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Locative media in children´s digital books: designing new narratives on space

Mídias locativas em livros infantis digitais: desenhando novas narrativas sobre o espaço

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Abstract: This paper investigates how locative media strategies in children's digital books can promote spatial knowledge. Locative media links information to physical space, which is considered one of the central elements of narrative. Narratives help condense and recall experiences and are fundamental to understanding time and time-based events. The use of locative resources in children's digital books can generate new spatial narratives, reorganized to support the meaning of the story and to expand the reader's interactions and sensory engagement. Through a theoretical review and a description of the development of the Portinari on the Island children's digital book collection, created by undergraduate design students in 2023, this study identifies the narrative elements of space and the spatial strategies incorporated into the books. The article also presents the stages of the design framework that integrates literary production, multimodality strategies, information architecture, prototyping, evaluation, and publication. As a result, this article proposes guidelines for the use of locative media strategies in the design of digital books that can enrich children's reading experiences and strengthen the integration of narrative and place. It further presents principles to guide teachers, parents, and mediators in supporting children during the reading process. Finally, it discusses the importance of considering technological constraints and of offering open-access books that remain compatible with standard devices.

Keywords: Locative media. Spatial knowledge. Children 's books.

Resumo: Este artigo investiga como estratégias de mídias locativas em livros digitais infantis podem promover conhecimentos espaciais. Mídias locativas articulam informações ao espaço físico, considerado um dos elementos centrais da narrativa. As narrativas auxiliam na condensação

e na rememoração de experiências e são fundamentais para a compreensão do tempo e de eventos temporais. O uso de recursos locativos em livros digitais infantis pode gerar novas narrativas espaciais, reorganizadas para apoiar o sentido da história e ampliar as interações e o engajamento sensorial do leitor. A partir de uma revisão teórica e da descrição do desenvolvimento da coleção de livros digitais Portinari na Ilha, criada por estudantes de design em 2023, o estudo identifica os elementos narrativos do espaço e as estratégias espaciais incorporadas aos livros. O artigo também apresenta as etapas do processo de design que integra produção literária, estratégias de multimodalidade, arquitetura da informação, prototipação, avaliação e publicação. Como resultado, o artigo propõe diretrizes para o uso de estratégias de mídias locativas no design de livros digitais capazes de ampliar as experiências de leitura infantil e fortalecer a integração entre narrativa e lugar. Apresenta ainda princípios para orientar professores, pais e mediadores no suporte às práticas de leitura. Por fim, discute a importância de considerar limitações tecnológicas e de oferecer livros de acesso aberto compatíveis com dispositivos padrão.

Palavras-chave: : Mídias locativas. Conhecimento espacial. Livros infantis.

Introdução

The concept of "place" is fundamental to the human experience, serving as the focal point around which both space and landscape are organized and imbued with human intentions and experiences (CATLING, 2018). Children are inclined to engage in mapping from early childhood. This mapping skill is initially developed through sensory exploration and playing in familiar environments. As children expand their interactions with places—through neighborhood walks, travel, or social interactions—they enhance their capacity to create and interpret maps to communicate the location of things they desire, their intended destinations, or their own location.

Another factor that significantly enriches children's environmental cognition is the use of media sources, particularly books with illustrations and images of real or fictional places. As Catling (2018, p. 274) notes, "these stories and illustrations draw on children’s local familiarity through their settings, even when these are new, such as rural or island environments for urban children, or unconventional worlds." In this sense,

spatial literacy is constructed through experience in real space, both physical and imaginary.

However, there is also a spatial experience that originates from fictional places. Ryan (2018) affirms that stories always concern concrete objects that exist in space. Therefore, a fictional text refers to a world other than the actual world, and the narrative orients the construction of this other world. The notion of "world" also offers a convenient target for the experience of immersion, which has received increasing attention since digital technology and its dream of virtual reality brought attention to it (RYAN, 2016).

Locative books represent a recent and timely form of children's digital literature that combines storytelling with spatial and interactive technologies. Through resources such as GPS, augmented reality, and mobile sensors, these narratives unfold in relation to the reader's physical surroundings, turning real places into extensions of the storyworld. As Menegazzi and Tarachucky (2020; 2022) point out, projects like *Uramado AR* illustrate how location-based narratives can encourage children to move through space, discover hidden story elements, and experience reading as an embodied and exploratory act. This model expands traditional notions of reading by combining digital art, play, and place-based learning, enabling children to engage with both narrative and environment in creative, participatory ways.

In Brazil, digital children's literature remains a limited yet experimental and pedagogically promising field, as noted by Vilela and Corsino (2022). Their study highlights that few national publishers invest in digital formats, and most works replicate print models with minimal interactivity. However, a growing number of literary apps are using multimodality, non-linearity, and reader participation to reshape how children engage with stories. The

authors' research with young readers in public schools reading digital books from Brazilian publishers shows that guided collective reading of these works can foster aesthetic appreciation, collaboration, and critical thinking.

According to Kirchof (2020), access remains a challenge in Brazil, as digital literature is often constrained by high device costs, limiting interaction primarily to middle and upper-class families. Nevertheless, children from underprivileged backgrounds actively seek alternatives—sharing devices or using school resources—showing strong interest in participating in the global digital culture.

Despite technological and market challenges, these initiatives reveal an emerging creative landscape in Brazilian digital children's literature that both aligns with global trends and reflects local cultural contexts. In this context, locative and interactive resources offer a valuable opportunity to expand traditional narrative forms, enabling children to engage with stories while connecting narrative, space, and cultural heritage. Building on this potential, the present study explores how locative media can be integrated into children's digital books, using a practical example.

In 2023, professors and undergraduate students in Design from a Brazilian public university developed the *Portinari in the Island Collection*, a series of interactive digital books for children that enabled them to test spatial resources in narratives. This experience motivated a discussion on the use of locative media in an educational context and raised questions about spatial narratives for children and how new media can contribute to the matter.

This article is structured as follows. It starts by presenting a brief review of locative media as a new medium of knowledge, intended to define the

uses and technology that constitute the field. Then, the theoretical basis of narrative and space is presented to amplify the understanding of how real and fictional places are described and perceived. A practical example of the use of locative media in children's digital books, the *Portinari in the Island Collection*, is described. Next, the process is discussed to analyze how locative media can enrich spatial narratives. The paper concludes with recommendations and proposes guidelines for spatial narratives in children's digital books.

1 Locative media

The term "media" is considered a synonym for communication instruments and/or objects: the physical part of information, responsible for the support, expression, and dissemination of information (communication) between human agents or between technological agents (PERASSI, MENEGHEL, 2011). While locative media is the information support whose informational content is linked to a specific location (TARACHUCKY, 2021).

Andrade (2016) states that a medium can be considered locative when it has the quality of aggregating informational content to a given location. In this case, the transmission and reception of messages must always occur at the local level, providing services according to the user's location. Locative media can be analog or digital. Analog locative media refers to the fact that the information medium offers a continuous physical relationship between the original message and its reproduction. Meanwhile, digital locative media allow encoded information to be created, viewed, distributed, modified, and/or preserved on digital electronic devices with screens (TARACHUCKY, 2021).

There is a relation between digital locative media and the innovative use of location-based technologies to create interactive and immersive

experiences that fundamentally link information to a specific geographical space. While the term can broadly encompass any link to additional information set up in space, it is primarily associated with technical projects that leverage digital content tied to physical locations.

The technological backbone of locative media includes:

- **Global Positioning System (GPS):** Provides accurate detection of specific locations.
- **Mobile Devices:** Smartphones and tablets offer the necessary hardware and software to support location-based technologies.
- **Geotagging:** Associates content with specific geographical coordinates.
- **Wi-Fi Positioning:** Another technology used for location determination.
- **Geographic Information Systems (GIS):** Supply diverse information about the geological, strategic, or economic situation of a location.
- **Web Map Services:** Platforms like Mapbox, OpenStreetMap, and Google Maps provide visual representations of places.

Despite the technological content, locative media also has a cultural impact: the "culture of mobility" based on three dimensions present in contemporary social life: **the physical**, which consists of the movement of bodies through space; **the informational**, related to the movement of information through the media; and **the imaginary**, corresponding to the cognitive capacity of human beings to "move through imagination" (ANDRADE, 2016).

2 Narrative and space

A narrative is an emotion-evoking and value-laden representation of one or more characters in a series of chronological events that are connected

by causality or agency, and which progress through conflicts toward a climax (GRIMALDI et al., 2013). Although space is not named in narrative's concept, Ryan (2016) argues that it is always present. In the 2016 book *Narrating Space / Spatializing Narrative: Where Narrative Theory and Geography Meet*, Ryan, along with geographers Foote and Azaryahu, discusses the relationships between narrative text and space. They highlight, on the one hand, the strategies used in narratives to map spaces, and on the other hand, the possibilities of establishing narratives during journeys, visits, and other spatial experiences.

In Ryan, Foote and Azaryahu (2016), four types of textual space are defined: **1) the spatial form of the text**; **2) the space materially occupied by the text**; **3) the spatial context of the text**; **4) mimetic space**, or space of the storyworld.

The first is **the spatial form of the text**, which refers to the internal organization of the elements of the narrative text. That is, it "describes a typographical realization of language and the arrangement of words on the page" (RYAN, 2022, p. 02). In digital narratives, two elements are fundamental to the spatial organization of the text: the graphical user interface and interactivity. In this context, the possibility of modifying the text structure, whether by entering new textual information or by interacting through buttons and hotspots, allows for a sense of autonomy over the proposed narrative.

The second type refers to the **space materially occupied by the text**, it refers to the physical medium used by the narrative. Ryan (2022) states that materiality can have zero, one, two, or three dimensions, the zero dimension is related to oral texts. In the case of digital texts, the author considers the idea of materiality problematic, since the text exists as a code stored in the computer's memory. Specifically regarding mobile

devices, it is possible to consider the materiality of the equipment that supports the information; thus, the grip of the mobile phone or tablet, as well as haptic devices, reinforce the physical perception of the media object that supports the text.

The third type considers the **spatial context of the text**, where the environment and architectural landscapes complement the narratives. They provide a spatial context in which narrative experiences take place, offering elements to anchor the events of the story in order to enhance engagement and immersion. The development of digital technologies and the advancement of network infrastructures that allow the massive use of GPS have made the popularization of site-specific narratives possible. In this context, there has not only been an expansion in the use of spatial narratives, but also a diversification. Ruston (2010, apud RYAN, 2022) observes three categories: **spatial annotation**, **games**, and **mobile narrative experience**.

Spatial annotation refers to projects where information about events related to specific places is inserted. This feature is widely used in historical itineraries, where a route map with highlighted points is presented to the user; as they follow the route and reach the indicated points, information about the place is displayed. An example is the *Literary Routes* project, coordinated by EmbraturLab and partners for the city of Rio de Janeiro. There is a route dedicated to the writer Machado de Assis, where a first-person audio guide introduces visitors to the city's landmarks that were important to the writer's life and work.

The category of **location-based games** became popular starting in 2016 with *Pokémon Go*, although there were earlier location-based games, none had such a wide reach. *Pokémon Go* combines a treasure hunt strategy and exploration of urban spaces with AR technology, where the player sees a

fictional creature (Pokémon) on their mobile phone screen superimposed on their location and must perform specific movements with the mobile to capture it.

The third category defined by Ruston (2010, apud Ryan, 2022), **mobile narrative experience**, is a hybrid of the two previous categories. It differs from location-based games by emphasizing narrative and, at the same time, distances itself from spatial annotation by creating a global narrative, often fictional and not based on historical facts that occurred in the places. An example that illustrates this category is *Uramado AR: Tanuki Awake*, previously analyzed by Menegazzi and Tarachucky (2022), an interactive traveling exhibition developed by Julie Stephen Chheng and Thomas Pons in 2017. *Uramado AR* is a treasure hunt route in augmented reality, it tells the story of *Tanukis* which are spirits of the forest waking up in the city. *Tanukis* (fictional creatures) are placed in different places of the designated area, outside and inside, more or less hidden, in different sizes. As the stickers are discovered one by one, the spirits come to life, bewildered, and ask questions to the participant. According to the reply given, the participant will discover at the end of the route that he himself is a spirit and will get to leave the game with his own colorful mask in augmented reality.

The fourth type of spatial narrative is **mimetic space**, or the space of the storyworld. Digital technology provides user immersion in narratives; creates simulations of the environment, where the reader has agency in relation to the presented narrative. Thus, it is possible to choose where to look, walk, and even how to interact with the scenery and other characters and/or avatars. Computers provide a live, first-person experience of the space. The spaces aren't merely represented, but turned into habitable environments, in which users can navigate either through an avatar

manipulated by external controls or, in some VR applications, through the user's own body.

Menegazzi and Tarachucky (2020) highlight that locative technologies in children's digital books open new possibilities for situated literary experiences by linking narrative events to physical spaces. Their multicase study identifies four main ways of integrating location-based systems into storytelling apps: **as tour guides**, which use stories to interpret real environments; as **educational tools**, designed to promote learning about a place; as **location-aware games**, which merge gameplay and spatial exploration; and as **location-aware fiction**, where the story itself unfolds through movement in the real world. These forms reveal how locative media can transform reading into an embodied act that requires displacement, attention to surroundings, and affective engagement with place. Beyond their technological affordances—such as GPS, augmented reality, and geotagging—these resources can contribute to a new spatial poetics in children's literature, allowing the environment to become both narrative setting and participant. This integration not only strengthens spatial literacy but also redefines the reader's role from passive observer to active explorer of narrative space (MENEGAZZI, TARACHUCKY, 2020).

3 Development of digital children's books: *Portinari in the Island Collection*

The Portinari on the Island project originated from a proposal by educators at UFSC's Child Development Center to situate Portinari's work within the cultural context of Florianópolis, fostering dialogue with regional artistic traditions such as those of Franklin Cascaes and integrating these perspectives into local school practices. Portinari's depictions of Brazilian life and social themes, together with Cascaes's Azorean folklore and mythical figures from Santa Catarina Island, provide

a rich foundation for narratives that connect children to local culture and history. As a digital book collection, the project aims to introduce these artists to new audiences and explore how digital media can enhance interaction and immersion, turning the adaptation into an act of cultural mediation that makes the works accessible and meaningful to young readers.

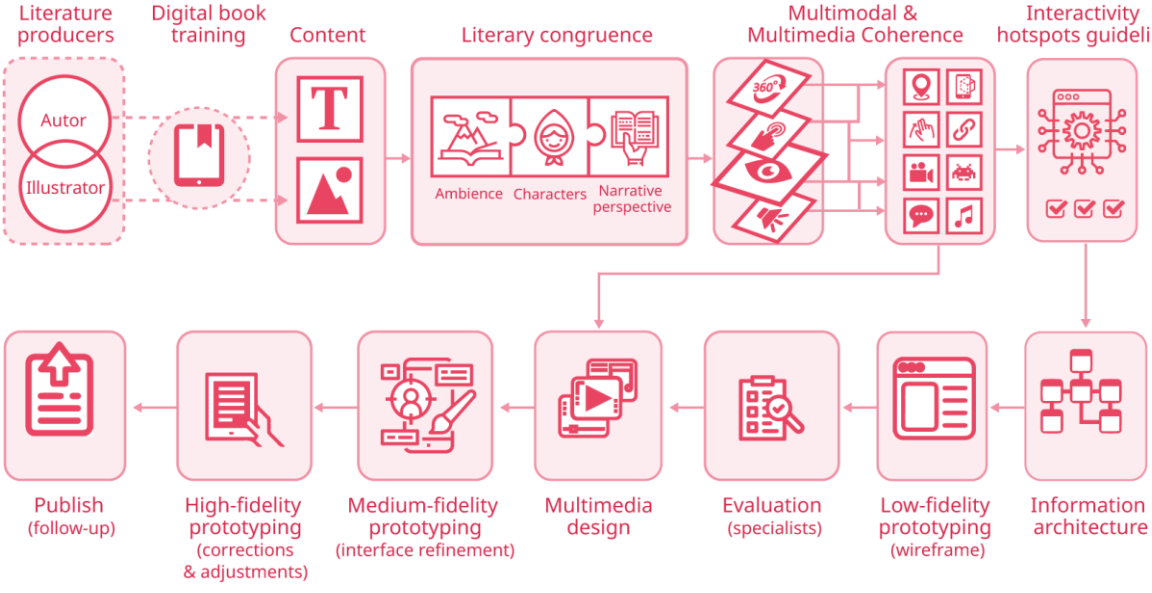
The project was led by professors from the Design course and the Child Development Center (Núcleo de Desenvolvimento Infantil—NDI) of UFSC, who supervised the Design students in the 2023.2 class and developed the content while providing pedagogical guidance. The project also received support from *Projeto Portinari*, the *Casa de Portinari Museum*, and the *Museum of Archaeology and Ethnology* of UFSC—where the *Franklin Cascaes Foundation* is housed—all of which granted access to and authorized the use of information and images from the artists' works. This collaborative and multidisciplinary structure enabled students to engage in practices across multiple areas of expertise, including Content Creation and Adaptation, Illustration, Graphic Design, Interaction and Multimedia Design, Reading Mediation, Locative Media Design, and Prototyping.

The *Portinari in the Island Collection* was developed following the participatory and multidisciplinary principles proposed by Menegazzi and Tarachucky (2020), which address both the opportunities and challenges of creating location-based electronic stories for children. Among the main opportunities are the potential to engage young readers with real environments, promote playful mobility, and reconnect reading with family participation and outdoor experiences. The authors also identify challenges such as GPS limitations, connectivity issues, the need for adaptable "sofa mode" for offline access, and the importance of avoiding adult-centered design practices. By integrating inclusive methods, local culture, and digital mobility while balancing technological functionality

with literary and educational goals, locative projects can offer meaningful, context-aware, and culturally responsive reading experiences (MENEGAZZI, TARACHUCKY, 2020).

The project adopted a methodology that combines Design Science Research and Action Research. Design Science Research focuses on creating innovative artifacts to solve practical problems, while Action Research is an inquiry process grounded in praxis, utilizing iterative cycles of planning, action, and reflection to integrate theory with practice. Together, they enable an iterative cycle of design, implementation, and evaluation with specialists and experts, following the framework proposed by Menegazzi, Machado, and Nunes (2024) for developing interactive digital books for children, as depicted in Chart 1.

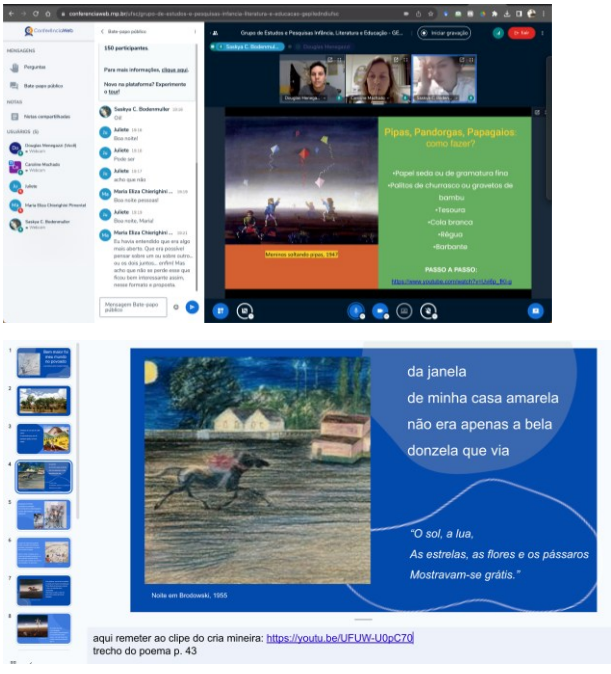
Chart 1. Framework of the process to develop interactive digital books for children. Adapted from Menegazzi, Machado and Nunes (2024).



The development process began with the **Selection, Training, and Adaptation of Content**. The literary material was created in collaboration

with educators from the *Child Development Center*—UFSC, resulting in six pre-existing texts chosen for pedagogical and cultural activities within the *Portinari on the Island project*. The educators/authors received an online training (Fig.1-left) to revise and adapt these texts for multimedia and multimodal use, preparing slide-based layouts that combined verbal text, selected artworks, and notes, comments, or multimedia links to be integrated (Fig.1-right). Student teams of approximately four members, with expertise in illustration, multimedia design, layout, and interaction design, were assigned to each text. Each team had the autonomy to adapt the texts to a multimodal, interactive digital book format, particularly developing locative strategies to enhance engagement and spatial exploration.

Figure 1. Educators/authors training to develop multimodal content (left). Screenshot of slide documents created by them (right).



The **literary congruence phase** included students' close reading of the slide-based texts, meetings with the educator-authors, classes on digital

resources for literary expression, and workshops on interpreting and reimagining Portinari's and Cascaes' works (Fig. 2-top). It also involved observing outdoor reading mediation sessions with children aged 0 to 6, who experienced Cascaes' stories while moving through UFSC places featuring artworks connected to the artist, such as the Boitattá sculpture (Fig.2-bottom) and attending a lecture by Eloar Guazelli, a renowned Brazilian children's book illustrator. These experiences guided the creation of graphic strategies to represent characters, settings, and narrative perspective, aligned with digital media and multimodal resources.

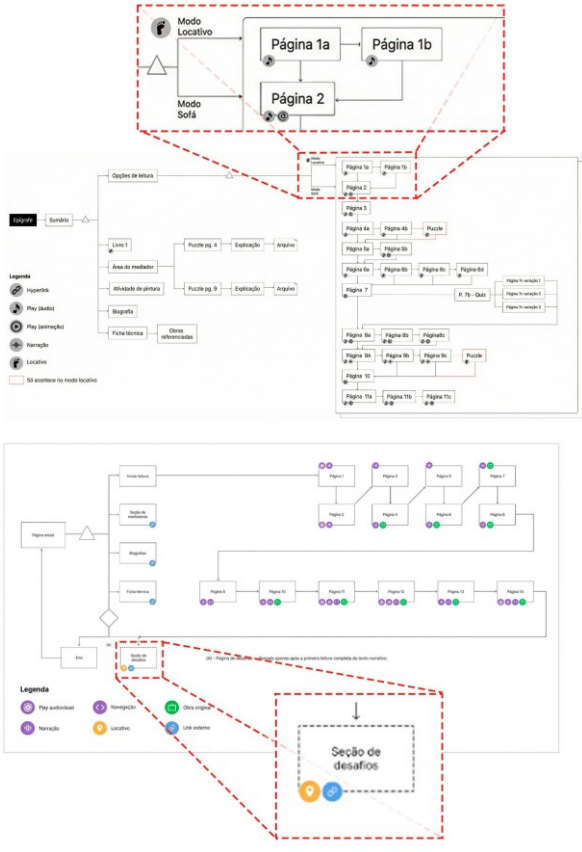
Figure 2. Design students engaged in workshops (top). Reading mediation sessions (bottom).

In the **multimodal and multimedia resources** phase, students developed and validated narrative strategies through an adaptation plan that aligned the story with multimodal formats—visual, auditory, haptic, and locative—and defined the multimedia resources to be activated by **interactive areas/elements**—hotspots.

Then, the narrative was translated into a concrete user experience through **information architecture and structure**, organizing multimodal and multimedia content into a logical flow and navigation system accessible and engaging for young readers and reading mediators (Fig.3). In this phase, students planned the **inclusion of locative media resources** in the story. Three teams designed the reading to include a decision point before starting, allowing readers to choose between “sofa mode” or “locative mode” (Fig.3-left). In these cases, the digital book pages were

duplicated for each mode, and the locative mode required additional adjustments, including instructional text to guide readers in using the locative resources. The other three teams opted not to separate the modes, instead integrating locative resources within the reading or in post-reading activities (Fig.3-right). In both approaches, students were instructed to indicate pages containing locative resources using icons (e.g., a pin in Fig.3-left, a footprint in Fig.3-right) to guide the team in planning and production.

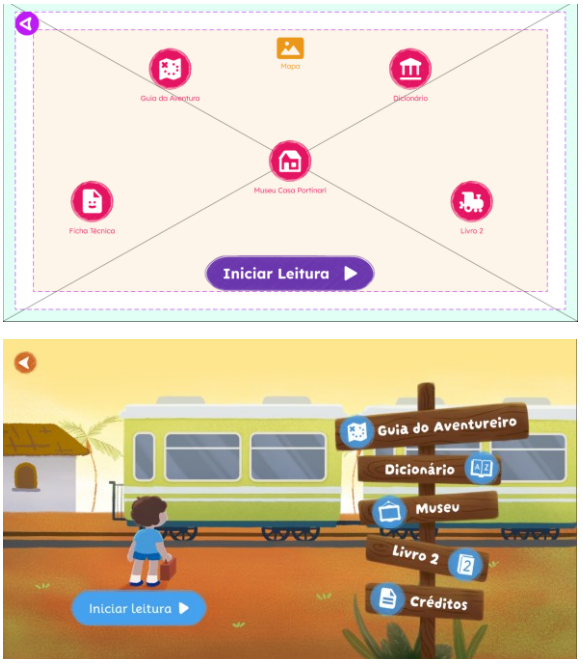
Figure 3. Educators/authors training to develop multimodal content (left). Screenshot of slide documents created by them (right).



The **prototyping and evaluation phase** consists of the development process with low-fidelity paper sketches outlining each story's structure and interactions. These sketches were then transformed into digital

wireframes—simplified layouts mapping elements and navigation flow—used to evaluate usability and narrative coherence before moving on to detailed design (Fig.4-left). Afterward, **multimedia enhancement** was carried out by **integrating and testing** the visual, auditory, haptic, and locative interfaces—videos, animations, ambient sounds, automated reading features, and other elements. These were evaluated in advanced prototypes to ensure multimodal coherence and to identify the most effective interactive resources for implementation (Fig.4-right). Once incorporated, the medium-fidelity prototypes were further tested through interaction sessions conducted by students from other teams acting as specialists, as well as by children's educator experts.

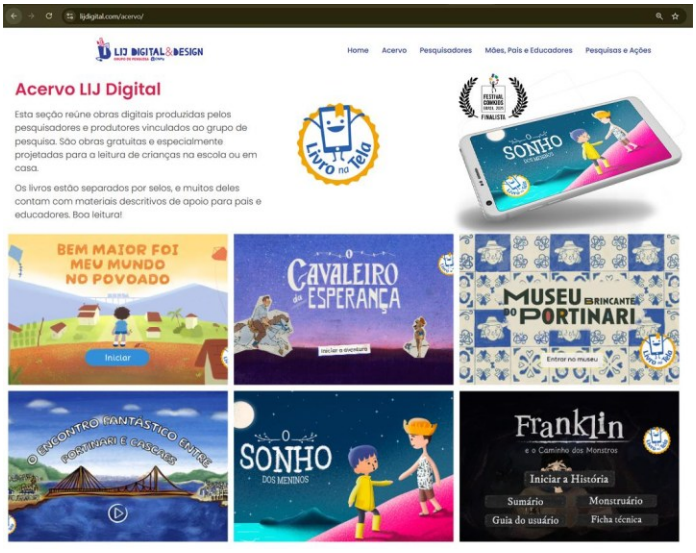
Figure 4. Wireframe prototype of a home page (left). Final interface of the same home page (right).



Before **implementing multimedia** elements, the **medium-fidelity** prototypes were evaluated through **interaction tests** conducted by students from other teams acting as specialists and by early-childhood education experts. These evaluations guided refinements to the interface

and to the integration of interactivity features such as hotspots, interactive areas, and buttons used to activate, pause, or control multimedia and navigation flow. Subsequently, multimedia enhancement involved integrating and testing the visual, auditory, haptic, and locative interfaces—videos, animations, ambient sounds, automated reading features, and locative modes and mechanisms. These components were assessed in **advanced prototypes** and again **tested with children's educator experts**. The final implementation consisted of **corrections and refinements**, with student groups presenting their projects to educator-authors, Design professors, and invited specialists in children's literature and education for validation prior to **publication and distribution**. As a collection, the books were published online as an open-access[1] (Fig.5). Additionally, one of the titles was selected as a finalist for an international award (ComKids 2024 – Shortlist).

Figure 5. The six *Portinari in the Island books* available in an open-access webpage.



Despite the satisfactory results of the project, a question remained: was the use of locative media effective in the creation of a spatial narrative?

[1] Available at: https://www.lijdigital.com/acervo. Accessed: Dec. 2025.

4 Discussion

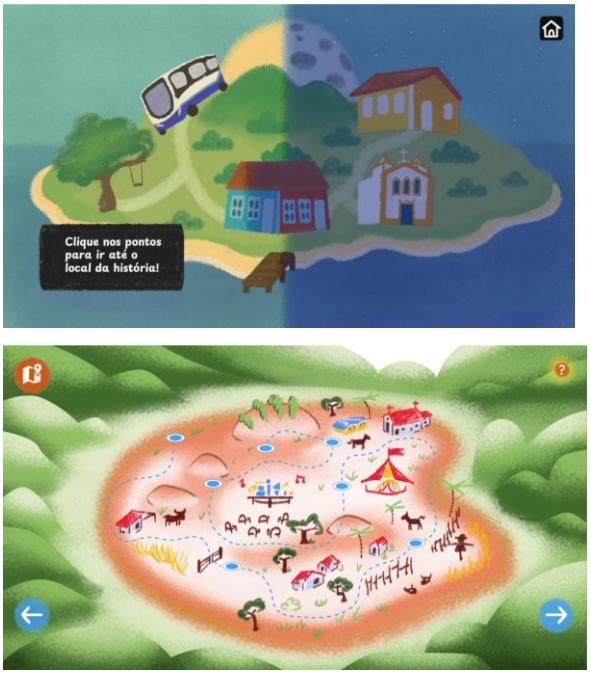
The six digital books created for this project employed locative media, aiming to extend the narrative beyond the screen into the reader's environment. While following the same design process, each book features unique locative and multimodal strategies and distinctive graphic approaches.

In the **Sofa reading mode** the spatial strategies observed in the digital books reflected **the textual** form described by Ryan (2022). They were primarily expressed through textual descriptions of places, which could include both verbal language and visual representations such as illustrations, as well as maps, landscape illustrations, character illustrations linked to local nature, folklore, and culture, and interactive hotspots. These elements structured the narrative visually and through interactivity, reinforcing a seated, contemplative reading experience while allowing readers to remain visually and cognitively connected to the represented places. In the **Adventure (locative) reading mode**, the emphasis shifted to more dynamic interactions, particularly games and challenges, mobile narrative experiences such as treasure hunts and puzzles, and other forms of movement-based engagement. Together, these approaches generated different degrees of spatial immersion, ranging from more descriptive and representational environments in Sofa mode to more exploratory and action-oriented interactions in Adventure mode.

The relationship between text and space emerged from the definition of the books' content. The main characters, Candido Portinari and Franklin Cascaes, are closely linked to their hometowns—Brodowski and Florianópolis, respectively—and their artworks reflect their experiences in these cities. Although other cities appear in Portinari's trajectory, such as Rio de Janeiro and Paris, it is noteworthy that the concept of "locative"

extends beyond spatial interaction, shaping the graphic design and illustrations of several digital book pages in Sofa mode. This is evident in menu and home pages, which use location-based visual cues such as street signs (e.g. Fig.4). It is also seen in maps inspired by the artists' hometowns. Examples include a homepage designed as an island map referencing Santa Catarina Island in the digital book Franklin e o *Caminho dos Monstros*, where Cascaes lived (Fig.6-left), and a reading-progress feature based on a map of Brodowski in *Bem maior foi meu mundo no povoado*, Portinari's birthplace (Fig.6-right).

Figure 6. Island map referencing Florianópolis as the homepage of a digital book (left). Map referencing Brodowski as the reading-progress page in another digital book (right).

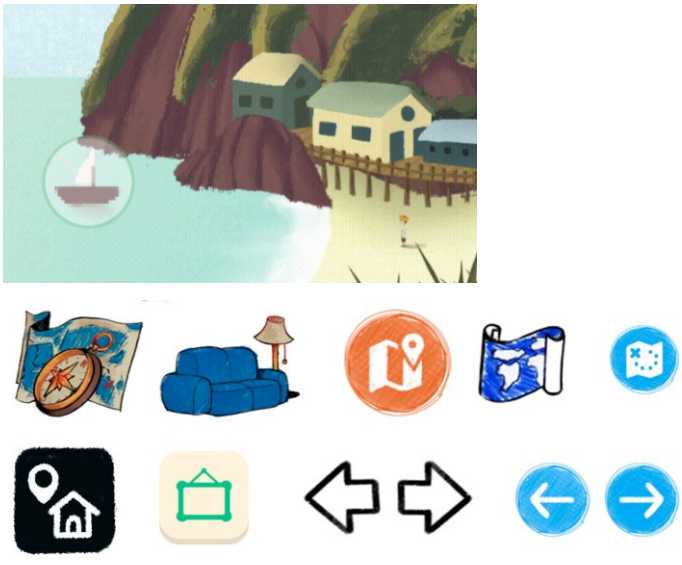


Alongside illustrations of **characters connected to local nature, folklore, and culture**, the books present, for example, bird figures based on species native to the Brodowski region (Fig. 7-top) and creatures derived from Cascaes' imaginary, inspired by oral storytelling traditions in Florianópolis (Fig. 7-bottom).

Figure 7. Bird illustrations in Bem maior foi meu mundo no povoado (top). Cascaes' creature (bottom left) and student reinterpretation in O Encontro dos Meninos (bottom right).

Furthermore, the design of **hotspots** was strategically developed to function as a semiotic and functional bridge between the digital narrative and the physical environment, using visual cues to signal the availability of locative experiences. Intratextual hotspots served as visual prompts to encourage readers to interact with animated or multimedia elements within the narrative pages (e.g., Fig. 8-left). Students also designed specific icons to enhance navigation and usability for each book project (e.g., Fig. 8-right), including buttons representing adventure or Sofa mode reading, map symbols for the chapter index, pins such as a house for the home index, a frame icon to access the artists' gallery, and standard interface icons for moving forward or backward between pages.

Figure 8. Intratextual hotspots (left). Navigation and interface icons designed by students (right).



Other activities can be understood within Ryan's concept of **spatial context**. Designed as games, challenges, and mobile narrative experiences, they aimed to extend the digital narrative into the physical environment and to activate spatial context through movement and embodied interaction. In *O Sonho dos Meninos* and *Franklin e o Caminho*

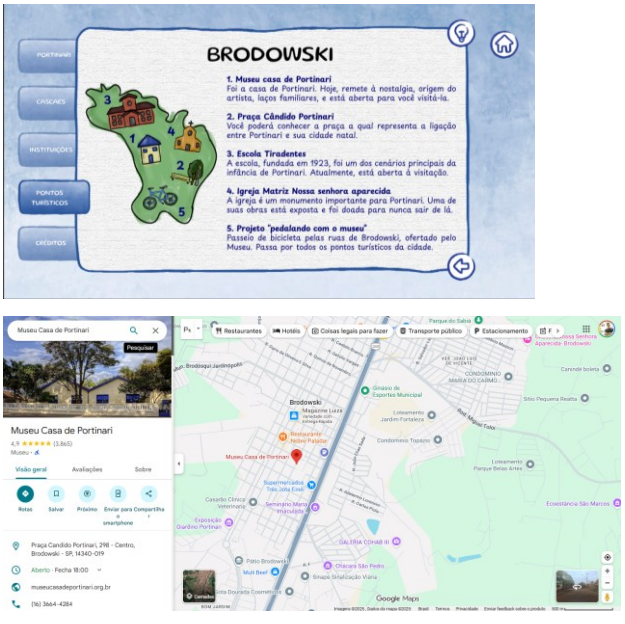
dos Monstros, children searched for physical stickers or cards in the environment to uncover passwords and unlock digital content. In *Bem maior foi meu mundo no povoado*, the locative "adventure" mode prompts readers, before each narrative page, to move to specific places such as the shade of a tree or to collect physical objects, including coffee beans stored in a glass jar called "Potinari," a wordplay on "pote" (jar) in Portuguese, to create a more sensory reading sequence. Another strategy involved the creation of museum-like spaces. In *O Encontro Fantástico de Portinari e Cascaes*, children can explore and create a gallery selecting three artworks from a preset combination to "personalize" a virtual collection within the app (Fig.8).

Figure 8. Virtual gallery customization in O Encontro Fantástico de Portinari e Cascaes.

Additionally, the **mobile narrative experiences** are presented in some books. In *Museu Brincante do Portinari*, children (or the mediator) can download PDF linearts of the artist's works from a dedicated section of the book, print and color them, and then arrange a physical exhibition.

Each printed artwork includes a QR code that links to short animations presenting play activities inspired by Portinari's paintings. In *O Encontro Fantástico de Portinari e Cascaes is* included an illustrated map with links to *Google Maps* routes to important locations in the artists' cities, such as the *Museu Casa de Portinari* in Brodowski (Fig. 9) and the *Fundação Franklin Cascaes* in Florianópolis, enabling the use of geolocation through Google Maps APIs. This approach did not require programming, relying instead on the prior creation of shared routes.

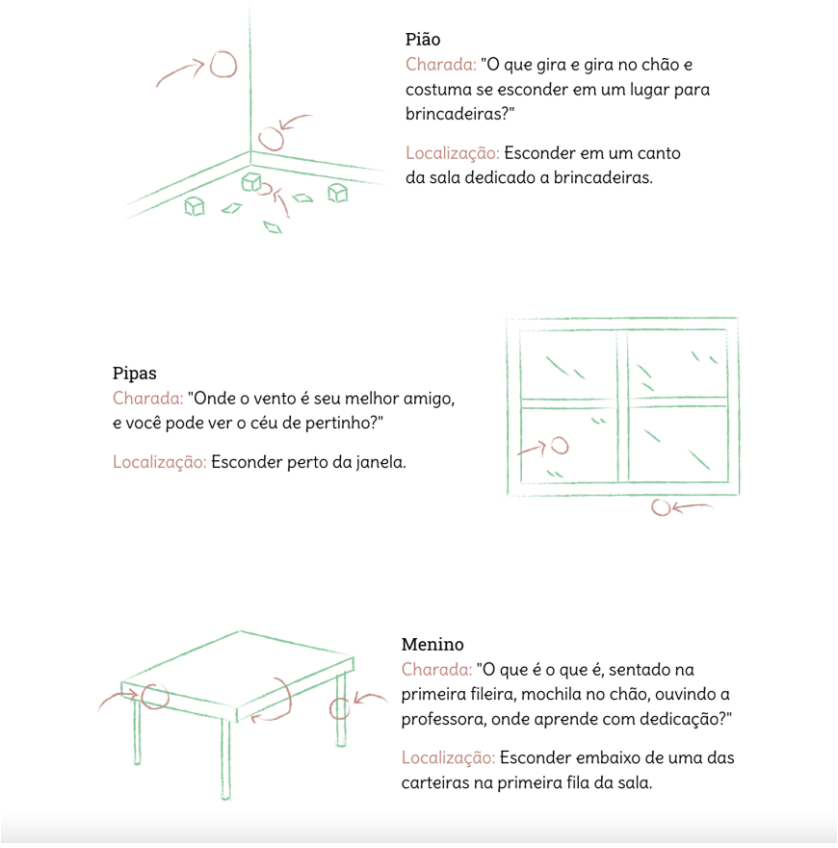
Figure 9. Illustrated map of Brodowski showing locations (left). Google Maps route to Museu Casa de Portinari, linked from the illustrated map (right).



However, the main aim of the book collection was to extend knowledge about the artists beyond Brodowski and Florianópolis, where they are well known. While the books reference landmarks from these cities, such as the Hercílio Luz Bridge—a touristic place of Florianópolis—or the Casa de Portinari Museum, using these sites as part of a locative route would limit the applicability of the resources. The locative routes needed to be replicable in different locations so that schools elsewhere could

implement the activities in their pedagogical practices. To support these experiences, some projects **developed supplementary materials**, including “Extra Materials,” the “Adventure Guide,” and the “Mediator Manual,” which provide scripts and printable kits to help parents and teachers connect the tangible and digital components. In *O Sonho dos Meninos*, the mediator’s guide instructs adults on how to carry out the gamified activity and where to hide the downloadable stickers in the physical environment, either at home or at school. The child follows clues in the digital book to find the stickers, and each one contains a code that must be collected to access an extra material (Fig.10).

Figure 10. Mediator instructions for conducting the locative activity in *O Sonho dos Meninos*.



The main challenge in designing these projects was the technological limitations. Since the project was developed by design

students, the use of location-based resources that required advanced programming was not feasible, nor was it possible to implement more complex features through coding, such as enriched haptic effects. Dynamic adaptations were made to allow for a more analog-based exploration of the environment. In this sense, many books adopted two reading modes: Adventure mode—provides challenges, games and the exploration of routes in the environment; Sofa mode—provides interactions on the screen itself.

The implementation of reading modes in the *Portinari na Ilha* collection materializes the possibilities of integrating location-based systems identified by Menegazzi and Tarachucky (2020). The "Adventure Mode," by proposing challenges and physical movement, aligns with the categories of location-aware games and location-aware fiction, turning reading into an embodied activity that requires attention to the surrounding environment. Similarly, the use of illustrated maps with links to *Google Maps* routes exemplifies the function of tour guides, employing narrative to interpret real-world settings. These strategies validate the theoretical premise that locative resources, even when technically adapted through analog or hybrid solutions, redefine the child's role from passive observer to active explorer of the narrative space, expanding the literary experience beyond the screen's boundaries.

It was also possible to identify different spatial narrative strategies being adopted. Considering the four typologies of textual space, described by Ryan, Foote e Azaryahu (2016), table 1 syntheses the strategies to address the places in the digital books of Portinari in the Island Collection.

Table 1. Identified uses of spatial narratives in Portinari in the Island Collection

Typhlology of Spatial narrative	Sofa mode	Adventure mode
Textual space	Textual descriptions of the places Maps Landscape Illustrations Illustrations of characters linked to local nature, folklore, and culture Hotspots (interactive areas)	_
Materiality	–	_
Spatial context	_	Games and challenges Mobile narrative experience
Mimetic space	–	_

Based on the review presented in the previous sections, it is possible to observe that the spatial narratives in the books focus primarily on Textual Space. The locative experience was intended to overlay the setting of a fictional story onto actual spatial contexts, including schools, homes, and other locations where the books were mediated, and this was implemented through Adventure mode activities such as games and challenges. However, due to the project's technological limitations, these cannot be characterized as location-based games. Regarding Mimetic Space, or the space of the storyworld typology, neither Adventure nor Sofa mode aimed to simulate virtual or augmented reality in their representations or interfaces, and thus the books did not explore this narrative modality.

5 Final considerations and recommendations

This article was written while a ban on screen use in schools in Brazil is being discussed. Despite this, the use of digital books for children, facilitated by mediators such as parents and teachers, can enrich the reading experience. The use of locative strategies, even if analog, as in the

case presented in this article, has the potential to establish connections between children and their environment, stimulating an enrichment of their environmental repertoire.

The following principles should guide the design of locative digital books for children:

- **Child-Centered and Play-Based:** Design should prioritize children's active participation and natural inclination toward exploration. Activities should engage children and reflect everyday experiences, allowing them to construct their own subjective maps. This aligns with observations from the *Adventure mode*, where gamified tasks significantly increased physical engagement and spatial experiences stimulated by the narratives.
- **Human-Centered Design:** Content should be placed comfortably within the user's field of view, with elements large enough for easy interaction without overwhelming the visual space. Navigation should be intuitive, with clear visual cues and consistent layouts that allow for easy mediation. This necessity was highlighted during usability tests with wireframes, where visual clarity and distinct icons proved essential for effective mediation by the experts.
- **Progressive Challenge**: The design should provide structured support for children to acquire complex spatial concepts and language, gradually increasing the challenge as their abilities develop. This helps them comprehend different spatial narratives and develop spatial abilities. This structure reflects the project's dual-mode approach (Sofa vs. Adventure), which allowed mediators to adapt the complexity of the spatial task to the child's readiness.
- **Multi-Sensory Engagement:** Leverage visual, auditory, and tactile elements to enhance the immersive experience and support

diverse learning styles. Interactive displays, sounds, and installations can engage and entertain children while guiding them through the narrative. Evaluation of prototypes confirmed, for example, that combining auditory cues with haptic feedback enriched the narrative atmosphere more effectively than visual stimuli alone.

- **Meaningful Interactivity:** Ensure interactive elements genuinely enhance the narrative and spatial understanding, rather than being mere distractions. Choices should have clear consequences, and interactions should contribute to the story's progression while also developing a sense of belonging by recognizing aspects of a place as part of culture and identity, exemplified by interactions with natural elements from the artists' hometowns, imaginary creatures, or representations of their artworks.
- **Fostering Agency and Creativity:** Allow children to make choices, influence the story's direction, and even create their own narratives or modify existing ones. This promotes a sense of ownership and deeper engagement with the material. Activities such as the "virtual gallery" customization and coloring physical artworks demonstrated that allowing children to curate content increased their sense of ownership
- **Liminality for Immersion:** Consciously design "liminal interfaces" that create a smooth, inviting transition between the real world and the story's fictional space, fostering a sense of wonder and immersion. This involves blurring boundaries and inviting the child's imagination to expand the perceived space, which is related to the Mimetic space, or space of the storyworld, typology. This promotes a sense of ownership and deeper engagement with the material. This was evidenced by the "treasure hunt" mechanics, where physical markers successfully bridged the gap to the digital storyworld without breaking immersion.

These principles emphasize that locative resources can transform digital reading into a meaningful, interactive, and embodied experience, addressing dimensions often overlooked in commercial digital books, particularly in the Brazilian context. However, their implementation faces significant challenges. As observed during the prototyping phase of this project, developing complex locative features—such as location-based games—requires specialized programming skills, which are often beyond the scope of design students and difficult to secure in small- and medium-sized Brazilian publishing houses.

Furthermore, the dichotomy between 'Sofa mode' and 'Adventure mode' explored in this study offers a theoretical contribution to the understanding of textual spaces in children's digital literature. While technological constraints limited the full exploration of 'Mimetic Space' through AR or VR, the proposed hybrid model demonstrates that spatial immersion does not rely solely on high-end technology. By intertwining 'Textual Space' (visual and verbal descriptions) with 'Spatial Context' (physical movement and analog interaction), the collection proves that the narrative itself serves as the primary technology for spatializing experience. This suggests that locative media for children can be effectively constructed through the semantic bridging of on-screen content and off-screen physical environment, regardless of the advanced locative media resources.

From a methodological perspective, the use of accessible tools—such as Google Maps APIs combined with printable analog materials—validates a model of 'low-tech locative media' adaptable to diverse educational contexts. This result highlights the capacity of the public university to foster innovation: despite limited financial resources, the collaboration between a qualified faculty and the creativity of design students proved

capable of overcoming technological barriers. This approach challenges the assumption that locative literature requires expensive proprietary software. Instead, it emphasizes that the educator's mediation and the child's imagination are the essential components for activating the locative potential of the story. Thus, the project offers a replicable framework for educators and designers to produce culturally relevant, site-specific narratives without the barrier of complex coding.

As this study offers practical guidelines for incorporating locative media into digital books, it aims to contribute to the qualitative production of locative literature through an exemplary model and reference works. It also provides principles for teachers, parents, and reading mediators to understand the uses, limitations, and selection of locative books. In a context where smartphone use is being restricted in Brazilian schools and access to quality children's literature is expensive and remains limited for many families, this project also contributes by making a book collection freely available on an open and accessible online platform. The collection does not require modern devices and can be accessed via standard computers, facilitating its use in educational settings.

Future research should consolidate interdisciplinary methodologies integrating educational, artistic, and technological perspectives. Studies like this one aim to foster discussion and development, providing a realistic and grounded perspective on children's digital literature. Such initiatives highlight opportunities and limitations for promoting spatial literacy, cultural appreciation, and creative engagement with physical and digital environments. By converging design, technology, and education, they can contribute to define quality standards for children's narratives and shape how children navigate, imagine, and inhabit the world through digital artifacts.

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