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Music of the Planets: An Interdisciplinary Digital Storytelling Approach in Kindergarten

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Abstract

This paper presents the design, implementation, and evaluation of an interdisciplinary digital storytelling project titled Music of the Planets, aimed at preschool children. Combining music, science, and digital technology, the scenario utilized Gustav Holst's The Planets as a narrative anchor to engage children in multimodal learning experiences. Children explored planets and composed music using interactive tools. The project emphasized inquiry-based learning, digital literacy, and creative expression, while also fostering collaboration and critical thinking. Observations revealed high levels of engagement, emotional connection, and meaningful participation, highlighting the potential of digital storytelling as an effective pedagogical tool in early childhood education. Challenges related to technical resources and time investment were noted, but overall, the program demonstrated strong alignment with STEAM education principles.

Keywords: digital literacy, digital storytelling, ICT, music education, preschool

Introduction

In recent years -especially following the global pandemic -digital tools have become increasingly embedded in early childhood education. These tools serve not only as resources for instruction but also as catalysts for enhancing engagement and interactivity in the classroom. The 21st century is characterized by the rapid development of information and communication technologies (ICT) and education is experiencing a paradigm shift where ICTs are becoming integral to the holistic learning process, starting from the earliest levels of formal education.

Research into the intersection of early childhood education and ICT has moved beyond the question of whether digital tools can enhance learning, to focus on how best to integrate them meaningfully into preschool contexts (Gialamas & Nikolopoulou, 2010). The range of possibilities that digital technologies offer -such as multimodal content, animation, sound, and interactivity -makes them valuable pedagogical resources (Kennewell & Beauchamp, 2003). However, ICTs alone do not enhance educational practices. It is the pedagogical expertise of early childhood educators that determines the efficacy of these tools.

In line with global trends, the National Curriculum for Preschool Education in Greece (Penderi et al., 2022) emphasizes the cultivation of digital literacy and critical engagement with digital content. It aims to familiarize children with digital environments and help them develop skills in managing information for diverse communicative needs. Furthermore, it supports children in developing responsible digital habits and critical thinking skills, while expanding the learning experience beyond the boundaries of the classroom. Through guided use of digital resources, preschoolers are encouraged to make informed choices and explore the world in enriched and meaningful ways.

The pedagogical value of digital tools is particularly evident when integrated with play -a cornerstone of early childhood learning. ICT-supported play fosters children's creativity, technological fluency, and cognitive development. Studies show that the way digital tools are

embedded within free play or structured activities significantly impacts learning outcomes (Nikolopoulou & Gialamas, 2015).

Within this broader context, the current paper presents an interdisciplinary learning scenario designed for preschool children, titled "Music of the Planets". The project aims to introduce children to classical music -specifically Gustav Holst's orchestral suite *The Planets* -through an engaging digital journey across the solar system. This topic was chosen for two primary reasons. First, planets are a beloved and familiar theme in early childhood education, capturing children's imagination and curiosity. Second, classical instrumental music, particularly without lyrics, can be challenging for young children to appreciate and focus on. By embedding the listening experience within a narrative enriched by digital media -videos, animations, 3D models, and interactive storytelling -children are supported in making emotional and cognitive connections to the music.

Musical activities in early childhood significantly contribute to cognitive, emotional, and social development (Hallam, 2010; Jentschke & Koelsch, 2009). Engagement with music enhances not only auditory and motor skills but also broader competencies such as collaboration, emotional regulation, and cultural awareness. Music, when paired with thoughtful use of technology, becomes a powerful medium for experiential learning. As Hallam (2010) suggests, such positive musical experiences in early childhood can have a lasting impact, particularly when embedded in a supportive pedagogical framework.

The purpose of this paper is to present and analyse the design, implementation, and educational outcomes of this interdisciplinary, digitally supported project. It demonstrates how music, science, and technology can be woven together to enrich the preschool learning experience, foster curiosity, and support the development of 21st-century skills.

Theoretical framework

The implementation of this interdisciplinary scenario is grounded in a blend of experiential, multimodal and STEAM learning approaches. It further promotes the development of early digital literacy through the use of digital storytelling. These frameworks are drawn from contemporary perspectives in early childhood education, emphasizing the meaningful integration of technology in learning environments.

Following the principles of experiential learning (Kolb, 1984), the scenario provides opportunities for children to engage in a learning cycle involving concrete experiences (e.g., music listening, drawing, movement), reflective observation (e.g., expressing impressions and preferences), abstract conceptualization (e.g., learning facts about the planets), and active experimentation (e.g., using digital tools).

This project also aligns with the multimodal learning framework, where learning occurs through various sensory and representational modes -including visual, auditory, kinesthetic, and digital (Kress, 2000). The integration of music, movement, storytelling, and digital media supports the diverse learning styles of young children and facilitates deep engagement with complex content.

The scenario supports the development of early digital literacy and introduces technology as a tool for exploration, creativity, and communication. By engaging with multimedia resources and interactive applications, children begin to understand the role of digital technologies in both learning and social contexts.

Additionally, the project aligns with the STEAM (Science, Technology, Engineering, Arts, and Mathematics) educational philosophy, which highlights interdisciplinary connections and the role of creativity in scientific inquiry (Yakman, 2010). Through artistic engagement with scientific content, such as using music to explore the solar system, children are

encouraged to blend factual understanding with personal expression, fostering holistic learning.

One of the technological tools integrated into the scenario is the digital story. Though definitions vary, digital storytelling generally involves narrating a story through the combination of digital elements such as visuals, sound, video, and text. As Robin (2008) explains, digital stories are multimedia texts designed to convey narratives, historical events, or educational content by bringing together various media forms. When presented in a compelling and age-appropriate manner, digital stories can become powerful tools for concept development, imagination, and multisensory learning.

The design of the scenario reflects the principles of child-centered learning and active engagement, positioning children as curious investigators and creative producers. This is consistent with sociocultural approaches to early childhood education, which emphasize collaborative learning, dialogue, and respect for diversity. Children's individual ideas and contributions are valued, promoting a sense of agency, identity development, and social-emotional growth.

Description of the educational program

Context of the school classroom

The educational program was implemented in a public kindergarten located in an urban area. It is a two-classroom school, providing a well-organized and adequately resourced environment suitable for preschool education. The classroom used for the program is spacious, allowing the organization of distinct learning centers, and includes a large outdoor yard that supports a variety of experiential and play-based activities.

The group consisted of 25 children, including 13 boys and 12 girls, aged 4 to 6 years. Among them, 14 were in their final preschool year and 11 were younger preschoolers. The class also included two children with signs of potential language-related learning difficulties and one child diagnosed within the autism spectrum, who participated in all activities with the support of a special educator.

These characteristics shaped a learning community rich in diversity, which guided the development of an inclusive and differentiated teaching approach. Close collaboration between the kindergarten teacher and the special educator was central to creating a supportive and equitable learning environment and active participation for all children.

Technological resources

The technological infrastructure of the school was limited. The classroom was equipped only with a desktop computer and Wi-Fi internet access. There was no interactive whiteboard or projector available. To implement the digital storytelling activities and other multimedia-based learning experiences, the teaching staff utilized personal mobile devices for scanning children's work, recording sound and narration and taking photographs and videos. This creative use of personal technology by educators highlights the adaptability and innovative spirit often required in under-resourced educational contexts.

Goals and content of the program

The educational scenario aligns with the new Official Curriculum for Kindergarten in Greece, specifically within 4th Thematic Field: Child, Body, Creativity and Expression, and more precisely within Subtheme 4.2 Arts, with an emphasis on 4.2.3 Music.

Music literacy as a core focus

Music literacy encompasses a broad range of knowledge and appreciation related to diverse musical examples and styles. It includes the ability to decode musical sounds and their sources, while initiating children into the enjoyment of listening, expression, and performance, thus enabling them to construct meaning through musical experiences. The program sought to immerse children in musical identification and categorization, including different instruments and styles, understanding of music as a form of expression and communication across cultures and everyday life and music performance and creation, fostering creativity and imagination.

The key competencies aimed to be developed in this domain include knowledge in naming and categorizing musical instruments, identifying basic concepts related to music performance, recognizing various musical genres from national and international repertoires, distinguishing the different functions of music and songs in their own and other cultures. Also, include skills in expressing and justifying their preferences for specific musical genres and attitudes in developing a positive disposition toward listening and music appreciation, collaborating and participating in group musical activities, supporting their own musical preferences while respecting others, behaving as attentive and considerate listeners in diverse musical events.

Integration of science and digital literacy

In addition to music, the program integrated elements from 3rd Thematic Field: Child and Science (3.2 Natural Sciences - subsection 3.2.3: Earth, Planetary System, and Space), and 1st Thematic Field: Child and Communication (1.2 Information and Communication Technologies - ICT).

Through the subtheme on Natural Sciences, the program capitalized on the innate curiosity and fascination children exhibit toward understanding the natural world. It aimed to cultivate early scientific thinking and awareness of the role of science in everyday life, thereby laying the foundation for lifelong scientific literacy.

Key competencies related to this theme included knowledge in understanding the planetary system as a part of the galaxy and broader universe, skills in representing the planetary system through various forms of expression and attitudes in recognizing the importance of the planetary system and its influence on life on Earth.

The program also fostered digital literacy, aligned with the curriculum's emphasis on the Processing of Information and Digital Creation. Young children were introduced to developmentally appropriate digital tools to express themselves creatively through multimedia environments and to manage and present information, using basic software for design, recording, and playback of audio, images, and video.

The digital dimension of the program emphasized with skills, as creating original digital content and expressing themselves through tools for image, sound, and video editing and production and attitudes, as using ICT purposefully and creatively as a natural extension of their expressive toolkit.

Implementation of educational scenario**Teaching methods**

In early childhood education, instructional material plays a crucial role. Particularly in kindergarten, the selection, creation, and design of such material must be engaging and developmentally appropriate to sustain young learners' interest. In this educational program,

the primary teaching method employed is the use of digital storytelling -short narrative-driven scenarios that serve as the main vehicle for teaching and learning.

According to Bratitsis (2021), digital storytelling merges traditional oral storytelling with multimedia content and digital tools, often incorporating interactive elements. This interactivity enhances learning and comprehension while also supporting the development of critical thinking and problem-solving skills in young children.

To create an immersive and engaging experience, digital tools and platforms were used, as PowerPoint presentations for visual storytelling and structured lesson delivery, digital 3D models of planets, NASA's Eyes on the Solar System for real-time visualizations, YouTube to access orchestral performances and child-friendly explanatory videos, Chrome Music Lab, encouraging students to experiment with sound and create their own compositions, Book Creator to document learning processes and student reflections, Scanners and sound recording tools to digitize children's drawings and voices.

The combination of these technologies not only provides a rich, multisensory learning environment but also aligns with the affordances of digital storytelling. As noted by Smeda et al. (2014), the inclusion of varied multimedia elements -such as text, visuals, audio narration, and music -helps to capture children's attention, stimulate emotional engagement, and promote deeper cognitive processing of the subject matter.

Role of the educator

During the implementation of the educational scenario, the preschool teacher alternates between multiple roles to support and guide the learning process effectively. Specifically, throughout the development of the learning program, the educator acts as orchestrator of the learning experience, guiding children through the different stages of the educational program and supporting their use of the digital tools. As mediator, encouraging their creative expression. As social pedagogue, collaborating with special education staff and families to implement individualized support and as researcher, observing, documenting and interpreting the learning process of the children.

Procedure

The project was implemented over a period of four weeks, with a total of ten sessions, each lasting approximately 45-60 minutes. Activities were organized around the exploration of specific planets in Gustav Holst's The Planets and the corresponding musical compositions. The sessions followed a flexible grouping strategy: whole-class discussions were used to introduce content and guide exploration, while small groups of 4-5 children collaborated during creative activities, such as music composition, digital storytelling, or drawing.

Given the limited technological resources of the classroom (one desktop computer with internet access), technology use was carefully managed. The desktop computer was connected to external speakers to allow all children to hear the music, while small groups rotated to interact with digital tools such as NASA's Eyes on the Solar System, Chrome Music Lab, and Book Creator. Educators also used their personal mobile devices to photograph, scan, and record children's work, ensuring that all students had the opportunity to see their creations integrated into the digital story.

Each session combined listening, discussion, and hands-on activities. For example, when exploring Jupiter, children listened to Holst's composition, observed images and digital 3D models of the planet, and then expressed their impressions through movement and drawing. Later sessions introduced music composition activities, where children created original

soundscapes for planets not included in Holst's suite (Earth, Pluto, the Moon). The total duration of the project allowed sufficient time for repetition, reflection, and the gradual development of digital literacy and musical understanding.

Examples of specific lessons and activities

The scenario begins with the introduction of the composer Gustav Holst, who is speaking directly to the children. He shares his two great passions -music and astronomy -and explains how they inspired him to compose a suite of orchestral pieces, with each movement representing a different planet in our solar system. As seen in Figure 1, the visual serves as a thematic and imaginative entry point into an interdisciplinary exploration of music and space, sparking curiosity and setting the stage for deeper learning.

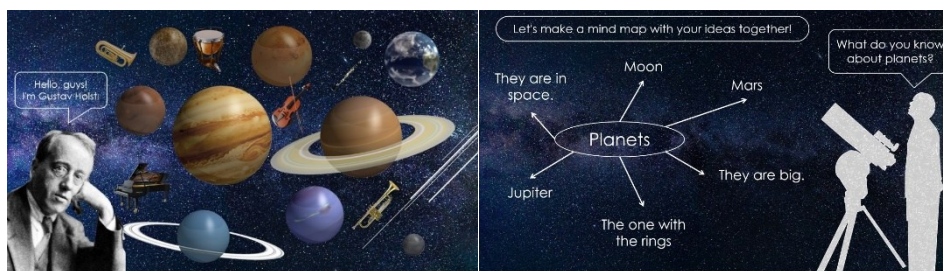


Figure 1. Introducing Gustav Holst and "The Planets" - Concept Map

At this point, children are introduced to two new concepts: classical music and the planets of the solar system. To explore their initial thoughts and prior knowledge about these topics, two diagnostic activities are implemented. The first is the creation of a concept map regarding the planets. In Image 1, children begin constructing a concept map to share what they already know about planets. This visual represents the first diagnostic activity, designed to activate children's background knowledge and support collaborative inquiry. It encourages learners to express existing ideas about the solar system, which will later be expanded through music and scientific exploration. The second activity introduces children to the world of classical music through a thinking routine titled "I See - I Hear - I Am Inspired". This diagnostic activity (Figure 2) invites children to observe, listen, and become inspired by the sounds of orchestral instruments. It sets the stage for exploration and expression, culminating in the creation of their own musical compositions by the end of the program.



Figure 2. Thinking Routine - Choose your planet

Gustav Holst, who serves as our virtual guide and companion, invites the children to choose whichever planet they would like to visit. They are encouraged to explore the planet and listen to the corresponding musical piece composed by Holst. The educational program is designed to be interactive. Children are free to choose which planet they would like to explore, and there is no predetermined order. This approach fosters autonomy and engagement, allowing them to follow their own interests.

Students have access to the musical composition for each planet, both in audio and through orchestral performance videos, by selecting the musical notes icon and a direct link to NASA's website, where they can view the real-time location of the planets by clicking on spaceship icon (Figure 3).

In addition to the core activities described above, each planetary exploration can be enriched with a variety of expressive and inquiry-based experiences. Children may be encouraged to move and dance to the music associated with each planet, express and discuss the emotions evoked by the musical elements, create visual representations of the planets through drawing or painting, or engage in guided searches for additional information or alternative musical pieces related to the celestial bodies. Dramatic play and storytelling can also be incorporated, inviting children to imagine what life might be like on each planet: What kinds of people, animals, or other beings might live there? How would they move, communicate, or build their world? These imaginative explorations foster empathy, creativity, and divergent thinking, while deepening children's emotional and cognitive engagement with the content.

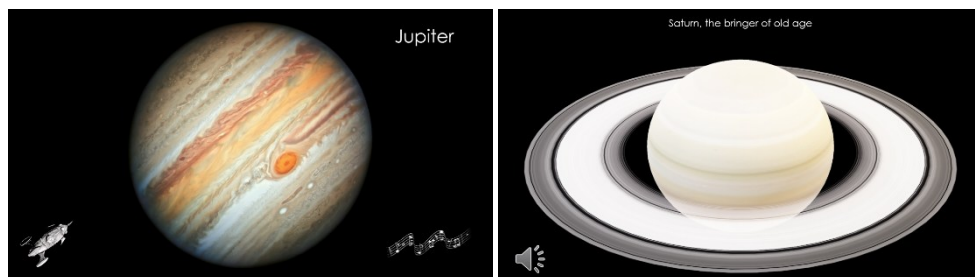


Figure 3. Eye on Jupiter - Saturn 3D interactive model

There are two planets for which Holst did not compose music: Earth and Pluto. The children noticed this omission and began to wonder why. This curiosity sparked thoughtful discussions about Holst's choices, including the historical context in which the suite was composed. Some children proposed that they could create their own music for these "missing" celestial bodies.

Returning to the routine "I see - I hear - I am inspired," the group moved to the third step: inspiration and creation. Children were divided into small groups and engaged in composing their own musical pieces for Earth and Pluto. In this particular implementation, their creativity expanded even further -some children expressed a desire to compose music for the Moon as well. Additionally, a few boys wanted to create a piece for Mars, while some girls were inspired to write music for Venus. These spontaneous extensions of the activity reflect the children's engagement, autonomy, and emotional connection to both the artistic and scientific content.

As the journey through the planets and classical music reaches its end, the children are invited to reflect on their experiences and express their preferences. Guided by Gustav Holst, who congratulates them on completing their musical and scientific exploration, they are prompted to engage in a final reflective activity: voting for their favorite planet and musical piece. This activity not only reinforces their learning but also encourages personal expression, active participation, and critical thinking, while providing educators with valuable insight into students' engagement and interests.

Observations and reflections

The integration of technology in early childhood education plays a pivotal role in shaping children's understanding of the world and fostering meaningful engagement with educational content. In the context of the Music of the Planets project, technology served not only as a medium of information delivery but also as a tool for exploration, expression, and collaboration.

In the musical component of the program, children interacted with digital audio tools to identify musical instruments, rhythms, and genres. They experimented with recording their own voices, remixing soundscapes, and engaging with simple music editing applications. These activities supported the development of musical literacy by transforming abstract musical ideas into concrete, multisensory experiences (Marsh et al., 2020).

In the science-focused part, children interacted with visualizations of the solar system, explored planetary movement, and built 3D models. These hands-on and digital experiences helped them conceptualize the structure and scale of the solar system through playful, exploratory learning. The moment a child exclaimed, *"I like holding the whole planet in my hand,"* captures the power of tangible learning through digital-physical integration.

Children's emotional and cognitive engagement was particularly evident in their responses to Holst's compositions. They interpreted the music personally and imaginatively: *"Mars is very angry!", "Mercury is very fast!", "Neptune is too old," "Jupiter is the king, of course."* One child's critical observation, *"I like uncle Gustavo, but why didn't he write music about Earth? It's our planet. It isn't right,"* demonstrates both their emotional connection to the story and their capacity for critical reflection -key principles of constructivist learning.

The central narrative and character -Gustav Holst -helped maintain engagement and provided continuity between activities. His presence was so impactful that children affectionately referred to him as *"Uncle Gustavo."* Their curiosity about the planets not represented in Holst's suite led to spontaneous extensions of the activity, such as composing their own music, drawing imagined lifeforms, and dramatizing planetary life. These moments exemplified active meaning-making and ownership of learning.

Children also developed early digital literacy skills through the use of storytelling and design applications. Working in groups, they created digital artifacts that combined visual, textual, and audio elements. This collaborative digital storytelling encouraged negotiation, peer learning, and public sharing of work.

Educators played an essential role in facilitating these experiences by guiding technology use, promoting digital citizenship (e.g., turn-taking, respecting others' creations), and offering support during technical challenges. While some difficulties were encountered -such as device limitations or time-consuming preparations -the overall outcome demonstrated the value of thoughtful digital integration in early learning environments.

Results

The interdisciplinary design of the project resulted in strong engagement and meaningful learning outcomes across music, science, and digital literacy.

In music, children demonstrated an increased ability to recognize musical instruments and styles, to associate musical elements with emotions, and to create original compositions. Their reflections revealed both an emotional connection to the repertoire and a capacity for critical interpretation of abstract musical content.

In the area of science, interactive visualizations and digital 3D planetary models supported the development of conceptual understanding of the solar system. Children were able to compare planetary characteristics, identify similarities and differences with Earth, and formulate hypotheses about planetary environments.

In digital literacy, students acquired basic skills in recording, scanning, and combining multimodal elements into digital artifacts. Collaborative work in Book Creator encouraged negotiation, peer learning, and the respectful sharing of digital resources, thereby fostering both technical and social competencies.

Most importantly, the project fostered interdisciplinary connections. Music became a gateway to scientific inquiry, as children linked planetary features to the character of each composition (for example, a fast tempo was associated with Mercury's speed). Scientific knowledge informed creative expression, with children designing music for Earth, Pluto, and the Moon after discussing their physical characteristics. Digital technology enabled the integration of these domains, providing platforms for exploring planetary models, composing music, and documenting the entire process in a digital story.

Conclusion

The Music of the Planets scenario showcased how digital storytelling can be a transformative tool in early childhood education. As Melek (2020) suggests, digital stories support learning by arousing children's interest, allowing personalization, supporting concretization of abstract content, providing increased opportunities for participation, offering flexibility of use, and presenting content in a comprehensive and engaging manner.

These benefits were clearly evident throughout the project. The digital story captured children's attention and provided a narrative structure that supported smooth transitions between activities. It also allowed for classroom-specific adaptations, promoting personalization based on children's interests and developmental needs.

The use of digital storytelling made abstract scientific concepts -such as planetary characteristics and motion -accessible and engaging. The flexible design of the scenario enabled integration across different subject areas, including music, visual arts, language, and science. Teachers were able to observe children's reactions and learning progress in real time, gaining insights into their understanding and creativity.

However, some limitations emerged. Technical issues occasionally disrupted the flow of the lesson, and creating high-quality digital content required significant time and planning. These challenges highlight the importance of adequate infrastructure and support for educators when implementing digital learning scenarios.

Despite these limitations, the program demonstrated that digital storytelling, when thoughtfully implemented, can enrich early childhood education. The interplay between exploratory play, digital creation, and scientific simulation created a developmentally appropriate, engaging, and interdisciplinary learning environment.

In conclusion, Music of the Planets blended creativity, exploration, and technology. It supports the development of 21st-century skills in a developmentally appropriate, emotionally engaging, and interdisciplinary way -honoring children's voices and imaginations as central to the learning process.

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