Museum Education

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Definition: Museum education involves using a museum's resources and collections to facilitate learning for diverse audiences. It includes activities like tours, workshops, and interactive exhibits that promote active, inquiry-based learning. Focused on accessibility and inclusivity, museum education aims to engage visitors, enhance their understanding, and foster a deeper appreciation for cultural, historical, or scientific content to foster active citizenship and lifelong learning in a non-formal learning context. Museum education uses collections and exhibits to engage audiences through hands-on, inquiry-based learning. By integrating digital tools and interactive technologies, it enhances learning through immersive and distance-based experiences. This approach promotes active engagement, critical thinking, and meaning-making, transforming traditional teaching methods. Museums serve as inclusive spaces where knowledge—embodied in artifacts and digital mediators—supports cognitive, emotional, and social development, fostering deeper connections with culture and history.

Keywords: museum education; digital cultural; artifacts; teaching mediator; inclusion

1. Brief Outline of Museum Education

Museum education refers to the intentional use of museum resources, collections, and environments to facilitate learning and personal development for diverse audiences. It encompasses a variety of formal and informal educational practices aimed at engaging visitors in active, inquiry-based learning. This includes guided tours, hands-on activities, workshops, and interactive exhibits that encourage critical thinking, emotional engagement, and the co-creation of knowledge. These objectives can also be achieved through didactic workshops, the use of interactive installations, and the integration of multimedia technologies, such as virtual reality, augmented reality, and artificial intelligence (e.g., digital tutors and avatars) or digital twins of scanned works of art transformed into digital artifacts. Museum education is grounded in principles of accessibility, inclusivity, and learner-centered approaches, with a focus on fostering meaningful connections between individuals and cultural, scientific, or historical content. The goal is to enhance visitors' understanding, stimulate curiosity, and cultivate a deeper appreciation for the collections, artifacts, and narratives within the museum setting. This vision of the museum as a place of learning is a commonly accepted one; indeed, on 24 August 2022, during an Extraordinary General Assembly held in Prague, the International Council of Museums (ICOM) approved the proposal for a new definition of museums. Following this decision, the newly adopted ICOM museum definition is as follows: "A museum is a not-for-profit, permanent institution in the service of society that researches, collects, conserves, interprets and exhibits tangible and intangible heritage. Open to the public, accessible and inclusive, museums foster diversity and sustainability. They operate and communicate ethically,

professionally and with the participation of communities, offering varied experiences for education, enjoyment, reflection and knowledge sharing" [1]. It is important to note from the outset that the topic of museum education [2] must draw its vitality from a variety of disciplinary fields. These include museography and museology [3–5], pedagogy and educational methodologies [6–9], emerging fields in neuroscience [10,11], the use of technology for educational purposes [12–15], media education [16], and constructivist and socio-constructivist psychology [17–22], to name just a few.

2. Historical Definition of Museum

The term museum originates from the Greek word *mouseîon* (μουσεῖον), which referred to a temple or sanctuary dedicated to the Muses, as well as a school or gymnasium of the arts [23]. In Greek mythology, the Muses were the nine daughters of Mnemosyne and Zeus, goddesses of thought who resided in Pieria, near Mount Olympus. They were considered divine patrons of the arts, inspiring humans to advance in arts, sciences, culture, taste, and refinement through their eloquence and persuasion. The term *mouseîon* was later adopted into Latin as museum, retaining its association with the Muses, who in Roman culture were equated with the Camenae. They presided over various fields of knowledge, including lyric poetry, epic poetry, love poetry, history, dance, music, tragedy, comedy, and astronomy. The modern term museum evolved phonetically, morphologically, and semantically from its Greek and Latin antecedents. It is defined as a place where objects of historical, artistic, scientific, or ethnographic interest are collected, arranged, and preserved. This definition highlights two initial considerations: museums encompass numerous disciplinary fields, and the concept of the museum has ancient roots [24–26]. Additionally, a museum can also be defined as a collection of objects valuable for their art, rarity, or antiquity, as well as the place or building where they are arranged and displayed. This introduces a third conceptual element: a museum is not only the collection of valuable objects but also the environment in which they are preserved and safeguarded.

3. Historical Overview of Museums and Museum Education

The concept of the museum as a space dedicated to the preservation and organized display of art and written documents for public access, cultural enrichment, and study dates back to antiquity [27], with notable examples in Egypt, Greece, and Asia Minor. However, these early collections were often private and did not evolve into public institutions. In Roman times, private collecting flourished among patrician families, who amassed works of Greek, Egyptian, and Middle Eastern art, often as war spoils. Some notable examples include collections like those in the Villa of the Papyri at Herculaneum, which housed manuscripts in Greek and Latin. Prominent figures such as Marcus Agrippa advocated for the cultural value of making collections publicly accessible, as seen in the display of artworks in spaces like the Pantheon (in this case, as is well known, these were statues or other banners related to deities in the Roman empire that nevertheless had a very high artistic and collecting value). Earlier figures such as Lucius Cornelius Sulla and Emperor Titus transported treasures from conquered regions to Rome, while Emperor Hadrian became known for his extensive collection of art and antiquities, reflecting the Romans' interest in objects from older civilizations, including Egyptian relics and artifacts from the Fertile Crescent. Parallel traditions of collecting also developed in other regions, such as Africa and Oceania, where objects were amassed to signify power and prestige, often serving both ornamental and intimidating purposes. The Church later played a significant role in collecting ancient objects, recognizing their symbolic and didactic value. Religious leaders used such collections to convey power, beauty, and theological teachings, as seen in the preservation of relics and the use of detailed iconography in churches.

In the Byzantine Empire, Emperor Constantine VII fostered the arts and maintained an impressive collection of antiquities, enriched by his vast dominion. By contrast, Western rulers of the Holy Roman Empire were less focused on systematic collecting, though figures like Charlemagne and Frederick II, here meaning Frederick Roger of Hohenstaufen (Jesi, 26 December 1194—Fiorentino di Puglia, 13 December 1250), demonstrated significant interest in acquiring and studying objects from various cultures. Frederick II's exposure to Middle Eastern traditions, shaped by his upbringing in multicultural Sicily, enabled him to mediate between different cultures, exemplified during the Sixth Crusade. Both the Byzantine and Holy Roman Empires used the collection and display of classical artifacts to assert ideological continuity with ancient Rome. This practice extended to smaller feudal courts, where local rulers amassed artifacts, often through the plundering of archaeological sites under their jurisdiction. The Middle Ages further advanced the exchange and study of historical objects through the interplay between monastic traditions and the rise of universities, fostering intellectual collaboration across vast distances. The Renaissance marked a turning point with the emergence of scholarly collecting, driven by a newfound appreciation for the intrinsic value of art. This period laid the groundwork for a more modern understanding of collections as both educational and aesthetic endeavors. The late eighteenth and nineteenth centuries marked the emergence of some of the world's most renowned national museums, a period that witnessed the flourishing of culture through these pivotal institutions. Among the most significant museums founded during this era are the Vatican Museums, the Louvre, and the British Museum, alongside other notable establishments such as the Staatliche Museen zu Berlin, the Prado Museum in Madrid, and the National Gallery in London. Each of these institutions played a crucial role in the preservation and dissemination of cultural heritage, shaping the development of art history and museum practices as we know them today. Given the vast number of such institutions, recounting their histories in detail would require far more than a brief overview.

4. The 20th Century: Modern Museums and Cultural Heritage Sites

In the 20th century, Western museums underwent significant transformations to adapt to the demands of modern culture, shaped by major societal shifts such as industrialization, urban expansion, universal suffrage, advancements in transportation and communication, and efforts to combat illiteracy. These changes fostered a broader cultural awareness and a growing public interest in visiting museums and cultural heritage sites. Museums evolved into centers of scientific study, often associated with research institutions. Displays became more systematic, utilizing showcases and descriptive panels to enhance visitor engagement and understanding. Architectural designs of modern museums emphasized flexibility and functionality, accommodating diverse exhibition needs and leveraging natural and artificial lighting to highlight collections effectively. Technology further enriched the visitor experience, with innovations such as mobile panels and video mapping enhancing the adaptability of exhibition spaces. Museums also prioritized visitor flow, creating logical and intuitive pathways through exhibits, while modern climate control systems helped preserve collections by regulating temperature and humidity. Iconic examples of innovative museum design include Frank Lloyd Wright's spiral structure for the Guggenheim Museum in New York and Mies van der Rohe's Neue Nationalgalerie in Berlin, both of which integrated functionality with artistic vision. Mass tourism added complexity to these developments, requiring older buildings to accommodate larger crowds while maintaining accessibility and appeal. This challenge also presented opportunities for expansion, with the creation of spaces for conferences, libraries, and other facilities. Examples such as the Pompidou Center, the Musée d'Orsay, and the Museum of Modern Art demonstrate how modern museums can balance aesthetic, educational, and practical considerations.

In Italy, the widespread use of historic buildings as museum spaces reflects a dual-edged legacy. On one hand, collections benefit from being housed in architecturally significant structures. On the other, such settings often impose constraints due to their original design purposes, requiring adaptations that can compromise the integrity of the buildings. Economic considerations have driven this practice, limiting the development of purpose-built museums designed to harmonize architecture, lighting, and exhibition spaces for optimal presentation and preservation of artifacts. In the meantime, the museum concept was being consolidated, museum education has evolved significantly over the centuries, reflecting broader cultural, social, and technological transformations. Initially, museums were conceived as repositories of knowledge for elite audiences, with little emphasis on active learning or accessibility. During the Enlightenment era, the idea of museums as spaces for public education began to take shape, driven by the rise in scientific inquiry and democratization of knowledge. Collections were curated to educate citizens about the natural world, history, and art, fostering an intellectual culture aligned with societal progress. By the 19th century, with the growth of public institutions and compulsory education systems, museums became integral to national identity formation and civic education. Exhibits were designed to teach moral and patriotic lessons, often through linear narratives of progress and achievement. However, the approach remained largely didactic, with museums as authoritative transmitters of knowledge and visitors as passive recipients. The 20th century marked a paradigm shift, influenced by progressive educational theories such as John Dewey's experiential learning [28,29] and Lev Vygotsky's sociocultural framework [30–32], but also references from museum education such as the constructivist museum created by George E. Hein [18–20]. These theories emphasized active engagement, contextual learning, and the social dimensions of knowledge construction, encouraging museums to adopt more interactive and participatory strategies. Hands-on exhibits, educational programming, and school partnerships became central features, aiming to make museums accessible and engaging for diverse audiences. Technological advancements in the late 20th and early 21st centuries further transformed museum education. The introduction of digital tools, interactive media, and virtual experiences enabled new forms of engagement, allowing visitors to explore artifacts and narratives in multisensory and personalized ways. Augmented and virtual reality [13], for instance, have made it possible to recreate historical environments and simulate scientific phenomena, bridging the gap between immersion and conceptual distancing [6]. Today, museum education embraces inclusivity and co-creation, engaging communities in curatorial processes and using exhibits to address contemporary issues. Guided by constructivist and learner-centered approaches, museums now serve as dynamic spaces where visitors not only absorb information but also contribute to collective knowledge. This historical trajectory underscores the ongoing transformation of museums from static repositories to vibrant educational ecosystems.

5. Fostering Inclusive Museology: Balancing Tradition, Accessibility, and Social Engagement

The importance of accessibility in museum contexts is a pressing issue, yet one often constrained by multiple challenges. Many collections are housed in historic buildings—such as towers, castles, sacristies, and monasteries—that are inherently difficult to adapt to modern accessibility standards. While relocating collections might seem like a solution, this is often infeasible. Assistive technologies, therefore, represent a crucial tool to overcome such barriers [6]. A detailed case-by-case analysis would be beneficial but falls beyond the scope of this discussion. Nevertheless, the technologies and practical examples explored here aim to inspire strategies to enhance inclusion and maximize cultural heritage engagement. Increased emphasis on staff training, focusing on educational and

pedagogical perspectives, is essential. Museum curators, even with modest investments, can significantly improve accessibility and inclusion through thoughtful exhibition design. Museum directors, in turn, should consider expanding public services to enhance accessibility. In architectural terms, the "Design for All" approach offers a promising framework for universal accessibility, fostering inclusivity and diversity [33–35]. While it is more straightforward to implement in new constructions, this paradigm faces challenges in adapting existing structures. Scandinavian countries have long championed this approach, integrating it into sustainable development strategies. Many local organizations advocate for this philosophy, promoting its social and cultural value. The integration of inclusive practices in museums extends beyond physical infrastructure. It involves staff training to address diverse visitor needs, removing both physical and cognitive barriers. Assistive technologies developed for inclusive education can be leveraged to enrich museum installations and visitor experiences. Such efforts align with the evolving expectations of society, requiring museums to foster inclusive environments through careful planning and design. Failing to prioritize social inclusion risks marginalizing certain groups, reinforcing social inequalities, and diminishing museums' cultural and educational relevance. To counteract this, museums must embrace inclusive strategies in their design, management, and programming, ensuring their spaces are welcoming and representative of societal diversity. This approach reflects the broader goals of an "inclusive museology" [6], which seeks to balance the preservation of historical traditions with the democratization of public spaces—an endeavor both theoretically simple yet practically challenging.

6. Digital Artefacts as Mediators in Museum Education

According to Valsiner [36] and Iannaccone [32], material psychology, which explores the relationships between human beings and the material aspects of their cultural and social environments, offers valuable insights when applied to museums and the role of educational mediators. In the context of cultural psychology, the focus on how cultural constructions—such as rituals, meanings, and artifacts—shape human actions, emotions, and cognition [36] provides a framework for understanding the unique role of museums. Museums, as repositories of material culture, are spaces where objects and artifacts embody and transmit cultural meanings. They create opportunities for visitors to engage with tangible representations of history, identity, and social norms. Educational mediators play a crucial role in this process, acting as facilitators who help bridge the gap between visitors' personal experiences and the cultural narratives embedded in the exhibits. By interpreting and contextualizing these artifacts, mediators [14] help visitors navigate the complex interplay of materiality, culture, and psychology. In this light, museums become sites for interdisciplinary exploration, combining psychological, anthropological, and sociological perspectives to foster deeper connections with material culture. For example, mediators can use insights from cultural psychology to design interactive and reflective experiences that not only convey knowledge but also stimulate personal reflection and emotional resonance, enhancing the visitor's engagement with the museum's collections, with the historical context of the people who produced the artifact, the artist who created the painting, or the subject depicted in the object or artwork. By doing so, they ensure that the museum serves not just as a passive display space but as an active environment for learning, cultural exchange, and the psychological integration of diverse perspectives. For these reasons, this work will explore a very current way of carrying out museum education, specifically that of creating a virtual museum, or virtualizing at least part of the museum collection for educational use. When this happens, in whole or in part, we are faced with the realization of digital artefacts and these artefacts become educational mediators (in this work, this is used as a synonym for learning facilitator, teaching mediator, and educational facilitator).

Fortunately, the literature dealing with the time of didactic mediation, through the use of digital, is vast and very thorough [6,14]. At the core of any virtual museum lies a collection of digital artefacts, which can be characterized both from a technological perspective—such as file types and the software used to create them—and through the relational framework involving the subject, artefact, and object [14]. In this latter view, the subject refers to the user of the artefact (a system, tool, or product), while the object is the focus of human–technology interaction [13,14,19]. These relationships can range from anthropocentric to technocentric extremes, with varying intermediate stages. In the anthropocentric approach, the subject-object interaction is simultaneously mediated and direct, seamlessly embedded in the surrounding environment, thereby enhancing usability and reducing the need for technical expertise [14]. Conversely, a technology-focused approach separates the subject–artefact relationship from that of the artefact–object, resulting in predetermined interactions that may create a disconnect between learners and the subject matter [14]. In such instances, the artefact neither adapts to the user nor evolves through use [14]. Technological advances, such as 3D scanners equipped with post-processing tools, have significantly facilitated the creation of digital assets by automating and refining object digitization processes [2], offering great opportunities for inclusive museology, e.g., replicas of exhibits that can be manipulated by blind visitors or children. In fact, more specifically, this has blurred traditional distinctions between artefacts as tools and as outcomes, a separation that was more rigid in pre-digital contexts. Today, artefacts often merge process and product, continuously modifying and interacting with the systems that create or use them. This fluidity exemplifies the "eternal beta" nature of digital products, wherein artefacts are no longer static but dynamic entities capable of perpetual transformation [14]. Let us open a parenthesis for a moment: what is meant by eternally beta products? Without intending to resort to oversimplification, but maintaining a sense of realism, this aspect pertains to the temporary installation of technology within a museum context or the insufficient training of staff to effectively manage such installations. Even a minor issue, such as a power failure, can significantly hinder operations, despite the resolution being relatively simple. In other cases, the issue arises from a lack of funds needed to complete a project, a challenge faced by many public institutions whose funding depends on external factors. Closing this brief parenthesis, in museum education, this adaptability supports inclusive co-design processes, enabling digital artefacts to address diverse educational needs while fostering collaborative engagement between creators and users [14]. The digital shift has also redefined the role of artefacts as mediators in educational contexts. Digital artefacts facilitate teaching and learning by linking human actions with stable processes, serving as a "hinge" between internal cognition and external realities [14]. They mediate cultural and educational experiences, particularly in virtual or augmented museum environments, enabling visitors to engage interactively with content through actions interpreted by digital systems [14]. This mediation is inherently multimodal, integrating sensory–motor, linguistic, metaphorical, and affective dimensions to create cohesive learning experiences. Such processes align with theoretical frameworks proposed by academics like Damiano [6] and Bruner, who emphasize the role of metaphorization and representation in learning [14]. As cultural mediators, museums exemplify large-scale mediation, integrating numerous artefacts that facilitate social, educational, and personal interactions [14].

7. Categories of Mediators and Digital Artifacts

Building on the previous discussion, it is important to explore the relationships and categories that can be defined in order to gain a deeper understanding of the pedagogical aspects associated with the use of mediators. According to Damiano [6], mediators are

categorized into four types: active, iconic, analogical, and symbolic, which are further classified as either "hot" or "cold" mediators [6]. Hot mediators possess the capacity to evoke motivation and activate emotional and affective factors, often encompassing ludic and simulative characteristics. These mediators are particularly effective in facilitating the acquisition of new knowledge through teaching–learning processes [6]. The idea of employing ludic and simulative approaches is not novel; historically, these methods were integral to learning, as exemplified by traditional toys like dolls and lead soldiers. When adults guided play by explaining actions—such as alleviating a doll's stomachache or strategically positioning an army—play transitioned into a mechanism for transmitting knowledge, skills, and competencies from adults to children [6]. Learning through ludic approaches is both engaging and produces a lasting impact on memory. Conversely, cold mediators are better suited for revising known material, summarizing learning progress, and organizing knowledge during lessons or study. These mediators frequently involve symbolic or iconic elements [6]. When effectively combined and alternated, different types of mediators provide significant benefits to the teaching–learning process. It is immediately evident that such mediators can be installed in museums to facilitate the teaching–learning process in this informal context, and they can serve as valid substitutes for human museum guides. This is not because human guides are ineffective, but rather because visitors are often not accompanied by a physical guide, or because guided tours tend to be superficial and do not address appropriate educational topics. Back to the specifics of hot and cold mediators, as Rivoltella and Rossi highlight, in digital-era pedagogy, the interplay between hot and cold mediators aligns with processes of immersion and distancing, structured within fractal frameworks [14]. In educational design, whether in physical or virtual spaces, the spatial context plays a pivotal role. For instance, "if the myopic automaton represents the space of action, while the layout is the space for aggregation, hot mediators are privileged in the former, and cold ones in the latter" [14]. Hot mediators encourage immersion through active and analogical strategies, while cold mediators facilitate distancing via iconic and symbolic representations. In immersive virtual environments, corporeality becomes crucial. Immersion can be understood as the activation of senso-motoric schemas, enabling praxis, sensory, emotional, and cognitive experiences. Conversely, distancing involves applying these schemas to aggregate these dimensions into cohesive conceptual frameworks. This two-phase process—activation followed by application—culminates in a "cohesive adhesive effect" and reflects the aggregation dynamics described before. Aggregation replaces traditional notions of generalization or abstraction, reframing mediation as a dynamic space for either exploration-manipulation or world simulation. These processes enable the emergence of praxis, sensory, emotional, and cognitive fragments (immersion) and their subsequent organization into complex, senso-motorically driven layouts (distancing) [14].

8. Immersion and Simulation: Bridging Informal Knowledge and Formal Education Through Mediators

The concept of immersion in mediators highlights the challenges of describing the learning process as a straightforward progression from concrete experience to abstraction. Today, learners enter formal education with fragmented prior knowledge acquired through informal and non-formal learning contexts, often involving direct interactions with the world or symbolic and multimodal artifacts from an early age [6]. Therefore, it is clear that such mediators are particularly valuable in a non-formal setting like a museum, which, unlike a school, typically encounters the learner-visitor only during their "walk" through the expansive galleries that house the collections. From a higher conceptual point of view, however, these fragments lack validation from formal educational structures and can result in incomplete understandings, differing significantly from the past, when schools

were the primary, and perhaps the only, source of knowledge for many students. The increasing integration of schooling into society has elevated cultural discourse in families and workplaces, yet many individuals struggle to transform scholarly knowledge into teachable material, occasionally leading to misinterpretations and confusion in the learning process [8,9]. Again, from a sophisticated theoretical point of view, in the realm of scientific education, overcoming the nature–culture dualism necessitates shifting from observational to manipulative postures and from causal to systemic approaches—elements often missing in informal contexts [8,32]. Immersion, conceptualized as the simulation of real-world phenomena through sensory–motor devices, addresses these gaps by engaging practical, sensory, emotional, and cognitive dimensions [10,11]. Simulations, by allowing learners to independently explore relationships between variables, foster decision-making abilities beyond simply understanding causation [10,37]. Future educational and professional applications are likely to integrate increasingly sophisticated simulations, overlaying virtual environments onto real-world settings. For example, graphic design layers superimposed on archaeological sites could offer immersive historical experiences, engaging emotional and cognitive processes to enhance learning [2]. These immersive simulations often evoke a sense of scale and relational understanding, such as when experiencing a Greek temple's physical dimensions [2]. The concept of simulation inherently involves a structured space, historically created through imaginative play but now enhanced by technology to provide realistic and engaging virtual environments that activate both physical and mental processes [11]. Digital gaming environments further illustrate this potential, offering three levels of immersion: sensory immersion through visual and auditory stimuli, challenge-based immersion balancing difficulty and skill, and imaginative immersion that fosters empathy and creativity [8]. Effective gameplay design engages players not just through mechanical interactions like running or jumping but by creating meaningful choices and responses, akin to a cinematic narrative [38]. In educational contexts, didactic expertise is crucial in calibrating game difficulty, validating visual and auditory content, and selecting methodologies that harmonize learners with virtual tutors [13,39].

9. On-Line Museum Education

The concept of distancing, as described by Rivoltella and Rossi, pertains to the construction of meaning networks where fragments of knowledge are aggregated into organized, complex layouts through senso-motor schemas [14]. This process aims to contextualize knowledge by assembling fragments derived from formal educational activities or students' personal experiences. It also involves identifying tools to achieve collective agreement and validate this knowledge [14]. Conceptual maps, as Sibilio highlighted, such as those by Novak and Gowin and other graphic organizers, serve as effective tools for this purpose, especially in digital formats [8]. These tools extend their traditional role of representing concepts to become spaces for action, enabling users to aggregate, modify, and transform networks of meaning via interactive tools like touchscreens or mouse interfaces [14]. The sense of touch plays a vital role in this process, providing a means for the human sensorium to explore and make sense of the environment. Touch enables metaphorical and vicarious processes that enrich cognitive activities and foster their incorporation into actionable knowledge [11]. This incorporation occurs on two levels: maps give tangible form to both the concepts themselves and the processes used to modify and expand their topological structures [14]. As humans explore their environments, their minds naturally generate allocentric spatial maps, blending features from various mediator types, thus challenging the exclusive classification of maps as iconic mediators [14]. The interplay of immersion and distancing in educational contexts promotes conceptualization. These processes alternately engage enactive and homeostatic logics, akin to self-regulating automata, and

topological aggregation of fragments through layouts. Mediators support these transitions by facilitating the materialization of meaning fragments during immersion, connecting them into coherent networks during distancing, and articulating the dynamic exchange between the two phases [14]. This mediative function aligns with Derrida's metaphor of the hinge, brisure in French, which unites rigid and mobile elements without constraining them rigidly [14]. The concept of the hinge is a central idea in the philosophy of Jacques Derrida, which he employs to explore the relationship between signs and meaning within language and conceptual systems. This term emerges prominently in his work on deconstruction, a philosophical methodology aimed at uncovering the internal tensions and ambiguities within texts, ideas, and systems of thought. It is also applicable to our artifacts, which intertwine socio-materiality with systems of thought and the meanings we ascribe to the objects we manipulate to rediscover the past. In this context, the hinge serves as an image Derrida uses to depict something that simultaneously connects and separates. Just as a hinge on a door or in a book holds two distinct parts together, allowing them to move relative to one another, in language and thought, the hinge symbolizes the point of transition between two different elements—without these elements ever fully merging or becoming entirely independent [40]. Finally, there are still three essential characteristics of digital artifacts designed to support didactic mediation. They must function as boundary objects, bridging diverse meanings and processes; exhibit adaptability and the capacity for continual morphing to support teaching–learning processes; and foster light, tangible connections that ensure flexibility and the creation of meaning [32,36]. These principles hold significant potential for designing educational installations in museums or creating virtual learning environments tailored to museums' online platforms. The concept of distancing offers significant insights into the field of museum education. In this context, distancing involves constructing networks of meaning by aggregating fragments of knowledge into organized layouts through senso-motor schemas, allowing learners to engage with museum content in a structured yet exploratory way [14]. For museums, this approach is essential in transforming fragmented visitor knowledge—often derived from prior informal or non-formal learning experiences—into validated and coherent understandings through curated exhibits and interactive installations [14]. According to Aiello and Sibilio, tools like conceptual maps and Graphic Organizers can play a pivotal role in museum education [41]. Digital adaptations of these tools [41], integrated into museum exhibits, allow visitors to actively explore and manipulate information, fostering deeper engagement with artifacts and narratives [2]. Through touchscreens or other interactive interfaces, visitors can connect ideas, reorganize historical timelines [42–44], and interact with multimedia content, giving tangible form to abstract concepts while enabling personalized learning pathways. This tactile engagement aligns with the museum's role as a space for sensory and intellectual discovery, leveraging the human capacity to incorporate knowledge through both direct interaction and cognitive processing [2]. Immersion and distancing work in tandem within museum environments to enhance conceptual understanding. Immersion, facilitated through sensory-rich exhibits and interactive simulations, allows visitors to experience historical, cultural, or scientific phenomena firsthand. Distancing complements this by enabling visitors to contextualize these experiences, connecting fragments of meaning into cohesive narratives. This interplay mirrors the dynamics of curated museum exhibits, where immersive displays (e.g., virtual reality or life-sized dioramas) are paired with interpretive elements like maps, labels, and timelines to support meaning-making. In museum education, mediators are essential in bridging the gap between visitors' prior knowledge and new insights. According to Rivoltella and Rossi, mediators support three key actions: enabling the materialization of meaning fragments during immersive experiences [14], facilitating the aggregation of these fragments during distancing, and articulating transitions between immersion and

distancing phases. Museum exhibits, as mediators, function like Derrida's metaphorical hinge [40], connecting rigidly defined historical or scientific data with the fluid [14] subjective interpretations of diverse visitors [45]. To optimize museum education, digital tools must embody three critical characteristics. They must act as boundary objects, linking different visitor perspectives and facilitating collaborative meaning-making. These tools should also be adaptable, capable of evolving to meet diverse educational needs and learning styles. Finally, they should create flexible and accessible connections, ensuring that museum content is engaging and meaningful for all visitors [2,45]. For instance, augmented reality applications can superimpose historical reconstructions onto archaeological sites, allowing visitors to visualize the past while interacting with the present, thereby merging immersive and distancing elements. By embedding these principles into exhibit design, museums can create dynamic learning environments that go beyond passive observation. when, on the other hand, it is proven that active learning also takes place through a change in perspective [15,46–48]. Such environments support active engagement, empowering visitors to explore, question, and construct their understanding of the world [49]. In this way, museum education evolves into a participatory and transformative experience, aligning with the goals of modern pedagogy.

10. In-Presence Museum Education: The Constructivist of Hein

The ideas and contributions of George E. Hein [18–20], rooted in constructivist learning theory, significantly influence contemporary museum education and its alignment with the evolving role of museums as educational institutions. Hein, inspired by John Dewey [28,29], underscores the importance of connecting education with experience, arguing that effective learning occurs through active engagement and interaction with content. While Dewey emphasized the learner's interest and hands-on experience as pivotal to education, Hein expands this notion, cautioning that engagement alone is insufficient. Museum activities must foster deeper growth through structured, meaningful, and integrated experiences. Hein's theoretical framework categorizes museums into four educational models: the systematic museum, the orderly museum, the discovery museum, and the constructivist museum. Constructivism is a theory of knowledge and learning that emphasizes how people actively construct their understanding of the world through experience and reflection. The concept is based on the idea that knowledge is not simply transmitted from the outside but is constructed internally by individuals, using information from the environment, Constructivism has its roots in the works of thinkers such as Jean Piaget and Lev Vygotsky [32]. Piaget developed a theory of cognitive development in which children learn through interaction with the environment and the construction of mental structures. Vygotsky, on the other hand, emphasized the importance of social context and cultural interaction in learning [30,31]. Hein's models reflect varying pedagogical approaches based on epistemological perspectives and theories of learning. The systematic museum employs a didactic, sequential approach, emphasizing text-based hierarchies to communicate fixed narratives. The orderly museum uses stimulus-response techniques to guide learning but avoids claims of objective truth. The discovery museum, while offering exploratory opportunities, often predetermines outcomes, raising questions about the authenticity of its experimental learning. Hein advocates strongly for the constructivist museum, which adapts to the diverse educational needs of visitors rather than being constrained by the intrinsic properties of displayed objects. This model fosters personalized, socially interactive, and hands-on learning, allowing visitors to engage with multiple perspectives and choose their own pathways through the museum experience. For Hein, this approach transforms museums from static repositories into dynamic spaces that reflect the varied learning styles and life experiences of their audiences. By integrating multisensory and

interactive elements, the constructivist model demonstrates how adjustments to traditional exhibits can significantly enhance accessibility and learning outcomes. These changes align with the constructivist principle of tailoring museum experiences to foster active participation and personal connection. Hein positions museums as crucial agents in societal education, emphasizing the need for conscious pedagogical strategies to avoid conflicting messages and maximize their role in cultural interpretation and social action. This perspective challenges traditional museum paradigms and encourages a shift towards inclusive, dynamic, and visitor-centered educational practices [2].

11. Conclusions

Museum education, particularly when informed by constructivist principles, aligns closely with The Eight Key Competences for Lifelong Learning, adopted by the European Union in 2018 [50]. Among these, the competence in cultural awareness and expression holds particular relevance, emphasizing the understanding, appreciation, and creative communication of cultural ideas across diverse forms and contexts. By connecting cultural heritage with modern pedagogical practices, museums can play a vital role in fostering this competence, which is rooted in specific knowledge, skills, and attitudes. The competence in cultural awareness and expression entails understanding the interaction of local, national, and global cultures, the heritage they embody, and how individuals express and interpret ideas, emotions, and identities through various forms of art and culture. It also emphasizes skills such as the ability to creatively engage with cultural products and practices, recognize their personal and societal value, and approach cultural diversity with curiosity, respect, and ethical responsibility. In this context, George E. Hein's constructivist approach to museum education offers a particularly effective framework. Hein views museums as dynamic, interactive spaces that prioritize visitors' active engagement, personal connections, and diverse learning styles. His advocacy for constructivist museums, where the structure and presentation are tailored to visitors' educational needs rather than the properties of objects, mirrors the emphasis on the personal and societal dimensions of cultural awareness and expression. By encouraging visitors to engage deeply with exhibits, explore multiple perspectives, and participate in social and sensory experiences, constructivist museums directly support the development of this competence. Furthermore, museums that incorporate Hein's educational philosophy align with the EU's outlined knowledge and skills for cultural competence. First of all, in terms of knowledge, indeed, museums serve as repositories and interpreters of local, national, and global cultures, offering insights into traditions, languages, artistic expressions, and historical contexts. By presenting cultural narratives through multisensory and interactive exhibits, museums enhance understanding of how cultural expressions influence individual and collective identities. Second, in terms of skills, it can be stated that focus on participatory learning equips visitors with the ability to interpret and express ideas figuratively and abstractly, engage creatively with cultural materials, and make meaningful connections between personal experiences and broader societal themes. Interactive exhibits and multisensory activities further enhance visitors' ability to engage with and reinterpret cultural artifacts, fostering both personal and collective growth. Finally, in terms of attitudes, it is possible to prove that museums foster an open-minded and respectful approach to cultural diversity by encouraging empathy and curiosity. Visitors are empowered to appreciate cultural expressions different from their own while also reflecting on their identities and societal roles. This aligns with the competence's goal of nurturing ethical and responsible engagement with cultural heritage. Through thoughtful design and dynamic educational practices, museums embody the EU's vision of cultural awareness and expression as a core life competence. Hein's model underscores the idea that museums, far from being static repositories, are dynamic

institutions capable of shaping cultural consciousness. His integration of participatory activities, multisensory engagement, and diverse narrative perspectives transforms museums into platforms for critical dialogue and creative expression. This approach is also closely aligned with the principles outlined in the United Nations'2030 Agenda for Sustainable Development, specifically Goal 4, which seeks to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" [51]. By fostering inclusive access to cultural knowledge, encouraging diverse learning styles, and promoting creative engagement, museums contribute directly to the advancement of equitable education. Their role in providing dynamic and interactive learning environments aligns with the goal of lifelong learning, offering opportunities for individuals of all ages, backgrounds, and abilities to engage with culture and heritage in meaningful ways.

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