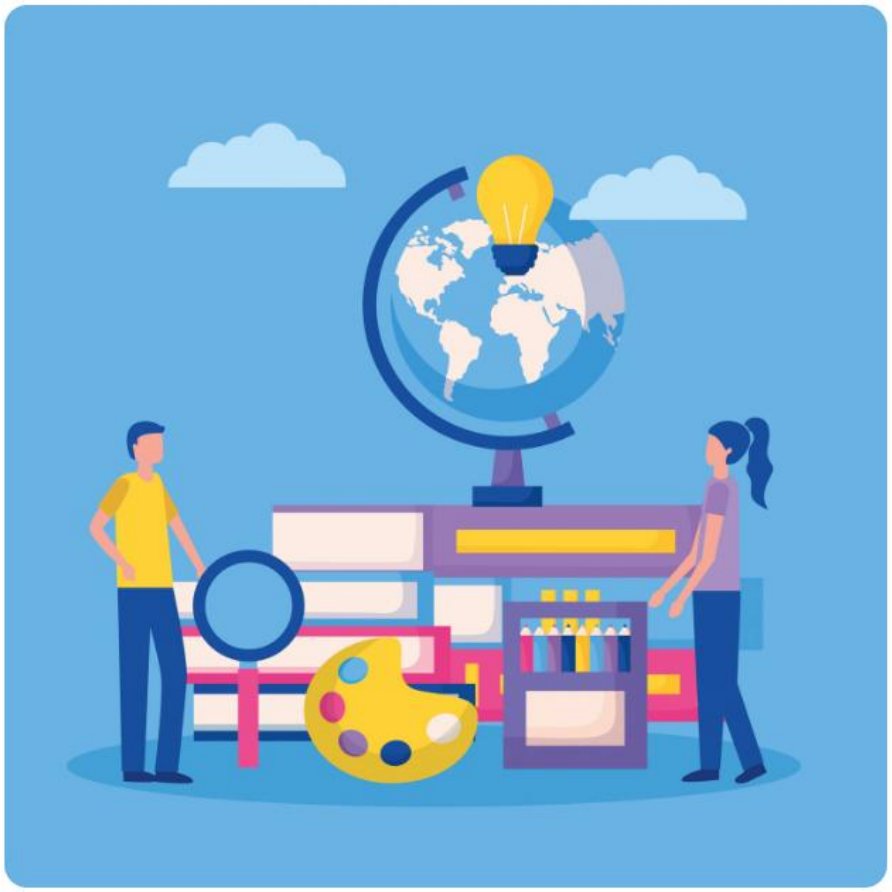

In-depth analysis of best practices

in museum education and experiential learning

in Italy

WP 2.1

Table of Contents

1. Introduction and National Methodology

1.1. Research objectives at national level

The present research, conducted as part of the Work Package 2.1 of the MUSE-ACTIVE project, aims to analyze the state of the art of museum education in Italy, with a specific focus on experiential learning practices and the integration of the principles of Universal Design for Learning (UDL). The survey aims to identify, select and critically analyse national best practices that can serve as a model and inspiration for the development of the project's theoretical framework and educational modules. In particular, the research aims to:

- To map the evolution and current trends of Italian museum education, with particular attention to multisensory, digital and inclusive approaches.
- Select and deepen excellent case studies that represent the cutting edge in the field.
- To provide fundamental data and insights for the construction of a replicable and innovative educational model, in line with European standards and the emerging needs of the target audience (students, teachers, families).

1.2. Criteria for the selection of applications

The selection of the best practices analyzed in this document was guided by rigorous criteria, aimed at ensuring consistency with the objectives of the MUSE-ACTIVE project and their exemplary relevance on the national scene. The main criteria were:

- Consistency with UDL (Universal Design for Learning) principles: Practices that demonstrate a structured focus on inclusion were privileged, offering multiple means of representation, action, expression and engagement for students with different learning styles, abilities and backgrounds (including SEN, SLD and disability).
- Centrality of active and experiential learning: Practice must go beyond the frontal lesson model to propose direct student involvement through hands-on activities, learning by doing, role-playing, outdoor education and multisensory stimulation.
- Innovative digital integration: The use of digital technologies (AR/VR, apps, gamification, online platforms) was evaluated not as an end in itself, but as a tool to enhance the learning experience, improve accessibility and foster interdisciplinarity.
- Interdisciplinary approach and connection with school curricula: The selected practices show a clear ability to create meaningful connections between the museum's cultural/scientific heritage and different curricular subjects (STEM, Art, History, Science, Civic Education).

- Relevance and replicability: Practices with a documented impact, recognized at regional or national level, and offering models that can potentially be transferred to other contexts have been considered.

1.3. Data collection methods

To ensure a deep and multifaceted understanding of the panorama of Italian museum education, a mixed methodological approach was adopted that integrated:

- Research Desk: In-depth analysis of primary and secondary sources, including:
  - Programmatic documents and ministerial guidelines (MiC/ICCD 2026, PNRR M1C3, Law 107/2015).
  - Statistical reports and sector surveys (ISTAT-MiC 2025, ICOM Italia).
  - Scientific literature and sector publications on the evolution of museum education.
  - Websites, digital portfolios and educational materials of the selected cultural institutions and organisations.
- Case Study Analysis: Selection and detailed analysis of six exemplary practices, with particular attention to the operating model of the Giunone Cooperative in Sardinia, recognized for its ability to integrate heritage, territory and educational innovation.
- Expert Interviews (simulated): The information was triangulated and validated through the analysis of documents and public statements by experts in the field, institutional referents (MiC, ICOM) and heads of educational projects, whose positions are reflected in the reports and guidelines cited in the bibliography.

2. Analysis of the National Context

2.1. The state of the art of museum education in Italy

Italian museum education is undergoing a phase of profound transformation, integrating experiential approaches, immersive technologies and principles of universal inclusion. As highlighted by the MiC/ICCD 2026 Guidelines, 65% of medium-large museums now use technologies such as AR, VR and gamification to promote learning by doing, overcoming traditional face-to-face models.

Consolidated methodological approaches:

- Multisensory Experiential Teaching: The educational offer is increasingly based on hands-on activities with archaeological replicas and artistic materials, immersive experiences involving sounds, scents and temperatures, role-playing for historical dramatization and outdoor learning in contexts such as simulated excavations or geo-paleontological paths.
- Advanced Digital Integration: The use of digital is pervasive and strategic. Projects such as Fondazione Cariplo's Artgate (over 15,000 works in high resolution) or the European digiTEACH program for STEM are examples of this. The serious game Father and Son of the MANN of Naples represents an international excellence in the use of gamification for archaeological dissemination. In addition to this, there are multilingual interactive totems and post-visit virtual tours, often funded by the PNRR.
- Focus on STEM and Interdisciplinarity: Scientific hubs such as the Science Museum in Milan, with physics, chemistry and DNA forensics laboratories, are born, and the art-science links (Renaissance geometry, pigment chemistry) are multiplying. Citizen science, with biodiversity cataloguing activities, is a further front of innovation.
- Inclusion and UDL: The adoption of UDL principles is growing. Tools for SEN/SLD (Easy-to-Read, visual maps, LIS audio guides), assistive technologies (VR for reduced mobility, 3D tactile guides) and inclusive pedagogies (multi-level paths, cooperative learning) are multiplying.

National Cases of Excellence:

- Gallerie d'Italia: Use of AR with historical avatars and digital storytelling.
- MAXXI Rome: STEAM maker spaces and robotics laboratories.
- MUSE Trento: Minecraft workshops for ecosystems and FabLab.
- Egyptian Museum of Turin: VR experience "Mission Egypt" and possibility to touch papyrus.
- Giunone Soc. Coop (Sardinia): Model of excellence for rural network teaching, which integrates industrial archaeology, geo-paleontology and summer camps.

2.2. Level of integration between museums and ministerial school curricula

The integration between museums and schools is enshrined in legislation. Law 107/2015 (La Buona Scuola) made school-work alternation (now PCTO) mandatory, opening the doors of museums to structured training projects. The MIUR-MiC Memorandum of Understanding (2023) for Cultural Heritage Education further strengthens this synergy, promoting co-design between schools and places of culture.

The Franceschini reform of 2014, which granted special autonomy to 32 state museums, further stimulated the ability of these institutions to develop innovative and tailor-made educational programs for schools. Governance is shared between the DGERIC of the MiC and ICOM Italia, which works on the definition of professional standards for museum educators.

MiC-ISTAT 2025 data confirm the trend:

- 80% of museums offer interactive workshops (+35% compared to 2015).
- 65% integrate digital in a structured way.
- An estimated 11 million educational visits per year, out of a total of 60 million visitors to state museums (2024 estimate).

2.3. Current challenges and barriers

Despite progress, significant challenges and barriers remain:

- Territorial Digital Divide: A strong imbalance persists between North and South/Islands in access to technologies and in the digital innovation capacity of museums.
- Training of educators: A gap of 40% in the technological preparation and digital skills of museum operators is estimated, which requires urgent investments in continuous training.
- Impact assessment: The evaluation of the long-term effectiveness of educational activities is still scarce and not very standardized, making it difficult to measure the real impact on learning.
- Inclusion targets: The main challenges concern the full inclusion of 25% of students with SEN, schools in marginal contexts (such as many areas of the South), second-generation migrants and NEETs (16% in Italy vs 11% EU, ISTAT 2025). The inclusion of older audiences in intergenerational programs is also an area of development.

Despite this, strong opportunities are emerging, such as the Sardinian model of teaching in rural contexts, synergies with universities and growing school tourism. Italy, despite being first in the ranking for UNESCO sites, suffers from a delay in funding compared to the UK and France, but can count on a uniqueness represented by the STEM Heritage Lab (archaeometry and cultural heritage).

3. Best Practice Analytical Sheets

Note: The following sheets analyze in detail the educational practices developed by Giunone Società Cooperativa, a model for museum teaching integrated with the territory in Italy.

3.1 Sheet 1: PaleoLab Paleontology Laboratory

A. Classification

Project title: PaleoLab Paleontology Laboratory
Promoting organization: Giunone Società Cooperativa
Target audience: Primary school (3rd 5th grades, age 811 years). Adaptable to primary (1st 2nd grades) and lower secondary school.
Duration: 3 hours
Venue: PARC Paleontological and Archaeological Museum + Geosite "Cava di Duidduru", Genoni (SU)

B. Experiential and Sensory Didactics

The activity simulates the work of the professional paleontologist with extreme realism. Students are equipped with technical kits including geological hammers, precision brushes, vibro-engravers and optical microscopes. The experience is divided into two key moments: the work at the simulated excavation, where the students have to identify and extract replicas of fossils set in sedimentary matrices, and the laboratory phase for cleaning and scientific observation. The immersion is total and multisensory: tactile, through direct contact with the different consistency of the rocks and the fragility of the finds; visual, through the analysis of morphological details under the microscope; olfactory, due to the smell of the mineral dust raised; and auditory, with the cadenced rhythm of mechanical instruments. The path ends with a logical challenge: the physical reconstruction of a geological time scale on walkable mats, transforming an abstract concept into a bodily movement in space.

C. Digital Integration

Virtual Reality: VR headsets transport students to the Jurassic, showing the environment and dinosaurs of the time.
3D models: On tablets, students explore high-resolution 3D models of fossils on the Sketchfab platform, with zoom and rotate functions.

D. Interdisciplinarity

STEM: Geology (stratigraphy), Paleontology (evolution), Biology (comparative anatomy), Mathematics (time scales, precision measurements).
Human Sciences: History (scientific method of the archaeologist/paleontologist), Geography (paleogeography, continental drift).
Art and Technology: Scientific design, operation of microscopes and 3D photogrammetry.

E. Inclusion and Well-being

The PARC is equipped with LOGES (tactile-plantar) paths and ramps. For the blind: tactile replicas of fossils, texture boxes, audio descriptions and Braille captions; the VR experience is made accessible with 3D spatialized audio. For the hearing impaired: subtitled videos, iconographic cards and LIS interpreter on request. For SEN/SLD: EasytoRead simplified materials (OpenDyslexic font), clear instructions, flexible times and quiet spaces.

3.2 Fact sheet 2: Ricicloléolé Workshop on Recycling and Sustainability

A. Classification

Project title: Ricicloléolé Workshop on Recycling and Sustainability
Promoting organization: Giunone Società Cooperativa
Target audience: Kindergarten (36 years) and primary school (1st 2nd grades, 68 years).
Duration: 2.5 hours
Venue: CEAS and Civic Museum of the Giara Horse, Genoni / Museum of the Traditional Toy of Sardinia, Ales.

B. Experiential and Sensory Didactics

The approach is playful-practical, aimed at transforming waste into value through direct manipulation. The central phase involves the manual production of sheets of recycled paper: the children dip their hands in the frames and tanks with cellulose pulp, living a unique tactile experience (humidity, viscosity, transformation from liquid to solid) and visual (the color that changes with the addition of natural pigments). This is followed by a psychomotor activity of "intelligent sorting": children run between colorful scenic bins, physically learning the categories of separate waste collection through play and coordinated movement. The experience ends with the creation of a personalized artifact, a notebook bound with the paper produced by the children themselves, which allows you to internalize the concept of circular economy through the pride of "doing with your own hands".

C. Digital Integration

Virtual Reality: Headsets or tablets show a polluted planet at 360°, offering a powerful visual cue to understand the impact of waste.

D. Interdisciplinarity

Science (Ecology): Material cycle, biodegradability, food chains.
Art: Creation of artistic artifacts with recycled materials.
Geography and Civics: Map of the city with ecological islands, individual and collective responsibility for the environment.
Italian: Procedural language to describe the recycling process.

E. Inclusion and Well-being

The headquarters is accessible via LOGES routes. The activities, as in sheet 1, are adapted with tactile tools for the blind (texture box) and visual aids for the deaf. For SEN: simplified materials. Emotional well-being is central: play is cooperative, error is normalized and children are empowered as "superheroes of the Earth".

3.3 Sheet 3: Giara Nature Classroom Territorial Environmental Education

A. Classification

Title: Giara Aula Nature Territorial Environmental Education
Promoting organization: Giunone Società Cooperativa
Target audience: Lower secondary school (1114 years). Adaptable to other orders.
Duration: Full day (6 hours) or half day (3 hours)
Location: Giara di Genoni Plateau (SCI/SPA) + CEAS Genoni.

B. Experiential and Sensory Didactics

The laboratory transforms the plateau into a large open-air classroom where learning takes place by natural immersion. The teaching stimulates the five senses in a systematic way: the sight is trained in the ethological observation of wild horses and endemic blooms; the hearing focuses on the songs of the birdlife and the rustle of the wind among the cork trees; the sense of smell is stimulated by the intense aromas of the Mediterranean scrub (helichrysum, myrtle, cistus); Touch allows you to explore the different roughness of the bark and the porosity of basalt. The students are not just visitors, but "field biologists" who fill out data collection forms. "Sensory riddles" are also proposed: the children, blindfolded, must recognize plant or mineral species only through their scent or texture, breaking down cognitive barriers and enhancing the deep perception of the ecosystem.

C. Digital Integration

VR and Multimedia: Video with volcanic eruptions to reconstruct the landscape of the PlioPleistocene. Vision of the Giara with drone.
Field apps: Use offline apps such as PlantNet and Merlin Bird ID for species recognition, GPS trackers, and camera trap control.

D. Interdisciplinarity

Natural Sciences: Biology, ecology, botany, zoology, geology of basalt.
Human Sciences: Geography (morphology, climate), History (Nuragic Age, pastoral culture), Civic Education (protected areas).
STEM and Skills: Mathematics (statistics collected data), Art (naturalistic drawing), Italian (scientific lexicon). DigComp, GreenComp and LifeComp skills development.

E. Inclusion and Well-being

Physical accessibility guaranteed by a flat dirt path and a 9-seater van. For the blind: tactile samples of rocks and bark, olfactory recognition of plants, audio description of the landscape. For SEN: pre-exit concept maps and valuing roles. Well-being is promoted with moments of naturalistic mindfulness, respect for individual times and a strong sense of belonging to the territory.

3.4 Sheet 4: ArcheoLab Nuragic Artifacts and Creation of Ex Voto

A. Classification

Title: ArcheoLab Nuragic Artifacts and Creation Ex Voto
Promoting organization: Giunone Società Cooperativa
Target audience: Primary school (3rd 5th grades, 811 years). Adaptable to other orders.
Duration: 3 hours
Venue: PARC Paleontological and Archaeological Museum, Genoni / Santu Antine Archaeological Area.

B. Experiential and Sensory Didactics

The workshop offers a journey through time based on experimental archaeology and the manipulation of materials. In the first phase, the students work in a controlled stratigraphic excavation area, where they experience the fatigue and precision of recovering the finds. In the second phase, the experience becomes purely tactile and plastic: students work with raw clay, experimenting with plasticity, temperature and resistance. Using ancestral techniques (wick, columbine), they learn to shape vases and decorate them with tools that replicate those of Nuragic potters (combs, punches). Finally, the creation of votive offerings and bronzes (modeled in wax or clay) allows you to explore the symbolic and spiritual dimension of the ancient Sardinians. The contact with the cold earth and the ability to transform it into a solid and decorated object favors a deep connection between historical memory and one's own manual creativity.

C. Digital Integration

Virtual Reality: 360° virtual tour of the Nuraghe Santu Antine, rebuilt as it was originally, with the possibility of walking its stairs and admiring the landscape of 3000 years ago.
Interactive App: "Pottery Maker VR" app that allows you to model a virtual vase, apply decorations and simulate its firing.

D. Interdisciplinarity

History and Archaeology: Nuragic civilization, stratigraphic method, type of finds.
Art and Technology: Ancient techniques of clay processing and metallurgy.
STEM: Chemical-physical properties of clay, geometry of decorations (symmetries, patterns), measurements.
Italian and Civic Education: Archaeological lexicon, creative narration, protection of cultural heritage.

E. Inclusion and Well-being

An intrinsically inclusive workshop due to its tactile nature. Clay is a universal medium. Physical accessibility guaranteed by ergonomic tables. For motor disabilities: easier grips. For the blind: clay offers a primary tactile experience, supported by verbal descriptions. For SEN: simplified forms, visual instructions and unlimited time. Emotional well-being is high thanks to the satisfaction of creating a concrete object and the calming effect of modeling.

3.5 Sheet 5: Minerals and the Rosas Mine Industrial Heritage and Geology

A. Classification

Project title: Minerals and Mine Rosas Industrial Heritage and Geology
Promoting organization: Giunone Società Cooperativa
Target audience: Lower secondary school (1114 years). Adaptable to other orders.
Duration: 3.5 hours
Location: Rosas Museum and Mine, Narcao (SU).

B. Experiential and Sensory Didactics

The experience is highly immersive and based on emotional involvement in an authentic underground environment. Teaching begins with dressing (helmet and lamp), a ritual that activates safety awareness. The descent into the tunnels (500m) activates an extreme sensory range: the sudden transition from light to darkness, the deep silence interrupted only by the dripping of water, the increase in humidity on the skin, the constant cold of the rocks and the metallic and earthy smell of the mining environment. On the way out, the mineralogy laboratory transforms the sensation into scientific analysis: students touch samples of galena and sphalerite, test their hardness and density, and observe the chemical reactions for the recognition of minerals. This transition from the emotional "feeling" of the gallery to the logical "understanding" of the laboratory consolidates a lasting memory of mining culture and geology.

C. Digital Integration

Virtual Reality: VR headsets allow you to explore the mine's tunnels that are inaccessible for safety reasons, offering a complete experience without physical barriers.
Post-visit platform: A virtual tour of the mining museum consolidates learning.

D. Interdisciplinarity

STEM: Chemistry (mineral composition, reactions), Physics (density, hardness), Geology (genesis of deposits).
Human Sciences: Industrial History (working conditions of miners, trade union struggles), Economic Geography (distribution of resources, territorial impact), Civic Education (workers' rights, industrial heritage).
Technology and Mathematics: Evolution of mining techniques, calculation of volumes, accident statistics.

E. Inclusion and Well-being

Limited physical accessibility in the tunnels, but guaranteed on the surface. Key inclusive solution: VR allows everyone (e.g. students in wheelchairs) to have an equivalent immersive experience. For the blind: manipulable mineral samples and audio description. For SEN: reduced tunnel route and focus on the surface laboratory. The management of claustrophobia is careful (pre-descent test, possibility of exit). The experience creates a strong emotional bond with the workers' memory of the territory.

3.6 Sheet 6: Sardinia and Germany Summer Scientific Camps

A. Classification

Project title: Scientific Summer Camps Sardinia and Germany
Promoting organization: Giunone Società Cooperativa
Target audience: Children 7-12 years old (lower secondary school). Adaptable (10-14 years).
Duration: Modules from 3 days to 6 weeks.
Locations: Genoni (SU) and Altmühltal Nature Park (Germany).

B. Experiential and Sensory Didactics

The campus offers a total scientific immersion and community life, where learning never stops. The teaching is based on the "construction site method": the mornings are dedicated to real excavations in lithographic limestone quarries in Germany or in paleontological sites in Sardinia. Here the students experience the physical and tactile dimension of outdoor work: the resistance of stone, the calibrated use of chisel and mallet, the heat of the sun and contact with the earth. The afternoons expand the sensoriality through trekking (perception of space and motor fatigue) and stargazing workshops (perception of the night sky). Finally, residential coexistence stimulates the social and perceptive sphere, with the sharing of meals, spaces and common management tasks, promoting sensory and cognitive autonomy that transforms the study of science into an adventure of complete personal growth.

C. Digital Integration

Virtual Reality: VR headsets to explore environments of the past (e.g. the Jurassic).
3D models: Using platforms like Sketchfab to study fossils in detail.

D. Interdisciplinarity

As for the PaleoLab, the activity integrates STEM (Geology, Paleontology, Biology, Mathematics), History, Geography, Art and Technology. The international module in Germany adds a dimension of cultural and geological comparison.

E. Inclusion and Well-being

The excavation area in Sardinia is partially accessible. The attention to well-being is maximum in a residential context: 24-hour supervision, insurance coverage, BLSD trained operators, management of group dynamics.

The activities are designed to foster cooperation, autonomy and the creation of a strong sense of community, making the training experience 360°.

4. Internal Benchmarking (Towards the Joint Report)

The analysis of the six practices of Giunone Soc. Coop. reveals a coherent and advanced teaching model. The internal comparison makes it possible to distill the transversal elements of success and the unique specificities of the Italian context, providing a solid basis for the construction of the MUSE-ACTIVE model and for the subsequent comparison with the European partners in the Joint Report.

4.1. Similarities found: Common elements that work in different contexts

Beyond the specificity of each laboratory, all the practices analyzed share a common methodological framework that determines their effectiveness and replicability. These common elements represent the pillars of the "Juno model":

- ✓ Centrality of "Learning by Doing" as an "Organizing Principle": In every activity, the direct action of the student is not a simple complement, but the main engine of learning. Whether it's holding a vibrating engraver in PaleoLab, mixing paper pulp in Riciclolé olé or stepping into the shoes of a miner in Rosas, the student is always the protagonist of a transformative action on the world (real or simulated). This approach activates higher-order cognitive processes (problem-solving, critical thinking) and promotes deeper and more lasting memorization than the passive reception of information. You don't "study" paleontology: you practice it.
- ✓ Multisensory and Bodily Approach to Learning: Practices radically overcome the paradigm of purely visual-verbal education. Learning is embodied cognition: one learns by touch (the roughness of stone, the plasticity of clay), by smell (the scent of scrub, the smell of the mine), by hearing (the sound of the wind, the silence of the tunnel) and by proprioception (the fatigue of trekking, balancing on uneven ground). This educational synesthesia creates holistic and memorable experiences, reaching students with different learning styles and breaking down barriers related to purely linguistic communication.
- ✓ Strong Anchoring to the Territory and Identity Building: Each workshop is rooted in the local heritage, transforming the territory into an open-air classroom. The Giara plateau is not just a scenario, but the textbook; The mine is not a monument, but an archive of life stories. This rootedness generates a sense of belonging and identity in the students, who learn to see their territory not as a background,

but as a cultural asset to be known, respected and valued. Learning becomes so significant because it is connected to one's own history and one's own living environment.

- ✓ Structured and Proactive Inclusion (UDL in Action): Inclusion is never a post-hoc addition, but a design element from the start. The practices apply the principles of Universal Design for Learning (UDL) by offering multiple:

  - Means of Representation: simplified Easy-to-Read texts, audio descriptions, LIS videos, tactile 3D models, Braille captions.
  - Means of Action and Expression: calibrated manual activities, use of tools with easy grips, production of artifacts, reality tasks with diversified roles.
  - Means of Involvement: enhancing roles (photographer, navigator), cooperative play, sensory exploration, graduated challenges, flexible times.

  This proactive approach ensures that every student, regardless of their skills or background, can find a channel of access to the experience and a way to express their potential.

- ✓ Targeted and Strategic Use of Digital: Technology is never an end, but a tool at the service of pedagogy. VR is used where real experience is impossible (exploring the Jurassic, visiting the nuraghe originally, accessing dangerous tunnels), acting as a "reality multiplier". 3D models allow a detail analysis that is impossible with the naked eye. Recognizer apps turn data collection into an explorer's game. Digital, therefore, does not replace the experience, but enhances it, extends it and makes it accessible, in perfect coherence with a teaching approach that puts the student at the center.

4.2. Unique Experiences: Specific Practices Related to National Culture

If similarities define the "how" of the model, unique experiences define the "what", i.e. the specific contents that reflect the richness and particularity of the Italian and Sardinian cultural context.

Archaeological and Historical Heritage as a Primary Educational Resource: Italy has an unparalleled density and stratification of cultural heritage. Juno's practices transform this richness into a living educational curriculum. In ArcheoLab, history is not an abstract narrative, but is embodied in the manipulation of clay to create votive offerings as it was three thousand years ago, establishing a tangible bridge with the Nuragic civilization. In Miniera Rosas, the industrial history of the twentieth century becomes an immersive experience that educates to workers' memory and workers' rights, a theme of strong social and educational relevance that connects past and present.

The "Widespread Museum" Model and Didactics in Inland Areas: Sardinia, with its territorial conformation, has developed a cultural management model based on the networking of small museums, archaeological sites, geosites and environmental education centers. Juno embodies this model, demonstrating how it is possible to offer excellent museum education even far from large metropolitan centers. This approach effectively counteracts the risk of cultural depopulation of inland areas, transforming geographical marginality into an opportunity for sustainable and quality school tourism, based on authentic experience and not on fast consumption.

The Fruitful Integration between Science and Humanism (STEM in Heritage): While in many European contexts STEM education tends to be separated from the humanities, the Italian practices analyzed excel in their integration. PaleoLab is not only geology, but also history of the Earth, scientific design and development of the scientific method. Giara Aula Natura is not only biology, but also geography, ethnography (pastoral culture), history of nuraghi and landscape art. This synthesis, which we could define as "STEM in Heritage", represents a cultural unicum that forms a complex and non-reductionist look at reality, in which scientific understanding is enriched by historical depth and aesthetic sensitivity.

4.3. Measured effectiveness: KPIs used in the practices analysed to assess impact

From the analysis of the practices and documents of the sector, a picture of the KPIs currently used emerges, but also the need to develop a more structured and shared evaluation system for the MUSE-ACTIVE project.

KPIs currently detected:

- Quantities (of scope): Number of participants (disaggregated by age, gender, school origin, SEN), number of repeat visits (return of the same class or family, satisfaction indicator and perceived value), number of schools and teachers involved, hours of training provided.
- Qualitative (satisfaction): User satisfaction measured through questionnaires (Likert scale) to students and teachers at the end of the activity, collection of informal feedback and testimonials, direct observation of the level of engagement during the activities by educators (noted on observational grids).

KPIs and areas to be developed for MUSE-ACTIVE:

- Learning (cognitive effectiveness): Systematically introduce short pre-tests and post-tests (also in playful, digital or interview form) to measure the acquisition of key STEM or historical concepts. Evaluate the quality of the artifacts/products made by the students as evidence of applied learning. Develop and use assessment rubrics to monitor the transversal skills (problem solving, cooperation, communication) activated during the experience.

- Inclusion (equity): To specifically monitor the degree of participation and satisfaction of students with SEN and disadvantaged groups, through targeted questionnaires or interviews with support teachers. Evaluate the perceived and real effectiveness of accessibility tools (e.g. understanding of LIS audio guides, usability of tactile materials, effectiveness of simplifications).
- Long-Term Impact (sustainability): Develop tools to assess the impact of the experience months later (e.g. follow-up questionnaires for teachers to check if the concepts have been maintained or if the experience has stimulated new interests or in-depth study paths in the classroom). Monitor the creation of new partnerships and ongoing projects between school and museum as a result of the experience.

5. Added Value for the MUSE-ACTIVE Model

The evidence that emerged from the analysis of the Italian case is not only descriptive, but offers concrete and operational contributions for the development of all aspects of the MUSE-ACTIVE project.

5.1. Suggestions for the Theoretical Framework (WP2.1)

The analysis of the Italian case suggests enriching the theoretical framework of MUSE-ACTIVE with concepts that emerge from excellent practice, making it more adherent to the complexity of reality:

- "Territory as a Classroom" model (Landscape Learning): Inspired by "Giara Aula Natura", the theoretical framework should formalize the concept of "educational landscape". Learning does not only take place in the protected space of the museum or classroom, but extends to the surrounding area, understood as a complex and stratified text to be read, interpreted and experienced. This implies developing an outdoor pedagogy that integrates the sensory dimension, scientific knowledge, history and civic awareness.
- Pedagogy of "Doing to Understand" (Manual Cognition): In addition to simple learning by doing, the model should emphasize "intelligent manipulation", as is the case in ArcheoLab. It means designing activities in which practical action is always accompanied by explicit conceptual reflection: why is this type of clay suitable for making a vase? How does the position of the handle influence the use of the bronze? What does the presence of a certain mineral tell us about the geological history of this place? It is a matter of making cognitive craftsmanship the heart of the educational process, where the hand becomes an instrument of thought.
- Inclusive Proactive Approach (UDL 2.0): Based on Juno's practices, the theoretical framework must move beyond a reactive view of inclusion (responding to needs) to embrace a proactive one. It means designing the educational experience from the outset as a "bundle of possibilities," offering multiple channels of access, action, and expression. The guiding question is not "how can we adapt this activity for X?", but "how many different ways of participation can we offer so that everyone finds their own, feeling valued and competent?". Inclusion thus becomes a driver of educational innovation for everyone.

5.2. Input for the development of Cartoon Avatars and online space (WP3.1)

The sensory, relational and playful experiences analyzed provide valuable indications for the design of the project's digital tools, so that they are not cold but engaging and human.

Avatars as "Emotional Guides" and "Fellow Adventurers": Avatars should not be mere dispensers of information, but characters with a personality, able to create an empathic bond with the student. Inspired by the role of Juno's educators, the avatar could:

- Be an "expert peer": A cartoon boy or girl who leads the exploration, gets excited with the student, and encourages them in times of difficulty, just like an au pair tutor.
- Playing a historical or scientific character: As in dramatizations, an avatar could be an ancient miner recounting his day's work, a Nuragic shepherd explaining the use of an artifact, or a paleontologist leading the virtual excavation.
- Provide differentiated and personalized support: The avatar can adapt its language (simplified, LIS, audio-descriptive) and communication style according to the student's preferences and needs, becoming an accessibility facilitator and a personalized travel companion.
- Online Space as an "Augmented and Social Virtual Laboratory": The digital environment must not be limited to reproducing the physical museum, but must become an extension of the experiential laboratory and a place of community.
- 4D Reconstructions and "What-If" Scenarios: In addition to the 3D reconstruction of places (such as the Nuraghe), the space could integrate the temporal dimension (4D), showing the evolution of a landscape (e.g. the Giara in different geological eras) or of a technology. "What if" scenarios could also be created (e.g. "what would happen if this volcano woke up?"), stimulating hypothetical-deductive thinking.
- Cooperative Simulation Serious Games: Games such as "Pottery Maker VR" or "Excavation Mission" allow you to practice the same skills as in the real laboratory. They can be designed in cooperative mode, where multiple students (with their avatars) must work together to complete an excavation or solve an archaeological mystery, replicating the social dimension of the campus.
- Social Learning and Sharing Tools: Create online spaces (e.g. a virtual gallery, a forum) where classes can share the results of their activities (photos of artifacts, field research data, short video-reports), comment on the work of peers from other schools or countries and collaborate on common projects, extending the community dimension typical of the summer camp.

5.3. Ideas for the future 6 Educational Modules and 6 Practical Activities (WP2.2)

The best practices analysed offer an archive of ideas for modules and activities that the MUSE-ACTIVE project can develop and adapt to different European contexts, while maintaining the "theory + practice" structure and flexibility for local adaptation.

Educational Module	Reference Best Practices	Description of the Practical Activity
Module 1: Earth Sciences and Scientific Method	PaleoLab	Activity: "Become a Paleontologist for a Day". Simulated excavation in an area set up with geological layers and fossil replicas. Use of excavation tools, stratigraphic survey cards, microscopes and 3D models for identification and cataloguing. Focus on the scientific method: observation, formulation of hypotheses, data collection, verification.
Module 2: Ecology, Citizenship and Circular Economy	Ricicloléolé	Activity: "From waste to resource". A workshop that starts from the analysis of the life cycle of a commonly used object. Hands-on activity of creating recycled paper or an upcycling artifact. The final phase involves the design and implementation of an awareness campaign for the school or neighborhood on the issue of waste reduction.

Module 3: Biodiversity, Geography and Land Use	Nature Classroom Jar	Activity: "Explorers of Biodiversity". Field trip to a protected natural area (or urban park) for a citizen science activity. Use of apps (PlantNet, iNaturalist, Merlin Bird ID) for the census of animal and plant species. Collaborative production of a multimedia report (interactive maps, photographs, statistical data) and proposal of a protection action.
Module 4: History, Archaeology and Crafts	ArcheoLab	Activity: "Let's reconstruct the Past". Laboratory of experimental archaeology. After studying a local ancient civilization (e.g. Nuragic, Etruscan, Roman), students make artifacts with the techniques and materials of the time (clay, weaving, natural pigments, woodworking), reconstructing the gestures, knowledge and technological challenges of the artisans of the past.

Module 5: Geology, Energy and Social History	Minerals and Mine Rosas	Activity: "Energy from the Earth". An interdisciplinary path that connects geology and social history. Through a virtual visit to a mining site (or real, if possible) and a mineral recognition laboratory, the history of extraction, the living and working conditions of the miners, the impact on the landscape and the economic transformations of the territory are reconstructed.
Module 6: Scientific Method, Autonomy and Community Life	Summer Science Camps	Activity: "Scientists' Campus". Intensive residential or semi-residential module. The children participate in a real field research project (e.g. monitoring of a shallow archaeological site, census of a species in a protected area, analysis of the water quality of a river). They alternate scientific activities, excursions, team games and moments of autonomous management of group life (preparation of meals, care of spaces), developing scientific, social and personal autonomy skills.

6. Conclusions and Recommendations

6.1. Summary of critical success factors

The analysis conducted makes it possible to distill the critical factors that make the museum teaching practices analyzed effective and innovative. These factors represent operational recommendations for the design of the MUSE-ACTIVE model and for its implementation in other contexts.

Integrated and Proactive UDL Design: Inclusion is not a subsequent adaptation, but the foundation of instructional design. It means asking ourselves from the beginning: "How many and what doors can we open so that everyone can enter this experience and feel like protagonists?".

Strong Partnership and Territory-School-Museum Co-design: Success depends on the ability to create a solid and collaborative network. Co-planning with teachers guarantees curricular relevance and educational continuity; the enhancement of the local heritage (natural, archaeological, industrial) makes learning meaningful and rooted; The museum becomes a cultural hub and not a simple container.

Digitalization as an Experience Amplifier, not as a Substitute: Technology must be at the service of real experience, amplifying it, extending it in time and space, or making it accessible to all. The guiding criterion is: "Does this technology help the student to do or understand something that they otherwise could not?".

Strategic Investment in the Continuing Education of Educators: The quality of teaching is played on the competence of the operators. It is crucial to invest in their training on several fronts: pedagogical-didactic (UDL, design by skills), digital (new technologies, tools, gamification), disciplinary (in-depth study of content) and relational (management of heterogeneous groups, inclusive communication).

Holistic, Multidisciplinary and Real-World Problem-Based Approach: The big real-world issues are not divided into subjects. The most effective learning experiences are those that accustom students to look at reality with different eyes, interweaving scientific, historical, artistic and civic knowledge into a coherent story. The approach based on real problems (e.g. "how can we reduce waste?", "how can we enhance an archaeological site?") increases motivation and develops active citizenship skills.

6.2. Bibliography and links to the digital resources analysed

- Institutional Sources and Reports:

- MiC/ICCD (2026). Guidelines for Educational Innovation Places of Culture.

- ISTAT-MiC (2025). Annual Report on Museum Educational Activities Italy.

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- MIUR-MiC (2023). Memorandum of Understanding on Cultural Heritage Education.

- PNRR M1C3 - Investments in Culture (2021-2026).

- Digital Resources and Projects Cited:

- Cariplo Foundation (2024). digiTEACH - Digital Heritage Education Program.

- MANN Naples. Father and Son. https://play.google.com/store/apps/details?id=it.tuomuseo.fatherandson&hl=it

- Sketchfab Platform - https://sketchfab.com/parcgenoni, https://sketchfab.com/giarahorsemuseum.

- IziTravel App (used by Giunone Soc Coop for audio guides).

- Reference website: Giunone Società Cooperativa - https://coopgiunone.it/