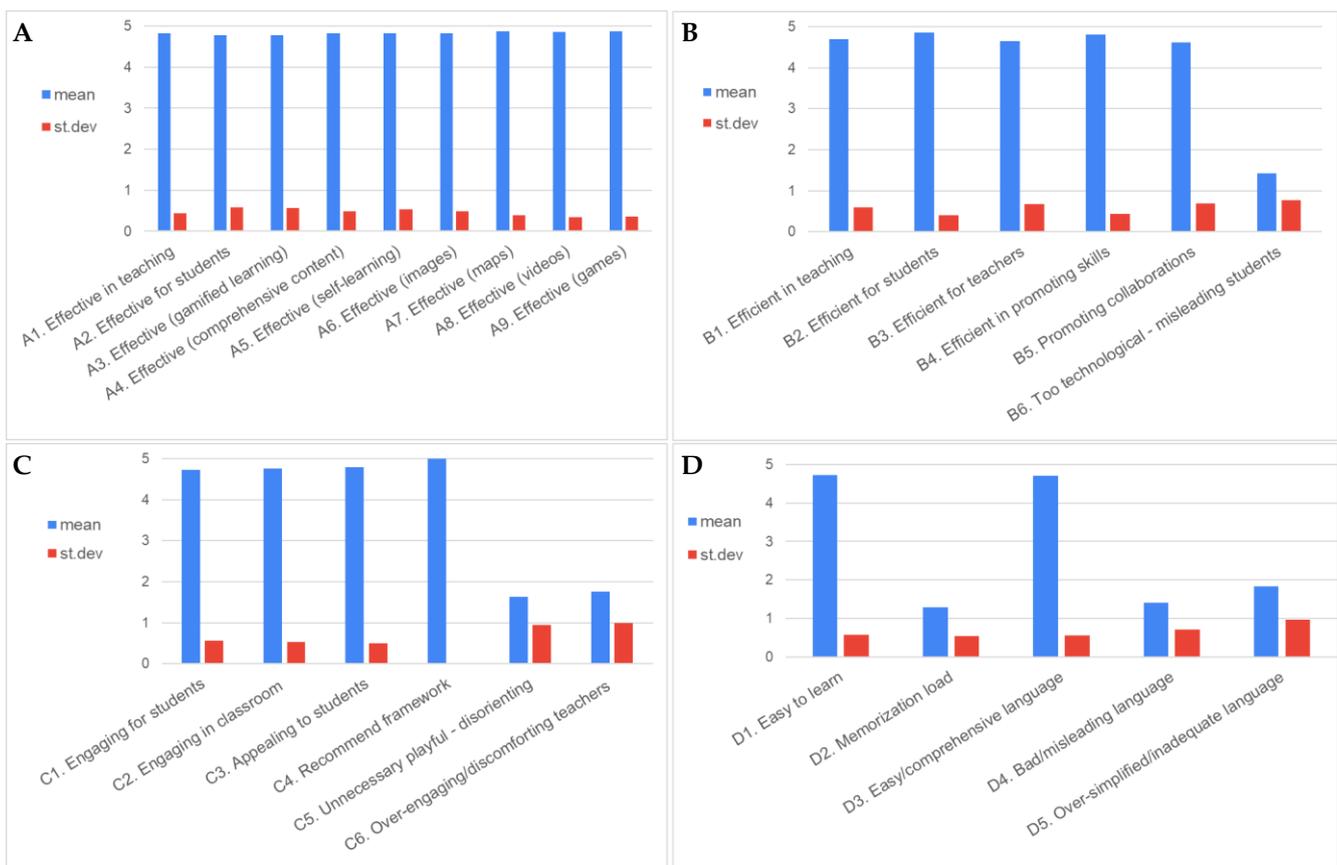


Figure 6. Final evaluation results (mean and standard deviation values): (A) effectiveness measures (top-left), (B) efficiency measures (top-right), (C) engagement measures (bottom-left), and (D) easy learning and simplicity measure (bottom-right).

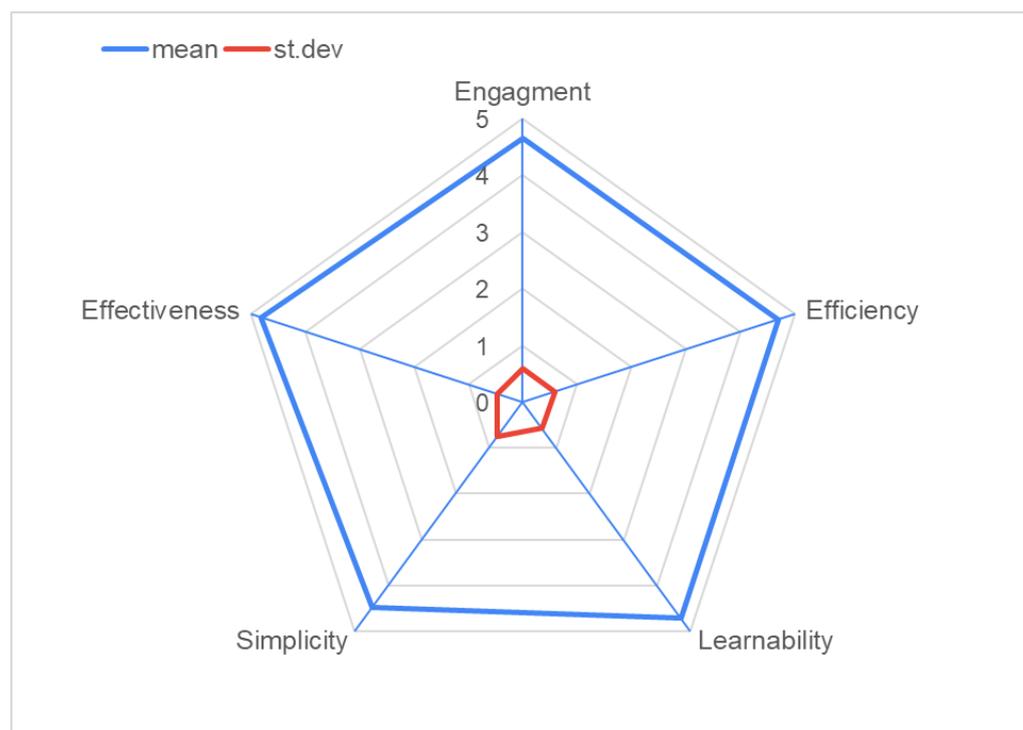


Figure 7. Usability and education assessment. Radar diagram with the mean and standard deviation curves for the factors: effectiveness, efficiency, engagement, learnability, and simplicity.

The general impression that someone gets based on the above visualization is that the achieved evaluation remarks have managed to extend, by far, even the most confident expectations. The overwhelming majority appreciated the effectiveness metrics at high levels, resting above 4.77 (smallest mean value) with tiny dispersions (i.e., standard deviation between 0.35 and 0.58). More specifically, estimates (mean \pm standard deviation) positively validate the proposed solution as effective for teaching (A1: 4.82 ± 0.43) and for the students (A2: 4.77 ± 0.58) due to its gamified nature (A3: 4.79 ± 0.56), the comprehensive content (A4: 4.82 ± 0.48), and the self-learning dynamics (A5: 4.82 ± 0.53). At the same time, most individual components were similarly highly rated, i.e., the images and the visual element (A6: 4.82 ± 0.48), the map utilities (A7: 4.88 ± 0.38), the embedded video and the audiovisual narrations (A8: 4.86 ± 0.35), and the incorporated knowledge games (A9: 4.87 ± 0.36). Likewise, efficiency was highly ranked to expedite teaching (B1: 4.7 ± 0.59), helping both students (B2: 4.85 ± 0.41) and teachers (B3: 4.65 ± 0.67) with their work while also promoting skills (B4: 4.81 ± 0.44) and collaborations (B5: 4.61 ± 0.69). Again, measures were placed among the top two Likert values (4–5), even of the last parameter (B6: 1.42 ± 0.77) in its reverse order, since it was phrased with a negative meaning (i.e., the unnecessarily excessive technological nature of the approach could be confusing and disorienting for the students). While this variable has a more sizable variance, it is still kept at low levels, indicating significant efficiency attribution while also validating the consistency and rightness of the received responses (as discussed in the Evaluation section).

The remaining two multi-parameter categories exhibit similar characteristics. The crafted transmedia integration was attributed as highly engaging for the students (C1: 4.72 ± 0.56) especially in the classroom activities (C2: 4.76 ± 0.53), appreciated as appealing (C3: 4.8 ± 0.49) and stimulating for the interest and the active involvement of the participants. It is not accidental that a perfect 100% responded that they would recommend this solution (C4), thus attracting and engaging broader audiences. The last two questions of the category had a negative phrasing, inquiring whether a potentially unnecessary playful character of the approach would disorient students (C5: 1.62 ± 0.94) and if its over-engaging nature would cause discomfort to the teachers (C6: 1.76 ± 0.99). The received answers, being laid in

the reverse order, are slightly less optimistic than those of the other group C variables but also feature notable variance. While the evaluation is again considered fair, some implied remarks require careful attention and interpretation (as further discussed at the end of this section). The same approving vision is also suggested by the remaining group of metric (D) results, investigating the learning curves and the easiness of the interactions. Most subjects characterized the crafted services as easy to learn (D1: 4.72 ± 0.58) with a low memorization load (D2: 1.29 ± 0.55). These two items, one being positively phrased and the other negatively, shape a complementary validation pair, convincingly attributing high learnability standards. Apart from the interfaces, vital educational impact perspectives also had to be appraised while assessing simplicity. Hence, the used language was judged (in a good way) as easy and comprehensive (D3: 4.7 ± 0.55), receiving excellent scores, and also as bad and misleading (D4: 1.42 ± 0.71) or too simple and inadequate (D5: 1.83 ± 0.98). The last two factors display wider dispersion with slightly worsened mean values (after their ranges were reversed), but they still indicate a well-above average rank. Nevertheless, the considerable differentiation of these two variables also justifies a deeper interpretation with qualitative insights.

A synopsis of the assessment outcomes is depicted in Figure 7, representing how the usability measures (and their educational orientation) are arranged across the main axes of efficiency, effectiveness, engagement, learnability and simplicity within a radar plot. The curves (mean, standard deviation) have been calculated using the entire population of the associated categorized parameters (presented above) after reversing the order of the negatively phrased questions. A second approach was also tested, extracting the statistic values only by the positively oriented variables (i.e., excluding B6, C5, C6, D2, D4, D5), with the result being almost identical (so, the greater population of samples was preferred). Accordingly, the global metric estimations were obtained using the following observations: effectiveness (A1-A9: 4.83 ± 0.46), efficiency (B1-B6: 4.70 ± 0.60), engagement (C1-C6: 4.65 ± 0.59), learnability (D1-D2: 4.72 ± 0.57), and simplicity (D3-D5: 4.49 ± 0.75). The results are very similar to the ones presented for each of the four groups (Figure 6), with a slight differentiation in the engagement and simplicity axes. As previously commented, this was already detected as an outlying effect for queries stated in reverse scaling (i.e., B6, C5, C6, D2, D4, and D5), especially those associated with simple content or language and engaging dynamics. The reason behind these particularities is that the specific features are both positively and negatively attributed, as explained below.

Post-analysis with further qualitative insights showed that populations involved in the surveys with a specific identity (i.e., teacher, student, etc.) expressed their fear over the reactions of the other groups. For instance, subjects with the role of students expressed their anxiety that over-engaging practices would probably discomfort teachers, with the latter worrying that too much technology might confuse and mislead students, thus having the opposite effect. Thorough discussions within the experts' board revealed the existence of such behaviors, especially in cases with limited previous experience on related learning projects. However, it was also realized that once trainers and trainees become familiar with this new paradigm through practical applications in real-world environments, the gained confidence drastically diminishes such worries. Furthermore, interesting findings suggest that each actor (educator or learner) has its own priorities in this process. Thus, professors are unwilling to over-simplify language, seeing in their mission the urgent need to preserve the ancient text's greatness and broadly maintain a high academic level of discourse. On the contrary, students are more concerned about the difficulties that over-sophisticated and complicated language creates, so they prioritize simplicity that would help them better comprehend topics. While such observations were somewhat expected, as analyzed in previous sections, the positive thing about multimedia and digital storytelling emanates from the multimodal layering structure of information and interactions. Hence, different levels of simplicity and engagement can be set, allowing both perspectives (easiness and literacy) to be adequately supported.

Summing up, the achieved content comprehension level is reflected in the obtained results for rating the experience, the learning dynamics, and the usability criteria. Most respondents expressed satisfaction with the quality of the colors, sound, images, graphics, and videos, characterizing them as applicable to the set requirements and aims. The crafted visualizations of Odysseus' adventures, mapping utilities, knowledge games, audiovisual presentations, and interactions contributed decisively to understanding the subject and the assimilation of the curriculum, as evidenced by most evaluations. The attempt to simplify the language in favor of conception and communication was successful for most students, who expressed satisfaction with the survey questions and the focused discussions. Based on all of these observations, the integration of technological tools in the educational process is expected to improve the whole experience and the learning outcomes. Overall, the combined quantitative and qualitative assessment confirms the validity of the approach, which received high evaluation scores while also offering adaptivity and flexibility to face various difficulties, especially at the beginning of such projects.

5.3. Discussion and Answers to the Stated Research Hypothesis and Questions

Having accomplished the main objective of the current project, which is the end-to-end implementation of the transmedia storytelling integration, we can now answer the set hypothesis and questions, relying on the completed production phases (analysis, design, development, evaluation) and the triggered discussions. The central assumption behind the motivation of this work is that (transmedia) storytelling technologies are not fully utilized in teaching, especially for philological courses (RH). Hence, there is vital space to elaborate essential perspectives, improving audience engagement, learning outcomes, and the educational process as a whole. Audience analysis indicated a vast majority agreeing that digital means are inadequately used in classical studies (>60%), with a compact 100% vote recognizing the potential to support the "Odyssey" in broadening today's teaching (RH). Indeed, a considerably high percentage admitted having previous contact with technology-assisted learning in classical studies (52%) and, generally, in any class (60%). Moreover, participants had solid expectations that multimedia would favor the schooling experience for all ages and educational stages (>75%), confessing prior use of knowledge quiz plays (>89%), while anticipating the positive impact of serious gaming and gamification components. These observations confirm the dynamics of such methods that have already made their appearance, and also the large amount of room left untapped for further advancements (RH). At the same time, the conducted investigation on related content and applications during project analysis has shown little effort, with limited ready-to-use services and even poorer practice in real-world class environments, covering all the angles of the stated RH.

Elaborating on the set questions, the current work has proven that literature teachers can seek, find, and integrate the right learning resources, turning them into applicable transmedia stories to encompass blended and game-based learning benefits. Indeed, we have witnessed such a project implementation in practice, materialized by literature instructors who do not possess technological know-how and programming skills. In context, the above argumentation rather stands as a rephrasing of the first research question (RQ1), also providing convincing answers to most of the set inquiry directions. Apart from the materialization of the envisioned concept, assessment procedures (provided in the previous section) have persuasively proven the validity of the approach, greatly attributing it as effective (4.83 ± 0.46), efficient (4.70 ± 0.60), engaging (4.65 ± 0.59), easy to learn (4.72 ± 0.57), and simple (4.49 ± 0.75). Thus, not only is digital storytelling achievable by sole educators lacking technical expertise, but the crafted services can also receive high approval, engaging the audiences in the learning process. The above findings were further validated through the qualitative analysis and discussions conducted within the experts' group. Hence, also elaborating on the data presented in Table 2, all group members, especially the literature high-school teachers (2) and the graduate university students in literature departments (3), admitted the plethora of tools offering simple operations and

valuable functionalities, so that they can be efficiently utilized in education. Thus, apart from Table 2 documenting the availability of applicable software to be operated by the non-developers (RQ1), these production collaborators were close to the implementation phases, witnessing the associated work, so they expressed their certainty on this matter.

In addition, the combined previous two paragraphs also answer a significant part of the second question (RQ2), verifying students' willingness to be part of such technology-enhanced teaching scenarios, with great expectations concerning the impact on their learning engagement and efficiency. Even from the audience analysis study, participants expressed their interest in such hybrid teaching approaches, agreeing that they promote collaboration (93%) while cultivating more skills and engaging students to seek additional knowledge (97%). Recalling the evaluation results, this optimistic view was further strengthened, asserting the proposed solution as effective for teaching (4.82 ± 0.43) and for the students (4.77 ± 0.58) due to its gamified nature (4.79 ± 0.56), the comprehensive content (4.82 ± 0.48), and the self-learning dynamics (4.82 ± 0.53). In the same context, efficiency was appreciated to expedite teaching (4.7 ± 0.59), helping both students (4.85 ± 0.41) and teachers (4.65 ± 0.67) in their duties while at the same time elevating skills (4.81 ± 0.44) and cultivating a cooperative spirit (4.61 ± 0.69). Finally, the method was found to stimulate the interest and active involvement of learners (4.8 ± 0.49), with a solid 100% being eager to recommend it for attracting and engaging broader audiences. Of course, this pivotal project did not have the chance to evaluate students in the actual subject mastering and the associated learning outcomes, thought topic testing, and examination procedures. Still, indicative sessions within the experts' group to qualitatively assess the knowledge quizzes and the gaming experience showed considerably high testing grades. Undoubtedly, future work is necessary for validating the approach in practice, i.e., in real-world classrooms and with greater populations. In all cases, the investigation and experimentation conducted for the needs of the current paper are considered more than adequate to support the acceptability of the main idea and its auspicious preliminary results.

6. Summary and Conclusions

The inspiration for this effort came from the contempt for literary and linguistic issues by young people and general society. As we move through the computer and digital media age, cultivating the spirit and the values promoted by the philological courses and the physical book seem outdated. Hence, there is an urgent need to find ways to modernize and renovate the teaching of classical studies, making them practical and interesting to students and broader audiences. The deployed project implementation allowed the opportunity to comprehend the modern teaching needs and elaborate on the means of mastering, customizing, and encompassing technology. More specifically, it was understood that multimedia applications and tools are essential for the learning process, as they define today's digital world, which is an integral part of our various daily activities. Thus, it logically follows that education could not be untouched by these developments shaping modern ubiquitous social realities. However, we are not yet in the age when text and tangible books do not serve the learning needs of people; they are still considered necessary in teaching a lesson and in its assimilation, but not its exclusive use. In sum, combining the traditional textbook and the integration of storytelling means to enhance the schooling experience is necessary.

Most philological courses usually place lectures and examinations at the center of the lesson, so they fail to satisfy the needs of modern students, even those looking to level their values. This situation could only be difficult and repulsive if content rendering is anachronistic and outdated, requiring corrective course actions. At the same time, the tremendous technological evolution defines the ways education will be considered in the future. Schoolchildren are increasingly engaged in digital means to get in touch with each other, retrieve and assemble information, expand social skills, and entertain themselves. With students being increasingly encircled by technology, it seems essential for learning strategies to steer towards that direction, aiming at transmitting new virtues and shaping

a fresh spirit. Otherwise, literature lessons will continue to be treated as secondary or marginalized in today's digital society, which is unfortunate, given their timeless value. Overall, teaching should be treated within a modern prism, away from stereotypes and prejudices, overcoming technical know-how fears and formalities implying the reduction of the literary value when rendering works with the help of technology.

The current project elaborates on the above perspectives through an interactive UX design strategy for crafting integrated transmedia edutaining services, relying on interactive learning resources and reusable media. The selected topic emanates from classical studies, representing the real-world case of sole literature educators with narrow technical expertise and developing skills, having to execute the entire process alone (or with limited multidisciplinary advice and help). Overall, it was an unprecedented and highly creative journey to renew the "Odyssey" lesson (rhapsody K), aiming at making it more productive and appealing to audiences. Multimedia-assisted education places students at the center of the knowledge acquisition practice, detaching obsolete examination-centered elements. In this way, the role of the teacher evolves into a guide, no longer faced as the absolute and inaccessible authority. Furthermore, the creative experience itself brings educators and pedagogues closer to modern tools and platforms, helping them advance skillsets and promote their digital literacy level. Hence, they are getting acquainted with the new trends and enhancing their confidence, thus reconsidering how to present topics and stimulate knowledge extraction. In addition, they become competent in creating, modifying, and updating their content more easily, remaining vigilant to shape the lesson creatively and effectively, with customizations to the needs of the respective audiences. Continuous awareness and familiarity in using (new) tools enables getting the most out of them in favor of the learning procedure. Hence, a timely and efficient plan can be maintained, coupled with constant revisions and updates, usually triggered by class-driven reinforcements and feedback.

The results of the current work suggest that the proposed methodology can be easily adopted by the targeted users, i.e., educators of classical topics with minimal technical expertise. While hesitations and slow progressions might appear at the beginning, familiarity with the tools and the procedures is easily obtained in most situations. Once teachers start being part of the process, they can substantially elevate their digital literacy and confidence, thus accelerating authoring and implementation rates. In this context, they can become comfortable using more advanced technologies and testing newly launched tools, thus becoming valuable collaborators to join wider multidisciplinary efforts. The formation of such production teams focusing on theoretical or classical teaching topics can profoundly benefit all implicated actors, i.e., the courses, the teachers, and the students. The conducted research represents a pilot study with preliminary yet solid results. The investigation of relevant topics is in no way exhaustive. As already supported, continuous resources and tools analyses are needed to satisfy the demand for constant updates.

Overall, the crafted experience has been considerably tested, earning satisfactory evaluation rates (both quantitative and qualitative ones). More specifically, the targeted multimedia production was efficaciously accomplished, and the outcomes were acceptably assessed in multiple directions. The initial hypotheses were confirmed, extracting best practices for organizing and executing similar multimedia projects in the education sector, especially in disciplines with limited capacities for handling technologies. Still, the proposed approach has to be thoroughly tested in broader audiences and within more pluralistic real-world classroom environments. Teachers can test the new modalities through different configurations in real-world scenarios, with possible elaboration to further utilities. Future directions can involve the evaluation of the offered transmedia paradigm in typical class and school environments. Comparisons with traditional classes that do not utilize the proposed transmedia storytelling can offer valuable insights, with specific students' examination tests also assessing the acquired knowledge. Hence, extended hypotheses and questions can be set and elaborated, offering fertile ground for multidisciplinary research and collaboration. Thus, further observations and useful insights can be obtained, providing precious feedback and reinforcing corrective actions where needed to polish the

extracted best practices. Finally, the entire approach and its pilot results can inspire other topics to elaborate on such blended learning techniques. Additionally, it may challenge technology providers and open-source initiatives (e.g., low-code platform creators) to invest in such contemporary education perspectives in favor of the entire society.

Author Contributions: Conceptualization, M.P. and C.D.; data curation, M.P. and C.D.; formal analysis, M.P. and C.D.; investigation, M.P. and C.D.; methodology, M.P. and C.D.; resources, M.P. and C.D.; software, M.P.; supervision, C.D.; validation, M.P. and C.D.; visualization, M.P. and C.D.; writing—original draft, M.P. and C.D.; writing—review and editing, M.P. and C.D. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Ethical review and approval were waived for this study, due to consent provided by the participants, being informed prior to their involvement in the analysis and evaluation questionnaires. Furthermore, procedures and rules suggested in the reference handbook of the “Committee on Research Ethics and Conduct” of the Aristotle University of Thessaloniki were fully adopted.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: All data that are not subjected to institutional restrictions are available through the links provided within the manuscript.

Conflicts of Interest: The authors declare no conflict of interest.

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