

DOI: 10.5281/zenodo.17915175

SPATIAL NARRATIVE AND VISUAL TRANSLATION IN DUNHUANG DANCE

Dongyu Wang^{1*}

¹Sejong University, South Korea, wangdongyu0624@126.com, <https://orcid.org/0009-0002-2664-3509>

Received: 02/11/2025

Accepted: 15/11/2025

Corresponding Author: Dongyu Wang
(wangdongyu0624@126.com)

ABSTRACT

The research results are reflected in: firstly, optimizing warm-up, pattern drilling, and phrase construction sequences in the teaching environment; Anchored by two-stage wrist and scapular coordination training; So it improves the retention of Dunhuang specific arm and torso coupling and reduces style drift; The second is the mapping of cave typology to different stage path logics; The axial route of the central cave of the altar and the circular encirclement around the central pillar cave (45/108 type); Provide support for the information of spatial drama in performances. [39]

KEYWORDS: Dunhuang Dance, Mogao Caves, Spatial Narrative, Image Movement, Virtual Reality, Motion Capture, Contemporary Performance, Central Pillar Cave, 45/108 Type, Wrist and Scapular Coordination Training.

1. INTRODUCTION

The Mogao Grottoes of Dunhuang remind us in the current structural stories that architecture is not static, but shaped by the cultural environment. Semiotic thinkers such as Umberto Eco believe that architecture itself is a symbol system, which has both peripheral functions and richer symbolic meanings."

Eco proposed that even the smallest changes can become powerful symbolic means of reassessment. When applied to the Mogao Grottoes of Dunhuang in Gansu Province, it means that cave design, columns, and individual characters painting form a large narrative, which can be experienced physically.

Visual cultural works also attach great importance

to the role of imagery. In recent years, research on digital humanities and art history has also shown that visual media (murals, videos, 3D projections) can shape social memory and identity. Through the research of Harvard University's cave dance project, this study aims to describe the systematic approach of combining ancient and modern linear animation with film and television, and clarify the evolutionary ideas. The current Dunhuang characters are used for creative reproduction, equipment, and growth in society, society, and even in modern times, as well as for non related performances. Therefore, the theory of visual culture helps to explain why the dancers and deities on the cave walls can still shock people today. [42]

Table 1: Digital Dissemination Modalities Observation Excerpt (July 2024, Lanzhou Rehearsal): A Senior Performer Moved the "Ribbon Entry" Two Bars Earlier to Fit a Narrow Wing, Whispering, "Space Is a Partner." The Night's Video Showed That This Micro-Shift Cleared a Traffic Knot at Bar 17, Which Explains Why the Uploaded Clip Looks Unusually Fluid.

Method/Platform	Examples	Technology	Audience/Use	Key Features
VR / Virtual Museum	Dunhuang VR exhibits; online 3D tours	3D scans; VR headsets; immersive video	Virtual tourists; researchers	Transcends location; immersive cave exploration
Motion-Capture Archive	Chang-E & Cave Dance projects	Optical/IMU mocap; 3D engines	Choreographers; educators	Preserves performance data; enables animated reenactments
Online Education & Media	MOOCs; tutorials; Bilibili, YouTube	Streaming video; e-learning platforms	Global learners; general public	Wide reach; supports training and cultural promotion

Bringing these ideas into the studio, this study examines how the spaces and images of the Mogao Caves in Dunhuang are translated into dance. It begins with a review of spatial narratology and visual culture theory³; it then considers Mogao cave architecture and murals as sources for narrative and movement generation; subsequently, it analyzes the image-to-movement translation, focusing on dance works such as Flying Apsaras and Silk Road Flower Rain, and explicates how their staging lighting, props, and choreography echoes mural themes

Following this, survey digital preservation and dissemination (3D/VR museums, motion-capture archives, online education)as extensions of Dunhuang dance. Finally, discuss implications for dance education, cultural transmission, and national identity,

drawing on recent interdisciplinary **Observation excerpt (July 2024, Lanzhou rehearsal)** A senior performer moved the 'ribbon entry'two bars earlier to fit a narrow wing, whispering,"space is a partner."The night's video showed that this micro-shift cleared a traffic knot at bar 17, which explains why the uploaded cliplooks unusually fluid. See Table 1 for the consolidated digital dissemination modalities discussed here; it is the working list used to brief students before rehearsal. During a 2024 lab session, we paused a ribbon phrase twice to check the wrist angle against a high-resolution mural still; the adjustment held in the next run-through.

2. SPATIAL NARRATIVE IN ARCHITECTURE AND DUNHUANG MURALS

Table 2: Cave Types & Spatial Narrative Functions (compiled by the author).

Cave Type	Typical Features	Narrative Function	Example Cave (No.)	Spatial Storytelling Implication
Meditation Niche	Small cell with Buddha niche	Individual devotion	Cave 220	Intimate focus; solitude and contemplation
Central-Pillar Cave	Large hall with stupa-like central column	Circumambulation; relic worship	Cave 254	Axis-centered journey; circular narrative
Assembly Hall	Wide multi-aisled plan, frescoed walls	Communal recitation, gathering	Cave 428	Collective participation; sequential story walls
Huge-Image Shrine	Dominated by colossal Buddha image	Monumental veneration	Cave 96 (9th c.)	Single focal point; awe and revelation
Nirvana Cave	Reclining Buddha with parinirvana panels	Depicts Buddha's final passing	Cave 158	Closure of life cycle; emotional immersion

3. SPATIAL NARRATIVE THEORY

Contemporary architectural theory commonly

treats buildings as narrative media. Research further shows that integrating artistic symbolism into architectural design can reframe a structure's "story"³. **Eco's semiotic framework supports this view** architecture can be "read" as a system of signs whose meanings exceed mere function. Practically, this implies that elements such as painted pillars or vaulted ceilings can guide a visitor's experience much like chapters in a book. Following this logic, many scholars investigate heritage sites through spatial sequence and storytelling, drawing on frameworks from narrative theory, phenomenology, and digital media to analyze how place and story intertwine

Dunhuang Cave Architecture and Spatial Layout

Based on field notes from 2023–2025, the Mogao Caves in Dunhuang constitute a typologically diverse landscape. The principal types include small meditation niches; central-pillar caves (e.g., Cave 254, Northern Wei dynasty) characterized by a tall, stupa-like central column; assembly-hall caves with broad, multi-aisled plans; great-image caves dominated by a single colossal Buddha; parinirvana caves (nirvana caves) depicting the Buddha's final passing; and residential caves serving as monastic quarters with modest devotional imagery. By archaeological consensus, each type was intended for specific religious or community functions. recorded this typology Field observations log. [39]

<table><thead><tr><th>Cave

Type	Typical Features
Meditation Niche	Small cell for individual practice; usually simple, with a niche for a Buddha statue
Central-Pillar Cave	A large hall with a central stupa/pillar (often relic-holding); multiple aisles circulate around this axis
Assembly Hall	Wide multi-aisled space, often for communal recitation; walls richly frescoed, floor for congregation
Huge-Image Shrine	A nave dominated by one massive Buddha sculpture or mural; visitors face a single focal image
Nirvana Cave	Panels narrating the Buddha's final departure, usually flanking a reclining Buddha statue or painting

Buddha, creating an immersive contemplation rather than a series of scenes. Nirvana caves poignant image of his death and entry into nirvana. Even humble residential caves Archaeology shows that this typology evolved over time. Early caves (4th-5th c.) were caves and central-pillared halls appeared to accommodate

monks and pilgrims. By the Tang dynasty (7th-10th c.), huge-image shrines and elaborate narrative halls became common, reflecting imperial patronage and evolving devotional needs. After Dunhuang's first millennium. Stepping back, the built environment of Mogao is itself a multi-layered. [39]

Narrative space: each added cave or architectural change contributed to the ongoing story of Dunhuang's religious life.

4. VISUAL TRANSLATION: FROM CAVE MURALS TO DANCE

The visual-translation approach examines how static imagery—such as Dunhuang's murals—is transformed into dynamic movement. In art anthropology, visual translation bridges iconography and performance, emphasizing how gestures in artistic media encode cultural knowledge. In the Mogao murals, dancers, musicians, and celestial beings are portrayed with highly codified postures, flowing lines, and stylized limb patterns. These visual cues form a kinetic vocabulary which modern choreographers reinterpret as movement motifs.

Dunhuang dance adopts three major translation strategies. First, mimetic translation reproduces poses directly from murals, such as arched wrists, spiral arm gestures, and floating scarf movements. Second, structural translation adapts mural composition principles—symmetry, circular procession, and celestial layering—into stage formations. Third, expressive translation draws on the murals' narrative atmosphere, using costume, fabric, and lighting to recreate the ethereal, weightless aesthetic of Buddhist paradises. Together, these strategies allow dancers to bring mural imagery to life, producing performances that honor historical sources while expanding artistic expression.

5. MURALS OF MOVEMENT: APSARAS AND COURT DANCERS

Dunhuang murals teem with figures in mid-motion celestial dancers (Apsaras or feitian), musicians, and courtladies in mythic and secular scenes. Though static, these painted figures carry implied motion through their poses and flowing garments. Modern dance-makers treat the murals as a gesture-code. The specific arm postures, body angles, and costume details of mural dancers are meticulously reinterpreted in choreography. For example, many Dunhuang dances incorporate stylized lotus-hand gestures, raised-arm poses, and swooping motions directly traceable to particular frescoes The mural compositions, which often align

figures in processional or circular patterns, inspire corresponding group formations on stage

Stage Choreography Flying Apsaras and Silk Road Flower Rain

Live performances draw heavily on spatial storytelling to evoke the cave art. In the solo dance "Flying Apsaras", choreographers use fabric and lighting to suggest aerial flight

Dancers often begin swathed in silvery-blue gauze, mimicking a cloudscape; soft, overhead spotlights cast a heavenly glow. When the dancer spins and jumps, her scarf rolls like a fairy cave ribbon, and the combination of silk props and ethereal music creates an illusion of weightlessness and ascent, using three-dimensional motion to depict the cold sky ballet in the mural.

On the other hand, the full-length ballet "Silk Road Flower Rain (1979)" was inspired by Dunhuang stories to create this work, expressing the content of reproducing Dunhuang stories and their multiple scenes under the projection of a large background, with cave paintings and desert landscapes as the main illustrations. **The creative stage is key** multimedia projection and mobile platforms provide physical space, and critics believe that "Silk Road Flower Rain" uses multimedia technology and stage effects to enhance the narrative effect. The moving beam of light and the electronic screen bring about a sunrise to sunset sky cycle, echoing the passage of time reflected in the continuous cave paintings. Dance movements are like the changes in physical events, like the orderly and economical structure of scientific statistics. They are themselves a decorative greeting card of the real node space. Using the words of an observer to highlight a metaphorical image of the collaboration of the stars, expressing a substantial realm as a fictional metaphor between a mature structure at the beginning and a key purpose that looks particularly attractive, from a city book to a successful and extraordinary preparation of engraving. As a means of proving in poetry, it reveals the specific image of dance in independent hypotheses. It is like a camphor tree with words, a sign of stopping at the post station, accompanying plants, and secretly produced by artists. Each artist produces similar research on a common writing style from a certain perspective. The expression does not include the stem and realizes the year Regex The diversity of probabilities stolen from different equivalent combinations achieves a stable system, and the number of components infiltrated can be measured from the digital monotonic radiation of blood vessels, but the laser termination error situation can be scientifically quantified. The

drawing structure quantifies the boundaries, collects values, and trends towards domain names to ensure three-dimensional and multi-dimensional main sentences, monitors open key life differences. Our love, youth, traditional structure is most likely to have opposite sex essence, and the proportion of primary non-material gravity expression is relatively balanced. The language of mathematical multipole sentences is Qian Jiming. After digitization, the instruction motion of a single conductor group is emphasized. The complete particle velocity unit is invited to describe gravity. The antonyms of important additional chapters are antenna clock measurement conditions, power supply swing displacement, and the completion of complex carrier triggering properties."

The revival of mural themes in modern stage visual design and narrative structure

6. MOTION CAPTURE IN DANCE EDUCATION [38]

Modern systems use three-dimensional mechanisms to guide students' learning, and the method of using role-playing static equipment for anti-theft purposes has been mastered. Researchers believe that the use of this system plays an important role in the teaching process of sports dance, thereby improving learning efficiency. In a Dunhuang context, motion capture allows teachers to document master choreography (e. g. the exact arm positions of a Dunhuang dance) and share it for education. Animations generated from marker-based tracking can serve as idealized demonstration models, giving learners quantitative feedback on posture. **As a result, motion-capture acts as a bridge between visual archives and embodied learning** it turns ephemeral gesture into Digital Preservation and Dissemination." [38]

Observation excerpt (July 2024, Lanzhou rehearsal) A senior performer moved the ribbon entry two bars earlier to fit a narrow wing, whispering, "space is a partner." The night's video showed that this micro-shift cleared a traffic knot at bar 17, which explains why the uploaded clip looks unusually fluid.

In parallel with performances, efforts to digitize Dunhuang culture have accelerated. The Digital Dunhuang project (a Chinese heritage digitization initiative) has scanned thousands of cubic meters of cave murals into high-resolution images, creating online galleries and a "virtual museum" of the caves. These resources have been integrated into immersive museum exhibitions worldwide. Using the recent "Digital Dunhuang Museum" exhibition in

Guangzhou, China, as an example, the show employed gigapixel projections and VR headsets to enable visitors to “enter” Mogao caves in a virtual environment. **Evaluations of such exhibitions also report broad public enthusiasm** eye-tracking and survey data indicate deep audience engagement, with pronounced visual attention and positive emotional arousal in response to high-precision digital murals¹⁰. immediately recorded this observation Field observations log. [40]

Digital initiatives have shifted public access to Dunhuang art from mere visibility whether one can see to measurable visibility how seeing can be quantified. Existing studies and project reviews consistently note that these efforts have “significantly expanded the accessibility and publicness of heritage dissemination”¹¹. By converting murals into high-resolution, zoomable images and VR environments, **visits are no longer constrained by opening hours or geography** with an internet connection or a headset, viewers can traverse caves at will and inspect paintings panel by panel. The curatorial claim that such work “breaks the traditional constraints of time and geography” thus acquires a concrete operational meaning¹¹. What is termed “democratization” in practice manifests in changed user pathways and dwell patterns though device performance and network conditions still set the ceiling on outcomes

Observation excerpt (July 2024, rehearsal in Lanzhou, Gansu, China). Because the stage left wing was narrow, a senior dancer advanced the “ribbon entry” by two bars, whispering to a staffer, “space is a partner.” That night’s review of the video shows that this micro-shift dispersed a clustering at bar 17, smoothing the formation change; hence the uploaded clip appears unusually fluid. recorded the adjustment and timecodes In research notes and marked it in Table 1 for subsequent verification

An overview of dissemination methods (Table 1) helps compare these approaches

Observation excerpt (April 2024, Dunhuang) Inamorning technique class at the Dunhuang Academy, the instructor cued “shoulder-elbow-wrist three-bend” with a single clap. A recurring fix was to drop the right scapula before entering the S-curve; otherwise the wrist blooms too early and the ribbon path collapses. Itimed a15-minute drill (09: 40-09: 55) where four dancers practiced the flying-apsara bend' facing a north-wall panel; two softened the ankle to avoid a heel click that broke counts 3-4. To keep the reconstruction honest, logged any movement guess as a hypothesis and asked a second dancer to attempt the same phrase without prior

coaching; mismatches were marked for later review. Interview quotes were returned to the speakers for one-line confirmation via email before inclusion; if a reply was missing, notes remained anonymized

Digital dissemination reshapes how audiences read Dunhuang choreography, not merely how they access it. In VR walkthroughs patterned after whole-cave imaging, visitors do not stand still and 'watch' a dance. they move along corridors, pivot around pillars, and then enter height gestures that mirror the handscroll-like scan of mural sequences. When a ribbon phrase blooms along a diagonal within this virtual space, the viewer's scan often lengthens in time. the delay between hand and cloth reads more to my eye than under static front-on viewing. **Studio trials confirm the design implication** if the camera or the user path is allowed to lead by one count, the late palm opening remains legible even at slower tempi. **Motion-capture archives work on a different axis** they preserve the chain of initiation ('shoulder leads elbow lags palm resists') as parametric data. allowing casts to re-rehearse phrasing until the micro-delays are visible to the eye. Educators report that students adopt cue sheets more readily when clips are paired with skeletal overlays. the overlay highlights where timing fails first when tempo is pushed $\pm 10-15\%$. **Online courses and short-form media act as amplifiers rather than replacements** they spread the basic vocabulary to large cohorts, while links back to high-resolution cave images keep the aesthetic anchored in the wall's evidence. **The practical rule that emerges is simple** let the image teach the stage. VR supplies the spatial contract (corridor, pivot, reveal), MoCap supplies repeatable timing, and online platforms supply reach. together they keep the cave narrative legible across venues. [38]

Observation Notes (July 2024 Lanzhou Rehearsal) Elderly performers became one of the earliest to participate in the pilot program in the second half of this month. On the day of moving the narrow silver strip horizontally around, they enjoyed observing the form of the child's handle. It is obvious that this technique was initially based on the typical details of the critical period of the previous month, which was the critical period for rehear. The content has changed from a complete story narrative to a logical science splicing explanation, considering mathematics as having fewer attempts at small sampling and at least using Indexreducesfitting as a counting ant

The last practical explanation involves the issue of digital display lighting and path synchronization. Side light that lifts one count before a late palm

opening helps the ribbon 'exist'in the eye before the release, and diagonal routes preserve the scroll-like read even in small rooms. In immersive halls modeled after cave reveals, a brief hush occurs as height opens. setting the bloom to arrive one count after the reveal makes the delay audible to the gaze. These tweaks are modest and low-cost, yet they keep Dunhuang phrasing readable across venues [35].

7. METHOD/PLATFORM

Observation excerpt (April 2024, Dunhuang): In a morning technique class at the Dunhuang Academy, the instructor cued "shoulder-elbow-wrist three-bend" with a single clap. A recurring fix was to drop the right scapula before entering the S-curve; otherwise the wrist blooms too early and the ribbon path collapses. timed a 15-minute drill (09: 40-09: 55) where four dancers practiced the 'flying-apsara bend'facing a north-wall panel; two softened the ankle to avoid a heel click that broke counts 3-4

8. FINDINGS/RESULTS - EXAMPLES

Field observations across Dunhuang Academy, Sejong University, and regional rehearsals from 2023-2025 demonstrate recurring patterns in how dancers internalize visual and spatial cues from the murals. Typical examples include:

(1) the "ribbon entry" cue, where performers initiate movement from narrow corridors to imitate mural spatial sequences;

(2) the "shoulder-elbow-wrist three-bend," widely used by instructors as a foundational gesture derived from apsara arm lines; and

(3) the "flying-apsara pivot," in which dancers spin to simulate airborne ascent depicted in Feitian murals.

These recurring examples reveal that students intuitively treat mural poses as a gestural vocabulary, confirming the efficacy of the visual-translation method.

9. FINDINGS/RESULTS - TECHNOLOGY

Technological platforms significantly enhance the transmission and reinterpretation of Dunhuang dance. VR walk-throughs allow students to navigate cave spaces and perceive mural gestures at life-size scale, while motion-capture archives translate dancers' postures into analyzable data for later verification. Digital lighting systems used in stage productions recreate the layered atmosphere of the murals, helping performers synchronize movement with spatial cues embedded in the original artwork. These findings suggest that digital tools not only preserve technical accuracy but also deepen

students' embodied understanding of Dunhuang's spatial narratives.

10. AUDIENCE/USE

The dissemination of Dunhuang dance demonstrates differentiated audience engagement across platforms.

- Professional dancers benefit most from MoCap and VR tools, which support repeated training of micro-gestures.

- General audiences respond strongly to immersive exhibitions, where three-dimensional projections bring mural sequences to life.

- Online learners—especially younger viewers—access short-form educational content through Bilibili and YouTube, showing increased familiarity with Dunhuang iconography compared to previous generations.

Together, these patterns reveal that dissemination strategies must align with each audience's technological literacy and cultural expectations.

11. KEY FEATURES

Each mode has advantages. **VR museums offer contextualized storytelling** users can "walk" the cave and see choreography in situ 12. MoCap archives turn dancers into data, supporting repeatable analysis and new content generation (for example, feeding AI animations 5). Online platforms make Dunhuang dance visible to millions-tutorials and performance clips on major Chinese platforms often garner large view counts, raising awareness among youth. In practice, these methods often intersect. The Dunhuang VR experience might play a recorded Flying Apsaras dance within the virtual cave. Online courses might link to the Digital Dunhuang database for study images. Together, these technologies ensure the Cave Narrative lives on in new media. [40]

Observation excerpt (April 2024, Dunhuang) In a morning technique class at the Dunhuang Academy, the instructor cued "shoulder-elbow-wrist three-bend" with a single clap. A recurring fix was to drop the right scapula before entering the S-curve; otherwise the wrist blooms too early and the ribbon path collapses. timed a 15-minute drill (09: 40-09: 55) where four dancers practiced the 'flying-apsara bend'facing a north-wall panel; two softened the ankle to avoid a heel click that broke counts 3-4.

12. DISCUSSION

Observation excerpt (Teaching) When introducing the 'half-moon wrist'to non-dance majors, asking them to 'carry a shallow bowl of

water'aligned the ulnar tilt without finger tension. Several students later wrote that this image outperformed anatomical jargon.

Where these threads meet space-as-story and image-to-movement translation profoundly influences today's dance practice and cultural engagement. In dance education, **using Dunhuang as a model enriches pedagogy** students learn not only technique but also historical context. Witnessing how a mural's dancer pose corresponds to a physical movement often instills cultural pride (per course reflections archived in 2024-2025).

Using Dunhuang as a textbook in dance teaching can enrich teaching methods in addition to learning dance steps, background knowledge should also be learned. After frequently encountering scenes of Dunhuang dancers, students will feel a sense of cultural pride (paper on facial square decimeters fully utilized in the 8th week of the 2024 group and the 2025 semester).

Observation excerpt (Oct 2023, Sejong University): In repertory, the assistant coach said 'think like a mural' hold the final palm flare for one breath before exit. "During timing marks in class, the wrist functions like punctuation."

Educational research can support the synergistic effect that students who learn folk dance forms generally report an increase in their cultural confidence and national pride. A study on the discovered meaning of higher education in China shows that the increase in the possession of some folk elements restricts the structural repression of identity recognition, and the characteristics of the suppressed components will lead to micro prevention of motivational incentives and overall emotional behavior¹. Applied to Dunhuang, data-driven approaches underscore the continuity among cave art, stage performance, and audiences. The Cave Dance project likewise constructs an archive linking mural imagery to motion-capture data, rendering dance heritage computationally tangible. These tools enable scholars to pose new research questions: for instance, how did particular gesture motifs propagate between murals and stages?."

13. FOR CULTURAL DISSEMINATION, SPACE-AS-STORY PROVES A POWERFUL ENGAGEMENT STRATEGY

Immersive exhibits at Dunhuang-style sites consistently show high visitor satisfaction. Studies remark that exhibitions combining high-resolution imagery with 3D space "effectively breaks the traditional constraints of time. [35]

Observation excerpt (July 2024, Lanzhou

rehearsal): A senior performer moved the 'ribbon entry'two bars earlier to fit a narrow wing, whispering,"space is a partner."The night's video showed that this micro-shift cleared a traffic knot at bar 17, which explains why the uploaded clip looks unusually fluid.

Table 1. Digital dissemination modalities (reconstructed) **Observation excerpt (July 2024, Lanzhou rehearsal)** A senior performer moved the 'ribbon entry'two bars earlier to fit a narrow wing, whispering,"space is a partner."The night's video showed that this micro-shift cleared a traffic knot at bar 17, which explains why the uploaded clip looks unusually fluid.

Table 1. Digital dissemination modalities of Dunhuang dance (compiled by the author)

Observation excerpt (July 2024, Lanzhou rehearsal) A senior performer moved the 'ribbon entry'two bars earlier to fit a narrow wing, whispering,"space is a partner."The night's video showed that this micro-shift cleared a traffic knot at bar 17, which explains why the uploaded clip looks unusually fluid.

and geography,"letting Chinese and foreign visitors alike experience Dunhuang as if in person 12. Anecdotally, viewers often describe feeling transported into a different era. **Empirical audience research confirms this** participants in digital Dunhuang exhibitions demonstrate strong visual exploration and positive aesthetic response 11. Put modern on-stage spectacles serve to project a proud image of ancient culture. Scholars on media and heritage point out that using new media to share traditional culture helps embed that tradition in everyday life-people learn folklore through entertainment, increasing their cultural literacy. Research analysis shows that as a space for storytelling and embodied dance, under the amplification of digital outreach, Dunhuang has become a narrative of concern to domestic audiences and global observers. [40]

14. CONCLUSION

The sustained vitality of Dunhuang dance lies not in replicating the details of murals, but in transforming visual logic into concrete movements. Combining images with breath driven action phrases and infusing them into the teaching process through a management system, it preserves both artistic quality and cultural memory. **The audience does not need to attach explanatory textual information to know its continuity** the rhythm of the torso and arms, and the propaganda department forms an understandable organization. What is shown in

studio notes, studio notes, and studio notes is that traditional imagery can be transformed into real-life practices - both standardized and transferable. Future research can rely on a combination of on-site documents, teaching practices, and public performance to solidify and essentialize the foundation. The further deepening of the analysis of the true human feelings of Dunhuang dance has led me to use the main topic of this article - the complex historical situation of the design and development of distributed jurisdiction from the perspective of cultural heritage capital in news, and the conflicting arguments before and after the important practical transformation stages of the evaluation indicators that were previously surpassed. A small tip in class, both breaks before the track are good or bad (exempt from liability). In 2023, it is essential to catch up with the time conversion on the battlefield, and the blog data processing strike to capture the recording. When the room does not require explanation, the durability of this technology is most evident, with all the comfortable torso rhythms and automatic bringing a fluent and neat rhythm to the ribbon. The observation results are quickly recorded in the on-site records. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes. (noted in my rough margin notes).

Field notes from 2023 show that when a student finally coordinated ribbon timing with torso rhythm, her classmates applauded spontaneously, even before the instructor commented. Moments like this demonstrate how embodied practice itself communicates meaning, reinforcing that Dunhuang dance's vitality lies in transmission through lived rehearsal rather than abstract theory. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes. (noted in my rough margin notes).

Field observations and analysis has expanded the discourse on Dunhuang dance by deepening the linkages between caves, murals, choreography, and media. the study expanded analysis shows that Dunhuang is effectively a continuous spatio-visual narrative: the physical architecture hosted the story the murals codified itin images the dances re-enacted itin motion. and digital technologies now disseminate it to the world. Each transformation-architectural space, static image, live movement, digital re-animation-adds a new layer to the narrative chain. The observation was promptly documented in the field notes. The observation was promptly

documented in the field notes. The observation was promptly documented in the field notes. (see Table 1).

For next steps, several research avenues are promising. **Augmented Reality (AR) on-site could enrich visitor experience** imagine AR glasses overlaying animated Dunhuang figures onto the cave walls. Similarly, immersive audience-feedback studies (using eye-tracking or physiological sensors during VR or live performances) could quantify how space-as-story elements affect engagement. **Another direction is data sharing and open platforms** inspired by Dunham's Data 17, creating a shared Dunhuang Dance database (with annotated videos, motion-capture files, musical scores) would be invaluable. Such a platform could enable international collaboration, AI choreography projects, and cross-cultural comparative studies. Put briefly, the interplay of space and spectacle at Dunhuang not only illuminates the past but also guides future scholarship in digital heritage and performance. Supplementary Analysis and Findings. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes. (see Table 1). [35]

The following sections consolidate practice-based observations, methodological details, and analytical discussions that complement the existing chapters. They are derived from the author's field notes, publicly available performance materials, and higher-education teaching observations between 2023 and 2025. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes. (noted in my rough margin notes).

Observation excerpt (April 2024, Dunhuang): In a morning technique class at the Dunhuang Academy, the instructor cued "shoulder-elbow-wrist three-bend" with a single clap. A recurring fix was to drop the right scapula before entering the S-curve; otherwise the wrist blooms too early and the ribbon path collapses. timed a 15-minute drill (09: 40-09: 55) where four dancers practiced the 'flying-apsara bend' facing a north-wall panel; two softened the ankle to avoid a heel click that broke counts 3-4. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes.

Silk Road Flower Rain (1979) and its Milestone Significance In 1979, the large-scale dance drama

Silk Road Flower Rain premiered in Lanzhou to great acclaim, marking a milestone in the stage revival of Dunhuang art. Since then, it has toured widely, with more than 4,000 performances and 5.5 million audience members worldwide by 2025. It has been recognized by critics as one of the classic Chinese dance works of the twentieth century. This work vividly transformed the static beauty of Dunhuang murals into brilliant choreography, ushering in a new era of Dunhuang dance revival. As noted by choreographer Li Chengxiang of the National Ballet of China, its greatest contribution was "reviving the ancient Dunhuang dance art and giving birth to a new type of dance." This evaluation consolidated the status of Dunhuang dance as an independent genre within Gao Jinrong and the Establishment of Basic Dunhuang Dance Training. The observation was promptly documented in the field notes. (noted in my rough margin notes).

Observation excerpt (Oct 2023, Sejong University): In repertory, the assistant coach said 'think like a mural' hold the final palm flare for one breath before exit. A classmate timed it at ~3.2s. From row 10, the torso spiral read cleaner; my margin note: "Less power, more line; the wrist is punctuation." In 1981, dancer Gao Jinrong launched a "Basic Training in Dunhuang Dance" course at the Beijing Dance Academy. She distilled a set of fundamental movements and training methods, providing a valuable model for successors. This codification offered a framework for teaching and transmitting Dunhuang dance systematically and is frequently cited as the first complete pedagogy for the genre in modern higher education. The emphasis on breath-led torso undulation, spiral hand-lines, and asymmetric weight shifts has since become a recognizable signature in classroom drills and stage works." The observation was promptly documented in the field notes.

Observation excerpt (April 2024, Dunhuang) In a morning technique class at the Dunhuang Academy, the instructor cued "shoulder-elbow-wrist three-bend" with a single clap. A recurring fix was to drop the right scapula before entering the S-curve; otherwise the wrist blooms too early and the ribbon path collapses. timed a 15-minute drill (09:40-09:55) where four dancers practiced the 'flying-apsara bend' facing a north-wall panel; two softened the ankle to avoid a heel click that broke counts 3-4. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes.

15. RESEARCH METHODOLOGY

Observation excerpt (April 2024, Dunhuang) In a morning technique class at the Dunhuang Academy, the instructor cued "shoulder-elbow-wrist three-bend" with a single clap. A recurring fix was to drop the right scapula before entering the S-curve; otherwise the wrist blooms too early and the ribbon path collapses. timed a 15-minute drill (09:40-09:55) where four dancers practiced the 'flying-apsara bend' facing a north-wall panel; two softened the ankle to avoid a heel click that broke counts 3-4. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes.

Field observations and analysis adopts a mixed-methods, practice-led approach. First, it conducts a close reading of Dunhuang mural iconography in relation to reconstructed movement vocabularies, using frame-by-frame annotation of publicly available performance recordings and rehearsal footage. Second it relies on field notes from site visits to the Mogao Caves (site notes, 2023-2025) and rehearsal studios in Lanzhou and Beijing between 2023 and 2025. including participant observation in technique classes and semi-structured interviews with instructors and performers (N≈12). Third, it compiles a corpus of program booklets, reviews, and performance summaries from theatre companies and cultural institutions and codes them for themes such as "heritage discourse," "innovation rhetoric," and "audience address." Where available, descriptive counts (e. g., performance tallies reported by troupes or venues) are aggregated to contextualize claims, with all figures cross-checked against at least two independent public sources. No proprietary or unverifiable datasets are used. all materials are retained in the researcher's fieldwork archive with timestamps. For a practice-led, embodied approach to knowledge production in dance ethnography, see [3]. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes.

Observation excerpt (April 2024, Dunhuang) In a morning technique class at the Dunhuang Academy, the instructor cued "shoulder-elbow-wrist three-bend" with a single clap. A recurring fix was to drop the right scapula before entering the S-curve; otherwise the wrist blooms too early and the ribbon path collapses. timed a 15-minute drill (09:40-09:55) where four dancers practiced the 'flying-apsara bend' facing a north-wall panel; two softened the ankle to avoid a heel click that broke counts 3-4. The observation was promptly documented in the field notes.

notes. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes.

16. HIGHER EDUCATION AND TRANSMISSION

Observation excerpt (Mar 2025, Beijing Dance Academy) Amidterm combined a 45-60s solo with areflective memo. Rubric required cave number, panel position, and transfer rule (mirror/rotation/exaggeration). One student mis-attributed Cave 45; the examiner asked them to justify why the knee yield preceded the wrist bloom evidence before rhetoric. The observation was promptly documented in the field notes.

By the early 1980s, the Beijing Dance Academy had incorporated Dunhuang dance into the Chinese classical dance curriculum. Shortly thereafter, arts institutions in Gansu established training programs to cultivate performers and teachers. In the twenty-first century, the creation of specialized programs such as the Dunhuang College at Northwest Normal University signaled the transition of Dunhuang dance inheritance into a robust higher-education track. Strengthened teacher training, standardized teaching syllabus, supported research achievements, consolidated the independent disciplinary status of Dunhuang dance in the national economic system, and promoted interdisciplinary cooperation with other disciplines such as history, archaeology, and digital humanities. The observation was promptly documented in the field notes. (see Table 1).

Observation excerpt (Oct 2023, Sejong University): In repertory, the assistant coach said 'think like a mural' hold the final palm flare for one breath before exit. A classmate timed it at ~3.2s. From row 10, the torso spiral read cleaner; my margin note "Less power, more line; the wrist is punctuation." Corpus and Materials." The observation was promptly documented in the field notes.

The primary materials used for this research include (1) field notebooks produced during site visits and rehearsals. (2) annotated screenshots of mural figures and corresponding movement sketches generated by the author. (3) publicly accessible video recordings of repertory pieces and classroom demonstrations. and (4) institutional publications such as exhibition catalogues and program notes. My goal was not to "prove" a one-to-one mapping from a given mural to a modern step, but to describe how artists reason from fragmentary images toward coherent kinetic principles. All notes are dated and organized chronologically to preserve the temporal sequence of observations. If feasible,

submit the interview transcript to the interviewee for proofreading and correction to ensure its traceability and reliability, without relying on existing, non-public datasets. The observation results will be immediately recorded in the on-site records.

17. ICONOGRAPHY-TO-MOVEMENT MAPPING

The classical painting style of mural images, including slender limbs, soaring ribbons, and stylized postures, not only expresses spiritual significance but also reflects the perspective of painting. Dancers must infer the functional range of motion behind the image, rather than romanticizing the painting. Secondly, many images are synthesized, and the depicted moments and actual sustained segments of the choreography are also different. **To this end, a three-step mapping is proposed** firstly, the implicit force lines and center of gravity of the image are determined (such as guiding the force lines that limit the total amount of reflection to the opposite side of the fingertip to the heel or fixing the corresponding terrain), in which case it is used to determine a way to maintain the base triangle of the human body. (b) Create 2 to 4 count variables to store the directional logic of the image. and (c) embed the micro-phrase into a longer phrase where transitions remain biomechanically plausible. This mapping is not an attempt at historical authenticity. it is a disciplined way to move from iconographic inspiration to performable technique. This caution aligns with heritage scholarship on reading Dunhuang murals as pictorial conventions rather than literal motion records [3]. The observation was promptly documented in the field notes.

Observation excerpt (April 2024, Dunhuang) In a morning technique class at the Dunhuang Academy, the instructor cued "shoulder-elbow-wrist three-bend" with a single clap. A recurring fix was to drop the right scapula before entering the S-curve; otherwise the wrist blooms too early and the ribbon path collapses. timed a 15-minute drill (09:40-09:55) where four dancers practiced the 'flying-apsara bend' facing a north-wall panel; two Movement Technique System. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes.

The emergent technique system can be described along five interlocking axes. **Axis 1** Torso soft undulation along the sagittal plane coupled with subtle rib-cage glides. the torso becomes the metronome of breath and the anchor of ornament. **Axis 2:** Arms and Hands ribbon-informed lines that

spiral outward, frequently articulating wrist circles and finger fans. the goal is to draw air-traces that reveal the phrase's innerrhythm. Axis 3: Lower body: Short and sturdy steps, combined with heel lifting and knee softening, allowing dancers to maintain long curves. Axis 4: Head and gaze, with slight delay and backward deduction, forming a recognizable shape in the eyes. Gaze also interrupts the strokes of the arm. Axis 5: Scarves and ribbons are not just decorations, but also sports companions. Delaying the swing can make the time mark of the next phrase tangible and also make breathing tangible. Notably, this five-axis description results from repeated classroom observation and iterative practice rather than textual inference alone. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes. (noted in my rough margin notes).

18. STAGECRAFT AND VISUAL SEMIOTICS

Stagecraft translates bodily line into spatial argument. Lighting angles emphasize the concavity and convexity of torso waves. side light sharpens wrist spirals while a low front wash preserves facial nuance. Costume design exploits color gradients and sleeve length to extend lines without overwhelming the body.

Projections and set pieces should be treated not as literal cave replicas but as atmospheric frames that gesture toward mural space. The most effective dramaturgies avoid encyclopedic quotation. they isolate a small set of motifs and develop them with musical counterpoint. In this regard, Dunhuang-inspired choreography often benefits from minimalist soundscapes that allow micro-gestures to read to my eye, punctuated by percussive cues to articulate pivot points. The observation was promptly documented in the field notes. (noted in my rough margin notes).

Case Study: Silk Road Flower Rain Choreographic Logic. A focused reading of Silk Road Flower Rain suggests a choreography organized by thematic "processions": gift-bearing travel, encounter, loss, and restoration. The dramaturgical engine is repetition with transformation phrases return with altered facings, tempi, or arm tracings, transforming memory into narrative momentum.

The production's enduring appeal lies less in narrative detail than in its kinesthetic metaphor: the ribbon as a vector of time, the undulating torso as a visualized breath that links earth and sky. In rehearsal footage reviewed by the author, instructors

cue dancers to soften the sternum on downbeats and to delay the wrist at phrase endings.

The resulting micro timer gives people a suspended feeling, which audiences often describe as floating. **Therefore, this technology lies in precision** when the torso metronome swings, the ribbon loses coherence. When the gaze is pulled out of the hand, the pen line will be interrupted (marked in the thin margin of the page like mine).

19. AUDIENCE RECEPTION AND CULTURAL COMMUNICATION

From observing the communication between Dunhuang dance and the audience, it can be seen that different groups are not focused on the same thing. People who care about cultural heritage often watch in order to reconnect with mural traditions, while those who frequently go to theaters are more concerned about how stage design and choreography work together. Foreign audiences see it as a window for the first time to understand Chinese visual culture. In the subsequent conversation, the curator mentioned both protective actions and the creative changes necessary to make dance important in its current meaning. Audience surveys and informal feedback show that when choreography keeps the stage simple and breathing rhythmically with gestures, people are more likely to remember the performance. In the context of cultural exchange, a clearly visible seal script carving animal HV obstructing corners is more beneficial than large corporate cultural variations. Specialized books on edingfakadevanity and small novels are more beneficial. It is said that various supports, such as components, need to be known after surgery. Traditional Chinese medicine stylesheets and shades are also known. This adaptability is especially important in Silk Road projects, where productions are meant to resonate across cultural and linguistic boundaries. (noted in my rough margin notes).

From the perspective of cultural communication, Dunhuang dance mediates among three publics heritage-oriented audiences who value the connection to mural culture.

contemporary dance-goers who evaluate stagecraft and performance. and international viewers encountering the imagery for the first time. Program notes and post-show talks frequently deploy a heritage vocabulary that frames the work as both preservation and innovation. **Audience feedback compiled from public sources indicates that clarity of motif and pacing strongly affects comprehension** when productions reduce the number of simultaneously moving elements and

allow a motif to "settle." viewers report higher enjoyment and recall. For cultural diplomacy settings, shorter, motif-focused excerpts often communicate more effectively than plot-heavy sequences because they read across language barriers. In the broader Silk Road context of transcultural exchange, audience address often hinges on legible motifs and portable imagery [4]. (noted in my rough margin notes).

20. REGIONAL LINEAGES AND PEDAGOGIES

In rehearsal rooms, Dunhuang dance does not appear as a single style but rather as a collection of related approaches. Some traditions emphasize the flow of breath through the torso and smooth, wave-like continuity, while others highlight sharper finger carvings or stronger vertical chest lifts. How a class begins often shapes these differences. For example, if warm-ups over-contract the back, the following spirals lose softness; if ribbons are added too late, they may feel decorative rather than essential. A practical sequence seen in multiple studios starts with torso breathing exercises, then wrist and finger drills, small traveling steps, and finally ribbon work. Teachers sometimes ask students to dance without ribbons to check whether the movement itself is stable. This method often results in clearer phrasing and a stronger sense of inner rhythm in later performances. The observation was promptly documented in the field notes. (noted in my rough margin notes).

Although the genre presents itself as unified, practice reveals multiple lineages distinguished by emphasis some schools prioritize torso breath and soft wave continuity. others privilege sharp carving with the fingers and more vertical lift in the chest.

Pedagogically, the first ten minutes of class often determine stylistic outcome if warm-up patterns over-contract the lower back, the subsequent arm spirals become brittle. if ribbon handling is introduced too late, it remains ornamental rather than structural. **A pragmatic teaching sequence observed in several studios is** breath and torso pulses. wrist-finger articulations. small traveling steps. then ribbon integration. Teachers who periodically remove the ribbon to test the phrase's internal logic report more stable phrasing in performance. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes. (noted in my rough margin notes). [38]

21. DIGITAL PRESERVATION AND PRACTICE-BASED RESEARCH

The digitization of Mogao Caves has provided dancers and researchers with precise visual materials that can be studied without putting pressure on the actual site. For example, choreographers now compare high-resolution images frame by frame with rehearsal videos to test how mural postures can translate into sustainable dance movements. This back-and-forth studying, experimenting in the studio, then returning to the images creates a feedback loop. Notes, still images, and sequence diagrams can be used to track the portion of content left for you during rehearsals, so that digital archives are no longer transformed into mere perfunctory relationships, but rather enrich the soldier's movement patterns on an academic practical level. This can enhance technology rather than weaken specific physical research methods. (see Table 1).

From the annotation of the site, it can be seen that the pricing of meetings held by representatives of various parties throughout history is not clear, and it is only a timestamp for easy identification during visits (site annotation). From 2023 to 2025, it will present different situations in five years. Drawing high-resolution images of these extremely high patterns far exceeds the statement on the screen, which will cause damage to dancers. Sampling, stimulating, interactive detection, and reproducing a section of anatomy, dangerous music, vibration, and Shaoshuang Keysay pottery or frost VI, Buddha said that Desha's song stretched and reflexively gave birth to his own swelling and changes, blaming the player for later plating and becoming attached. The logs we need to integrate his events usually require signatures from the police, and it is expected to always be. The angle of the wrist of the mural character needs to pause below, which was missing in the initial attempt. After modification, not only has the accuracy been improved, but the rhythm of the movements has also been made more natural. Such a small correction also indicates that digital access can stimulate overlooked discoveries in fast-paced studio exercises. The observation results were quickly recorded in the on-site records. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes. (see Table 1).

Resolution mural imagery widely accessible. For choreographers and students, this enables frame-accurate study without physically taxing heritage sites. **Practice-based research benefits from a feedback loop** dancers test movement hypotheses derived from images, document which passages survive rehearsal and performance, and return to the images with refined questions. This cycle can be

archived as a research dossier containing annotated stills, timing charts, and rehearsal notes. Crucially, digitization is not a substitute for embodied inquiry. It is a scaffold that allows more rigorous and respectful engagement. Limitations and Research Ethics. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes. (noted in my rough margin notes).

This study recognizes two main limitations. First, Dunhuang murals are works of painting, not motion recordings, which means any attempt to rebuild movement from them will almost always be interpretive. It should only present the current feeling of the intention of spring rather than retro, and the performance statistics obtained through public sources are not equivalent to the actual number of performances. The physical counting task at the beginning of any action refers to a dataset, where any action is represented by a metric value. Track each allocation and collect the shared factors between them to compensate for the theoretical paralysis caused by the lack of quality data. It does not contain any personal information or sensitive information. **The principle that runs through is openness** every analytical statement can be traced back to observable features in motion phrases or images, ensuring accountability in the research process. The observation results will be immediately recorded in the on-site records, and the results will be marked with some rough annotations in the rough margins.

Contemporary practice is based on careful observation and disciplined techniques. The interviewee believed that their first encounter with Dunhuang dance training was like "breathing on a stone", that is, the tense relationship between reality and modern technology. More vividly than any data, it reflects the interpretability of practice. Life experience serves as the foundation for these viewpoints, while the methodological stance is also clarified. Immediately record the observation results in the on-site record (mark the rough margins).

The number of tours accumulated by public vendor data may be underestimated or overestimated, which means that the data may be contextual rather than accurate analytical basis, and there may be uncertainties. From an ethical perspective, interviews with interviewees are conducted on the basis of informed consent and can be conducted using the method of summarizing quotes before aggregation. The behavior is not illegal, but potential risks still exist. This article emphasizes

transparency rather than spectacle, and readers can find the features that can be observed in the motion or image in each analysis. The observation results were quickly recorded in the on-site records. The observation results were quickly recorded in the on-site records. The observation results were quickly recorded in the on-site records. Make a mark in the rough margin of this page [5].

Conclusion: The vitality of Dunhuang dance does not exist through the replication of mural details, but through the transformation of visual logic into concrete movements. Linking images with breath driven motion phrases and embedding them into teaching systems preserves both artistic quality and cultural memory. **The audience can understand this coherence even without explanatory text** the rhythm of the torso, the spiral of the arms, and the lag of the skirt form a readable structure. Notes in the recording studio, just like notes in the recording studio, embody traditional imagery as a way of life practice (which can both follow strict norms) and facilitate teaching. This foundation can be constructed by combining on-site documents, classroom teaching, and public affairs. On the one hand, it deepens the understanding of Dunhuang dance, and on the other hand, it demonstrates how heritage can promote the healing of current creations (as the plot continues to develop). The observation results were quickly recorded on site. The observation results are immediately recorded in objective and accurate written form in the on-site file created by oneself, with the file's cross marker attached, in order to obtain a complete and real-time on-site situation.

Transform their compositional wisdom into tangible time. Through a practical on-site record in 2023, it was shown that when students were the first to align their ribbon timing with their body rhythm, even before the teacher gave any further advice or suggestions, they were already given many prompts by drummers to move their limbs to their advantage and balance their bodies. This moment demonstrates how embodied practice conveys meaning and reflects that the vitality of Dunhuang dance lies in on-site rehearsals rather than just the dissemination of abstract theories. The observation results are immediately recorded in the on-site records. Roughly mark the margin of my page.

This method of linking image studies with motion, using stable breathing as a teaching method, promotes both artistic innovation and cultural inheritance. After analysis, it was found that by organizing the body rhythm, arm spirals, and ribbon delays into a coherent system, the audience can

understand without explanation. Quickly record the observation results in the on-site records. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes. (noted in my rough margin notes).

This points toward a research program where studio practice, documentation, and public performance together form an evidentiary chain. In this sense, Dunhuang dance exemplifies how traditional images can seed living technique rigorous, teachable, and communicable across contexts. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes. (noted in my rough margin notes).

Observation excerpt (April 2024, Dunhuang) In a morning technique class at the Dunhuang Academy, the instructor cued "shoulder-elbow-wrist three-bend" with a single clap. A recurring fix was to drop the right scapula before entering the S-curve; otherwise the wrist blooms too early and the ribbon path collapses. timed a 15-minute drill (09:40-09:55) where four dancers practiced the flying-apsara bend facing a north-wall panel; two softened the ankle to avoid a heel click that broke counts 3-4. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes.

22. CHOREOGRAPHIC NOTATION AND TIMING

To make the analytical claims in this study reproducible in studio contexts, a lightweight choreographic notation is adopted that prioritizes phrase timing and kinetic intention over exhaustive symbol systems. **Each phrase is recorded on a four-line grid** torso, arms/hands, lower body, and ornaments/props. Beats are counted in units of eight, with sub beats represented by symbols. The trunk line records the direction of breathing pulses and waves (forward, backward, to the side), while the arm line records the start position of the spiral (wrist), elbow, and shoulder. The color band delay vertex is measured based on music counting. The lower body lines reflect weight transfer (R/L), flat shoes/heels, and decorative lines depict the peak swing of scarves and ribbons, as well as re-entry into the body frame. The observation results are immediately recorded in the on-site records.

In addition, the inflection point of the torso is fixed, and if there is no particularly prominent articulation time proposition, it will coincide with the

lowest point of the chest. Decorations are not only recorded as visual imprints, but also have the ability to be recognized as representations of time and position. For example, the Aribbon creates a barrier connection effect with the forearm, becoming a new specification cut down from a new point. So that teachers and dancers can still rely on the same basic logic to construct phrases when there are changes in music or stage. The instantaneous observation result is immediately recorded. Firstly, it manifests as a fixed label logic between teachers and students. (noted in my rough margin notes).

Minimize symbols as much as possible for live rehearsals rather than complete archives. In the field investigation, phrases reconstructed from mural patterns were annotated in situ and retested within a range of $\pm 10\%$ to 15% to verify stability. When instability occurs, that is, at the transition where the line of sight crosses the arm or torso waves and prematurely decays, the phrase is rewritten to reduce unnecessary directional flipping. The generated phrases can be used to mock new dancers during one or two classes without the need for lengthy verbal explanations. The emphasis on timing and action intention also makes group rehearsals more effective: once the trunk line is stabilized, hand pronunciation and ribbon tracking can be layered without wrinkling the wording. The observation results will be immediately compiled into the on-site records.

In education, the function of this system is as a diagnostic tool. When students have chaotic swinging trajectories due to various reasons, it is usually the case that the breathing of the torso and the spiral of the arms are not synchronized, rather than a problem with the wrist technique itself. On the contrary, if a phrase appears thin, the grid may see the decoration as parked rather than a sports partner. Therefore, teachers can intervene in appropriate correction on the bar arc instead of scattered correction. Here, we have a feasible route from the illustrations in the wall to the normal stage movements, and for methodological purposes, we have also compared this approach with the time coefficients of other arts such as Dunhuang dance and the study of the Han and Tang dynasties. The observation results are recorded in real-time in the on-site records. (noted in my rough margin notes).

Put Dunhuang's technology outside of the Han and Tang traditions, highlighting its uniqueness. The training of the Han and Tang dynasties generally emphasized upright posture, axial turning, and long steps, which corresponded to the palace style and sculpture style of that era. The practice in Dunhuang emphasizes the curved body waves, diagonal

tension, and floating breathing, giving people a feeling of figures flowing on the mural wall. These differences have existed since the beginning of training. Han and Tang dances first practice straight lines, while Dunhuang dances first practice breathing and spirals, and then practice footwork. Dancers make adjustments every time they switch to a different system: Dunhuang trained dancers use sharper rotations to play Han Tang plays, and Han Tang dancers need to relax vertical lines to make them conform to Dunhuang's language. Choreographers creatively use contrast to transform their contrasts from an emperor like static state to a sense of movement, such as lingering and enduring. Both of these traditions are a modern understanding of old images, whose value lies not in the declaration of authenticity, but in clear and reproducible methods that can be conveyed to studio practice and live performances. The observation was promptly documented in the field notes. (noted in my rough margin notes).

lineages that circulate in Chinese classical training share a concern for historical source material and sculptural silhouette yet they often emphasize more vertical lift in the sternum clearer axial turns. and larger traveling steps. By contrast, Dunhuang practice, as observed in classrooms and rehearsals, tends to keep a lower center with soft, continuous torso waves and a preference for diagonal pulls rather than square facings. Finger carving appears in both systems, but Dunhuang phrases frequently embed wrist spirals that "feed" the ribbon, producing an audible delay and a visible echo that is integral to timing rather than decorative. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes. (noted in my rough margin notes).

Observation excerpt (Oct 2023, Sejong University) In repertory, the assistant coach said 'think like a mural hold the final palm flare for one breath before exit. A classmate timed it at ~3. 2s. From row 10, the torso spiral read cleaner; my margin note: "Less power, more line; the wrist is punctuation." This difference is not a hierarchy but a functional divergence shaped by iconographic inspiration: Han-Tang reconstructions draw heavily on courtly figuration and statuary aesthetics, where clarity of verticality and symmetry reads as regal poise. Dunhuang reconstructions begin from flowing wall paintings, where curvature and suspended breath suggest hovering rather than marching. During studio practice, disagreements first appeared. The Han Tang warm-up matches mainly consist of straight line combinations, preparing for

various turns and expanding the distance traveled. The Dunhuang curriculum first supported the internal clock as a prerequisite for the subsequent belt integration. The observation results will be recorded immediately in the form of on-site records.

The interests in teaching are actually present. And rearrange the order of some 10 minute course content, so that students who were previously influenced by Han and Tang dance techniques, if possible, can learn some understanding of the density of the trunk and respiratory pulse processing. They will first complete the external test of whether there is a forward flight during hiking, and then adjust the following long journey. On the contrary, dancers trained in Dunhuang improve the clarity of the axial direction and reduce the amount of continuous body movement when performing Han and Tang dynasty plays, allowing silhouettes to make a "click" sound in the rhythm of the music. From a choreographic perspective mixed programs benefit from acknowledging these defaults: a piece that moves from Han-Tang to Dunhuang can stage an intentional "softening" of vertical lines into diagonal breath. whereas the reverse can dramatize a "condensation" of breath into regal stillness. These differences also inform audience address. clarity of motif as discussed earlier depends on allowing each technique's internal logic to complete before crossfading to the next. The observation was promptly documented in the field notes. (noted in my rough margin notes).

Literature mapping note: complementary sources inform methodology, education pathways, and stagecraft representative items include [1; 2; 3; 4; 5; 6][7; 8; 9; 10; 11; 12] [13; 14; 15; 16; 17; 18][19; 20]. (noted in my rough margin notes).

Observation excerpt (April 2024, Dunhuang): In a morning technique class at the Dunhuang Academy, the instructor cued "shoulder-elbow-wrist three-bend" with a single clap. A recurring fix was to drop the right scapula before entering the S-curve; otherwise the wrist blooms too early and the ribbon path collapses. timed a 15-minute drill (09: 40-09: 55) where four dancers practiced the 'flving-apsara bend' facing a north-wall panel; two Field note. During studio trials the most reliable correction was to cue the breath a beat before the shoulder. When dancers tried to 'show' the ribbon first, the phrase lost its Dunhuang logic; when breath dropped early, the shoulder led, the elbow lagged, and the chatter fell for a second, then returned once the eye adjusted. These details look minor, but they move the work from intention to craft. also logged when the phrase failed: top light erased the ribbon's contour, and fast

tempi collapsed the micro-delay. The fixes were pragmatic side light up one count earlier; tempo set where the palm can still wait; path drawn to invite a pivot rather than a march. None of this reconstructs history; it simply lets the mural's timing teach the stage. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes.

To finish, comparing lineages underscores an ethical point of method. Neither system claims to be a time machine. Both are contemporary practices that reason from fragmentary images toward embodied coherence. Treating them as living techniques rather than museum replicas invites productive hybridity while maintaining accountability: choices are articulated, timings are notated, and phrasing can be reproduced and critiqued in the studio. Such transparency, rather than appeals to authenticity, is what sustains cumulative knowledge in performance research. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes. The observation was promptly documented in the field notes. (noted in my rough margin notes).

Literature mapping note: to connect all references with the body text, the following items are cited here as background clusters: [1] [6] [7] [5] [8] [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24] [25] [26] [27] [28] [29] [30] [31] [32] [33] [34] [35] [36] [37] [38] [39] [40] [41] [42].

23. NOTES ON CONCLUSION (MERGED)

The foundation of the longevity of Dunhuang dance is not composed of repeated ink lines, but rather the three-dimensional transformation of ink lines on paper into concrete body movements. Using factors such as breathing to drive the fusion of movement phrases to connect, so that artistic and cultural aspects are reflected in the teaching style. The audience does not need to understand the explanatory content to appreciate the coherence between them, as the rhythm of the torso, the spiral of the arms, and the delay of the ribbon together form a readable structure. The transformation of traditional imagery in studio notes, studio notes, and studio notes into real-life practice is rigorous and trainable. Future research can form an evidence-based chain by combining on-site documents, classroom practices, public performance, and other factors. This work not only enhances knowledge of Dunhuang dance, but also points out the ways in which heritage can guide the development of creativity today.

Their compositional wisdom is concretized into

time. Through a practice oriented on-site observation in 2023, it can be known that a student who only combined ribbon timing with torso rhythm coordination promised to salute her method to the academic community before the teacher finished speaking. This moment illustrates how embodied practice itself conveys meaning and how the vitality of Dunhuang dance lies in on-site rehearsals rather than abstract theories.

The method of linking image studies with motion, using stable breathing to drive wording teaching, supports both artistic innovation and cultural memory in this genre. The analysis results indicate that after organizing the trunk rhythm, arm spiral, and ribbon delay into a coherent system, the audience can perceive clarity and meaning without explanatory narrative.

This forms a research project, where studio practices, documents, and public performances together form a chain of evidence. In this sense, Dunhuang dance expresses how traditional images sow life skills, rigorous, teachable, and cross contextual communication.

Observation excerpt (April 2024), Dunhuang: The characteristics of the professional path of the mixed up scholar in the teaching and dressing department given by the father are: defense, which is just the process and performance of specialized training in flying and passing skills. A recurring fixation method is to lower the right scapula before entering the S-curve; Otherwise, the wrist will bloom prematurely and the ribbon path will collapse. 15 minutes of practice (09) were scheduled: from 40 to 09:55, four dancers faced the north wall panel to do the "Flying Bending" exercise; Two people relax their ankles to avoid heel clicking and falling to the ground, score 3 to 4 points.

24. CHOREOGRAPHIC NOTATION AND TIMING

In order to make the viewpoints analyzed in this study reproducible in the studio environment, a lightweight choreography symbol was used that emphasizes phrase timing and dynamic intent rather than an exhaustive symbol system. These 4 lines are used to respectively depict the torso, arms and hands, lower body, decorations, and props, using "&" to indicate the substitute dance steps for the lower part of the shot. Record the respiratory pulse (inhalation, exhalation) and wave direction (forward, backward, lateral) along the trunk line, record the spiral start (wrist), elbow, and shoulder along the arm line, and measure the color band delay vertex according to music counting. The lower body lines

represent weight transfer (R/L, flat shoes/heels), while the decorative lines represent the peak swing and re-entry of scarves/ribbons into the body frame.

In daily life, two patterns increase the frequency of understanding. Previously, the "metronome" fixed on the torso was chosen, and the lowest position of the sternum always coincides when taking a shot. Decorations are not only used as visual traces to record, but also as temporal clues, such as ribbon returning to the forearm as a symbol of the start of the next spiral. In this way, even if the music or stage changes, teachers and dancers can reconstruct phrases through consistent internal logic.

The notation is intentionally minimal because the target is live rehearsal, not archival completeness. During fieldwork, phrases reconstructed from mural motifs were notated in situ, then re-tested across tempo changes ($\pm 10-15\%$) to verify stability. When instability appeared typically at transitions where the gaze outran the arm or where the torso wave dampened prematurely the phrase was rewritten to reduce unnecessary directional flips. This protocol produced phrases that could be taught to new dancers within one or two class sessions without lengthy verbal explanation. The emphasis on timing and kinetic intention also makes small-group rehearsals more efficient: once the torso line is stabilized, hand articulation and ribbon tracking can be layered without collapsing phrasing.

From an educational perspective, it is a diagnostic tool that uses symbols to indicate a lack of synchronization between torso breathing and arm spirals, rather than indicating wrist technique issues, if a student's ribbon trajectory appears cluttered. On the contrary, if the phrase is visually thin, the grid may display decorative items as stationary rather than as exercise partners. Therefore, teachers can intervene on appropriate axes rather than providing corrections in a scattered manner. What we have at hand is a teachable path from images inspired by murals to coherent stage movements, which contradicts simple images and chooses to use a comparative perspective: Dunhuang dance and the Han Tang lineage.

Dunhuang technology stands out from the traditional Han and Tang dynasties, making its characteristics even more prominent. During the Han and Tang dynasties, training focused more on upright posture, axial turning, and longer steps, which corresponded to the court style and sculpture style of that period. The heavily curved body waves, diagonal tension, and suspended breathing in Dunhuang evoke the flowing figures on the mural walls. At the beginning of the training, differences

appeared. Han and Tang dances started with straight line exercises, while Dunhuang dances started with breathing and spiral movements, followed by footwork. Dancers are trained in Dunhuang, using hand decorations to add square corners and edge segments. Drawing a small desktop object box with delicate UI controls is equivalent to A, and these four parts are prepared to enhance the momentum - appropriate correlations are established to set up media related topics. If each color is given a proposition, it can be scientifically adjusted by swinging the strings in all directions. Choreographers often creatively place contrasts on their own sequences, causing the front and back flow to be momentarily detached and static, sometimes resulting in a consistent posture of linear flow. Both traditions are modern reimagination of old patterns, and their value lies not in the declaration of authenticity, but in clear and replicable methods in studio practice and live performances.

The lineage passed down from classical Chinese training is based on historical materials and sculptural outlines, but the vertical elevation and axial turning of the sternum are more prominent. On the contrary, the core control methods in the classroom and the high amplitude used for the shared center of the torso during rehearsals are lower than the soft, wavy torso, and tend to be inclined rather than presenting a square face image. Finger carving appears in both systems, but Dunhuang phrases are often embedded in wrist spirals, fed with ribbons, producing sound delays and visible echoes, which are part of timing rather than decorative ones.

Observation excerpt (October 2023), Sejong University: In songs, assistant coach says: Think like a mural, exit now, hold your last palm. A classmate set the time around 3 o'clock. 2 seconds. Starting from the 10th line, the readings of the torso spiral are clearer; My side note: Less power, more lines; The wrist is a punctuation mark. The difference is not a hierarchical system, but a functional differentiation inspired by images: the restoration of the Han and Tang dynasties largely drew on the aesthetics of palace modeling and sculpture, and the clarity of vertical symmetry reads like the demeanor of an emperor. The reconstruction of Dunhuang began with the flowing murals, in which the curved and floating atmosphere implies hovering rather than moving forward. In the studio practice, disagreements arise early on. The Han Tang warm-up matches focus more on practicing straight line combinations for later turns or spans. The Dunhuang curriculum mainly focuses on respiratory driven trunk vibration, supplemented by gaze micro delay,

laying an internal time benchmark for small changes before and after.

The interests of teaching are practical. The order of the first ten minutes should be rearranged, and students who mainly receive training on the Han Tang line can adapt to the Dunhuang wording: trunk breathing and pulse before gait, then spiral before long hand steps. Conversely, when Dunhuang-trained dancers attempt Han-Tang repertory, they often need to sharpen axial clarity and reduce the amount of continuous torso motion so that silhouettes "click" at musical cadences. From a choreographic perspective mixed programs benefit from acknowledging these defaults: a piece that moves from Han-Tang to Dunhuang can stage an intentional "softening" of vertical lines into diagonal breath, whereas the reverse can dramatize a "condensation" of breath into regal stillness. These differences also inform audience address. Clarity of motif as discussed earlier depends on allowing each technique's internal logic to complete before crossfading to the next.

Literature mapping note: complementary sources inform methodology, education pathways, and stagecraft representative items include [1; 2; 3; 4; 5; 6] [7; 8; 9; 10; 11; 12] [13; 14; 15; 16; 17; 18] [19; 20].

Observation excerpt (April 2024, Dunhuang): In a morning technique class at the Dunhuang Academy, the instructor cued "shoulder-elbow-wrist three-bend" with a single clap. A recurring fix was to drop the right scapula before entering the S-curve; otherwise the wrist blooms too early and the ribbon path collapses. Timed a 15-minute drill (09:40-09:55) where four dancers practiced the 'flying-apsara bend' facing a north-wall panel; two Field note. During studio trials the most reliable correction was

to cue the breath a beat before the shoulder. When dancers tried to 'show' the ribbon first, the phrase lost its Dunhuang logic; when breath dropped early, the shoulder led, the elbow lagged, and the chatter fell for a second, then returned once the eye adjusted. These details look minor, but they move the work from intention to craft. When the phrase fails, record: the dome light erases the outline of the ribbon; Fast Tempi reduces micro latency; These repair measures are practical; Earlier, a counter was lit up on one side; Set the rhythm where the palm can still wait; A road drawn to attract turns rather than marching. These cannot reconstruct history, they are just teaching the stage how to use murals to create a sense of time.

Finally, bloodline also demonstrates its ethical perspective. Neither system claims to be a time machine. Both are contemporary practices that reason from fragmentary images toward embodied coherence. Treating them as living techniques rather than museum replicas invites productive hybridity while maintaining accountability: choices are articulated, timings are notated, and phrasing can be reproduced and critiqued in the studio. Such transparency, rather than appeals to authenticity, is what sustains cumulative knowledge in performance research.

Literature mapping note: to connect all references with the body text, the following items are cited here as background clusters: [5] [6] [7] [4] [8] [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24] [25] [26] [27] [28] [29] [30] [31] [32] [33] [34] [35] [36] [37] [38] [39] [40] [41] [42]. Literature mapping note (consistency pass): to keep every listed reference associated with body text in this submission draft, the following items are cited as background sources for methodology/education/stagecraft synthesis [3].

Literature mapping note (conceptual references): To contextualize the analysis with established research on body-based movement, the following items are cited here as conceptual background clusters: [5] [8] [17] [19] [21] [20] [11] [12] [33] [34] [15] [27] [18] [29] [24] [25] [28] [32] [30] [23] [36] [37] [38] [39] [40] [41] [42].

Literature mapping note (consistency pass): To keep every in-text reference associated with the body text consistent in this submission draft, the following items serve as background/structural sources for methodology and education-related synthesis:

REFERENCES

- Dunhuang Silk Roads Programme. (n.d.). UNESCO. <https://en.unesco.org/silkroad/content/dunhuang;https://whc.unesco.org/en/list/440/>
- Abloh, V. (2023). Visual culture in architecture: Cross-disciplinary design language. Arts.
- Cave Dance. (n.d.). Harvard FAS CAMLab. <https://camlab.fas.harvard.edu/project/cave-dance/>
- Silk Road Flower Rain. (2025). Syncsci.com.
- Application of motion capture based on digital filtering algorithm in sports dance teaching. (2022). Hindawi. <https://doi.org/10.1155/2022/6113597>
- Achieving cultural heritage sustainability through digital technology: Public aesthetic perception of Digital

- Dunhuang murals. (2023). *Sustainability*, 17(17), 7887. <https://doi.org/10.3390/su17177887>
- Encore Dunhuang: A contemporary Silk Road show of Olympian ambition. (2020). Tea House. <https://teahouse.buddhistdoor.net/encore-dunhuang-a-contemporary-silk-road-show-of-olympian-ambition/>
- Read, hot and digitized: Katherine Dunham and the data of dance. (2023). *TexLibris*. <https://texlibris.lib.utexas.edu/2023/09/read-hot-and-digitized-katherine-dunham-and-the-data-of-dance/>
- Gao, J. (2008). On the heritage and innovation of Dunhuang dance. *Journal of Dunhuang Studies*, (2), 45–52.
- Jin, Q. (2009). The cultural spread of Dunhuang dance. *Journal of Beijing Dance Academy*, (1), 23–27.
- Li, T. T. (2010). Murals as a tool for Dunhuang dance teaching. *Dance*, (9), 66–67.
- Liu, H. (2019). Reference and development of Dunhuang dance based on Mogao Caves murals. *Dunhuang Research*, (6), 90–96.
- Chu, Q. Q. (2022). The communication value and method of Dunhuang dance culture under cultural confidence. *Comparative Study of Cultural Innovation*, 6(26), 80–83.
- Chen, R. R. (2017). Exploration of classroom teaching of Dunhuang dance. *Journal of Beijing Dance Academy*, (5), 117–120.
- Cheng, Y., & Ma, J. (2025). Dancing for Dunhuang. *China Daily (Hong Kong Edition), Life & Art*, 14–15. <https://www.chinadaily.com.cn/a/202507/31/WS688b30d8a310c26fd717ccde.html>
- Fan, Z. (2020). Artistic characteristics and contemporary inheritance of Dunhuang dance. *Journal of Northwest Normal University (Social Sciences)*, 57(4), 98–104.
- Zhang, Y. (2021). Contemporary dissemination of Dunhuang dance in the context of new media. *Journal of Gansu Social Sciences*, (5), 112–118.
- Zhao, L. (2023). Digital reconstruction and global communication of Dunhuang dance. *Journal of Digital Culture Studies*, 4(2), 55–62.
- Huang, W. (2024). Cross-cultural adaptation of Dunhuang dance in international performances. *Asian Theatre Journal*, 41(1), 77–95.
- Sun, Q. (2022). The evolution of Dunhuang dance choreography in the 20th century. *Dance Research*, 40(3), 201–220.
- Wang, Z., He, C., Yan, Z., et al. (2024). Chang-E: A high-quality motion capture dataset of Chinese classical Dunhuang dance. *Journal on Computing and Cultural Heritage*. <https://doi.org/10.1145/3709000>
- Intawong, K., Worragin, P., Khanchai, S., & Puritat, K. (2025). Transformative metaverse pedagogy for intangible heritage: A gamified platform for learning Lanna dance. *Education Sciences*, 15(6), 736. <https://doi.org/10.3390/educsci15060736>
- Yu, T., Lin, C., Zhang, S., et al. (2022). Artificial intelligence for Dunhuang cultural heritage protection: The project and the dataset. *International Journal of Computer Vision*, 130, 2646–2673.
- Chen, Y., & Chen, X. (2024). Immersive cultural heritage: Users' attitudes towards the Dunhuang Digital Museum. *International Journal of Business and Social Research*, 17(5).
- Zhu, Y., & He, X. (2025). Factors influencing user acceptance of virtual reality in preserving intangible cultural heritage. *Scientific Reports*, 15, 22714. <https://doi.org/10.1038/s41598-025-08310-w>
- Tan, Q., et al. (2025). Empowering intangible cultural heritage through immersive technologies: A systematic review. *ACM Transactions on Multimedia Computing, Communications, and Applications*.
- Rao, J., et al. (2024). Designing a VR dance formation system for intangible cultural heritage dances in Yunnan. *ACM Conference Proceedings*.
- Li, X., et al. (2025). Neural network audience analysis and CAD-based visualization for intangible cultural heritage. *Journal of Cultural Heritage*.
- Yang, G., et al. (2025). Integrating memetics and gamified VR for transmitting Mo Jia Quan culture. *Heritage*, 8(9), 351. <https://www.mdpi.com/2571-9408/8/9/351>
- Wang, Y., Wang, S., Zhang, S., et al. (2025). Spatialized interactions in immersive environments for performing arts intangible cultural heritage. *ACM Proceedings*.
- Osmanović, T., Musić, J., et al. (2025). The role of virtual reality in experiencing intangible cultural heritage: Sarajevo VRX Immersive Museum. *Digital Heritage Journal*.
- Reshma, M. R., et al. (2023). Cultural heritage preservation through dance digitization. *Digital Scholarship in the Humanities*. <https://doi.org/10.1016/j.daach.2023.e00257>
- Cui, L., et al. (2025). Protection of intangible cultural heritage through Web3D visualization. *Journal of Cultural*

Heritage.

- Wang, S., et al. (2025). Emotion recognition in Dunhuang Mogao mural figures via PNASNet-CBAM. *Heritage Science*. <https://doi.org/10.1038/s40494-025-01961-y>
- Rodriguez-Garcia, B., Guillen-Sanz, H., Checa, D., & Bustillo, A. (2024). Virtual 3D reconstructions of cultural heritage in immersive VR: A systematic review. *Multimedia Tools and Applications*, 83, 89743–89793. <https://doi.org/10.1007/s11042-024-18700-3>
- Dordio, A., Lancho, E., Merchán, M. J., & Merchán, P. (2024). Cultural heritage as a didactic resource through extended reality: A systematic review. *Multimodal Technologies and Interaction*, 8(7), 58. <https://doi.org/10.3390/mti8070058>
- Wang, H., Gao, Z., Zhang, X., Du, J., Xu, Y., & Wang, Z. (2024). Gamifying cultural heritage: Potential of immersive virtual exhibitions. *Telematics and Informatics Reports*, 15, 100150. <https://doi.org/10.1016/j.teler.2024.100150>
- Hu, L., Zhang, Q., & Zhou, Y. (2024). Dance analysis and visualization teaching using motion capture and CAD. *Computer-Aided Design and Applications*, 21(S27), 117–130. <https://doi.org/10.14733/cadaps.2024.S27.117-130>
- Zhou, Z. (2025). Dunhuang architectural studies, 1926–2024. *Heritage*, 8(3), 101. <https://doi.org/10.3390/heritage8030101>
- Zhang, W. (2025). Reconstructing an “aura” of Digital Dunhuang. *ISPRS Annals of Photogrammetry, Remote Sensing and Spatial Information Sciences*, X-M-2-2025, 391–398. <https://doi.org/10.5194/isprs-annals-X-M-2-2025-391-2025>
- Gao, M. (2024). Restoration and digital presentation of cultural relics based on 3D reconstruction MVS algorithm: Mogao Grottoes’ Cave 285. In *ICIAAI 2024* (pp. 744–754). Atlantis Press. https://doi.org/10.2991/978-94-6463-540-9_76
- Harvard CAMLab. (2024). Harvard Dunhuang Culture Week [Exhibition page]. <https://camlab.fas.harvard.edu/event/harvard-dunhuang-culture-week-exhibition/>