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Mechanisms of Generative AI-Driven Sound Art Creation within the Framework of Quantum Cognition and Paradigm Reconstruction in Higher Education

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Abstract: As AIGC technologies become deeply integrated into higher education teaching and learning, a critical challenge has quickly emerged: many pedagogical approaches remain constrained by traditional linear thinking, particularly evident in the persistence of unidimensional instructional models. To address this impasse, this study introduces quantum cognition theory to construct a human–AI collaborative creative model. The model operates through three phases: latent state generation, observational collapse, and iterative evolution. An empirical investigation was conducted with three cohorts of students from the AIGC Film and Television Production Innovation Program at Sichuan Film and Television College. The findings indicate that under the influence of quantum cognition, a nonlinear pedagogical paradigm significantly enhances students' cross-path exploration capabilities. Moreover, human–AI co-created works demonstrated notable "emergence" in provincial- and national-level competitions. This research substantiates how this approach reshapes cognitive pathways and teaching evaluation systems in sound art, offering theoretical grounding and practical pathways for the paradigm reconstruction of arts education in the era of artificial intelligence.

Keywords: Quantum art; Large language models; Sound art; Interdisciplinary education; Cross-disciplinary studies

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1. Introduction

1.1. Research background

In recent years, higher education in China has been undergoing an unprecedented and profound transformation. It is moving beyond an instrumental phase defined by "digital empowerment" and steadily progressing toward a new era of "intellectual reconstruction." The central driving force behind this shift lies in the fundamentally altered role of digital information technology, which is no longer a mere auxiliary tool for teaching and learning but has penetrated the foundational logic of cognition and innovation, structurally reshaping the entire educational landscape. Within the field of sound art creation education, in particular, the traditional pedagogical model—long dominated by linear skill training and imitation-based creation—has increasingly revealed its disconnect from the cultivation of future-oriented creative capacities.

Sound art has never been an isolated game of hearing; it is a multidimensional sensory resonance. In essence, it weaves together the flow of time, the extension of space, the tremors of frequency, and the emotional ripples stirred in the listener's heart into a single expressive dimension. Here, information ceases to be a cold parameter and becomes a perceptual entity imbued with warmth and shape. It is precisely this cross-dimensional nature that renders sound art a crucial domain for artificial intelligence experimentation and innovation. With the rise of generative artificial intelligence—particularly the emergence of sound generation tools built upon large language models and Transformer architectures—the possibilities for sound creation are expanding remarkably, unveiling unprecedented creative horizons [1]. This clearly entails that educators and creators are no longer merely manipulating a fixed toolchain; instead, they are able to explore multiple potential solutions within a highly uncertain creative space. Such a shift poses a novel challenge to traditional higher education: namely, how to guide students through the teaching process to adapt to this nonlinear, multi-path, probability-driven creative environment, thereby cultivating the cross-boundary capabilities and innovative literacy required for the future [2].

1.2. Problem statement

Sound art instruction in contemporary higher education remains predominantly governed by linear logic: curriculum design, skill training, and the production of creative work largely follow explicit steps and deterministic standards. While this model holds certain advantages for imparting mechanical skills and delivering foundational technical training, it proves conspicuously inadequate when confronted with the nonlinear creative possibilities unleashed by generative artificial intelligence, struggling to adapt flexibly to new creative paradigms. Specifically, its limitations manifest in three respects. First, teaching content and assignments tend to overemphasize standardized procedures, neglecting the randomness and exploratory dimension inherent in the creative process. Second, evaluative criteria for creative work are disproportionately tied to pre-established technical indicators, failing to adequately recognize the value of innovative pathways, experimental endeavors, and diversified outcomes [3]. Third, during the creative decision-making process, students are frequently constrained within known experience and rules, finding it difficult to fully harness the multiple latent states generated by artificial intelligence to ignite originality. The ultimate consequence is a conspicuous deficiency in the capacity of university-level sound art education to cultivate students' ability to navigate the complex creative environments of the future.

This "determinacy dilemma" not only restricts students' creative potential but also impedes the iterative renewal of pedagogical models. There is therefore an urgent need to introduce new theoretical frameworks and practical methodologies to address the increasingly salient nonlinear characteristics and uncertainty challenges within AI-driven creative environments.

1.3. Research significance

To clarify precisely how sound art "emerges" following the intervention of artificial intelligence, this study endeavors to break free from the shackles of conventional cognition and turn instead to quantum cognition theory for explanation. What the research seeks to construct is not merely a theoretical model but a "cognitive key" capable of penetrating the underlying mechanisms and decoding the logic of sound creation in the age of AI. This theory regards the creative process as a “superposition state” containing multiple potentialities and, through a three-step mechanism of observation, collapse, and iteration, elucidates how creators arrive at aesthetic decisions within highly uncertain environments. Such a perspective not only remedies the inadequacies of traditional cognitive theories in accounting for inspiration, intuition, and nonlinear creation, but also opens up a new interdisciplinary pathway for sound art education research, thereby organically integrating physics, cognitive science, and artistic creation.

On the practical level, this study can provide an actionable pathway for universities constructing future-oriented sound art education. Against the educational trend of integrating the “New Humanities” and “New Engineering,” curriculum design, teaching methods, and evaluation systems must transcend the conventional model of linear skill transmission and pivot toward building a teaching environment that accommodates and stimulates uncertainty-driven creation. By introducing a human–AI collaborative creation mechanism alongside a quantum cognition framework, instructors can guide students, with the assistance of generative artificial intelligence, to explore multi-path creative strategies, thereby enhancing their interdisciplinary understanding, innovative capabilities, and decision-making literacy. This approach not only helps cultivate artistic talent endowed with future-oriented sensibilities but also furnishes an actionable framework for transforming the pedagogical model of sound art education.

2. Theoretical foundations

2.1. Core tenets of the quantum cognition framework

With the deepening application of AI technologies in sound art creation, a problem has become increasingly conspicuous: traditional linear models can no longer keep pace with the times. When a vast array of generative algorithms surges before creators, their psychological shifts and decision-making processes prove exceedingly complex—so much so that the black-and-white linear logic of the past falls short of providing any adequate explanation. This constitutes the point of departure for the present study: introducing quantum cognition theory and employing its distinctive probabilistic reasoning to reinterpret the laws governing generative AI-driven artistic creation, in the hope of offering learners and creators an entirely new lens through which to understand the nonlinear cognitive processes inherent in human–AI collaboration. Quantum cognition does not imply that the brain’s operation relies on quantum mechanical physical processes; rather, it posits that human cognitive logic, decision-making pathways, and aesthetic judgments align more closely with quantum probability theory. Within the context of sound art creation, its core tenets manifest across the following three dimensions.

The first is superposition. In traditional logical processes, a creator’s intention is typically treated as a deterministic, linear pathway. However, during the initial stage of generative AI intervention, the creator’s thinking enters a “cognitive superposition state”—meaning that the aesthetic image in the creator’s mind is not a single preset but a probability distribution composed of multiple potential frequencies, timbral textures, and narrative logics. In the context of AIGC, this manifests as follows: when a student faces a prompt input box, their mental conception of a “soundscape” remains unformed, analogous to a quantum state $|\psi=\alpha|A+\beta|B$, where $|A$ and $|B$ represent distinct aesthetic orientations. Such a superposition state furnishes generative AI with an expansive “heuristic space,” transforming creation from a prescribed “thematic composition” confined to a given topic into a process capable of achieving probabilistic resonance among multiple possibilities.

The second is quantum entanglement. When GenAI drives the creative paradigm, the human creator and the algorithmic model no longer stand in a binary opposition of "tool user" and "tool"; instead, they form an entangled system. By entanglement, we mean that within this system, a change in the state of one subject instantaneously influences the state of the other, with the two sharing a common wave function. During the practice of the AIGC Film and Television Production Innovation Program conducted at Sichuan Film and Television University, every fine-tuning of a prompt word entered by a student triggered intense oscillations in the model's latent space; conversely, the random timbres generated by the AI also instantly revised the student's aesthetic expectations. Such a non-local feedback loop progressively dissolves the boundary between the artistic subject (the student) and the technological object (the AI), thereby establishing the dynamic foundation for collaborative creation [4].

The third is collapse. Quantum measurement theory states that the act of observation causes a superposition state to collapse into a definite state. In the artistic creation process, this corresponds to aesthetic decision-making—the act of converging the infinitely possible generative trajectories into a single artistic expression. Generative AI can, every second, produce hundreds of sound-effect samples, which together constitute a digital "probability cloud." Through "close listening" and "value filtering," the creator, at a certain moment, selects a specific audio track. This act is, in essence, the creator as "observer" causing the wave function of the algorithm's random emergence to collapse through cognitive intervention, thereby endowing the sound work with determinate textual meaning and humanistic value [5].

2.2. The "wave" nature of sound art and its quantum metaphor

Admittedly, sound, as the most immediate human sensory experience, inherently possesses a natural interdisciplinary intertextual relationship between its physical properties and the underlying logic of quantum mechanics. This very point provides the most solid ontological support for the present study. In essence, sound is nothing more than the propagation of mechanical waves through a medium, characterized principally by three core features: frequency, amplitude, and phase. In the process of digital synthesis, sound can be regarded both as a continuous wave and as discretized sampling points (acoustically understood as sound grains); this dual nature resonates profoundly with the wave-particle duality in quantum mechanics [6].

The processing of digital audio cannot circumvent a fundamental law: it is impossible to simultaneously obtain absolutely precise temporal information and absolutely precise frequency information. This is an insurmountable physical boundary, commonly discussed in the academic community as the Gabor limit. This situation forms a remarkably apt physical metaphor for the Heisenberg uncertainty principle, and such "indeterminacy" constitutes the fundamental source of sound art's dynamic expressiveness and depth precisely [7]. Of course, as a sensory medium, sound transmits information in a nonlinear manner. When different timbres are superimposed, interference phenomena arise, much as quantum interference can generate complex probability patterns. During the creative process of students in the Innovation Program, the interference between collected voiceprints and AI-synthesized timbres can produce an "emotional standing wave" capable of transcending time and space. The teaching of sound art in higher education effectively harnesses this very quality of sound—one that possesses both logicality (i.e., music theory, algorithms) and ambiguity (i.e., emotion, imagery) [8]. When framed by quantum cognition, sound art becomes a bridge connecting abstract physical logic and embodied sensory experience, providing the most ideal experimental domain for the reconstruction of higher education paradigms [9].

3. Mechanism research

3.1. The probabilistic generation logic based on "indeterminacy"

From 2024 to 2026, the AIGC Film and Television Production Innovation Program at Sichuan Film and Television University has been conducted over three rounds of teaching practice. Throughout this process, sound art creation has shifted from traditional sampling and linear editing toward a nonlinear generative paradigm grounded in latent space exploration. This chapter systematically reveals the deep operating mechanisms from three dimensions: probabilistic generation logic, the observation–iteration mechanism, and human–AI co-creative evolution.

When generative AI drives sound creation, the process is, in essence, one of the model sampling within a high-dimensional probability space. In the experiments carried out by the AIGC Innovation Program, the prompt assumed the role of a logical starting point. A prompt is not merely descriptive text; rather, it serves as an "awakening" of a specific probability distribution within the latent space. When students input heterogeneous labels such as "rawness," "cyber," "industrial," and "viscous," the AI did not point toward a determinate sound effect; instead, it constructed a superposition domain in which multiple acoustic features coexisted. Through deep prompt optimization, the Innovation Program enabled precise intervention in generation probability. Such intervention resembles the construction of a "potential well" in quantum mechanics: by constraining the degrees of freedom of the algorithm, it guided "quantum seeds" to germinate within a preset aesthetic interval.

3.2. The "interactive observation" mechanism in human–AI collaboration

In the teaching practice of the AIGC Film and Television Creation Innovation Program at Sichuan Film and Television University, this study found that the logic of sound art creation underwent a fundamental reversal. Students' identity shifted from that of a "material processor" in the past to that of an "aesthetic observer" in the quantum cognitive sense. This shift is particularly evident in their interaction with AI: when an audio generation AI program is running, countless possible acoustic trajectories exist within the latent space; each time a student inputs a prompt or adjusts a parameter, the AI program generates multiple sets of distinct audio results in real time for them to observe and select [10]. Each round of "listening" and "filtering" that students perform on these samples is, in essence, an act of quantum observation. Before the student's intervention, the audio resides in an undefined probabilistic superposition state. Once the student exerts aesthetic intervention (for instance, selecting a particular audio segment and proceeding with a second iteration), the probability wave of the latent space instantaneously undergoes "collapse," thereby securing the uniqueness of the artistic expression. Such a mechanism implies that the final work is not independently generated by the AI; rather, it is a "reality" extracted by the student from infinite possibilities through high-frequency observation.

During the teacher–student interaction in the Innovation Program, this mechanism manifested itself especially clearly. Teachers guided students to no longer pursue "one-click generation" but to create through a cycle of "parameter guidance, immediate feedback, and intention revision." The minute feedback obtained after each observation prompted the model to recompute the global probability distribution. This dynamic coupling between human and machine formed a deeply interwoven interactive flow, endowing the process of sound reshaping with an exceedingly high degree of flexibility and serendipity.

3.3. Emergent aesthetics: From imitation to nonlinear transcendence

The most profound impression left by the difference between traditional pedagogy and the present "large language model" approach is precisely the element of indeterminacy. In the past, guiding students in FM synthesis or additive synthesis meant, frankly, "playing" with predetermined "equations." Given set parameters and frequency adjustments, an experienced practitioner could largely predict the resulting sound—a closed loop that could be anticipated. Now, however, creation after the intervention of AI feels more like "opening a mystery box"; it is this uncontrollable variability that most sharply distinguishes the new model from the old. The generative models used in the AIGC Film and Television Creation Innovation Program are probabilistic and stochastic at their core, producing subtle differences with each run. Such indeterminacy is precisely the most precious quality of art: it fills creation with surprise and aligns more closely with the serendipitous and emergent nature of artistic exploration. This mechanism allows AI to no longer merely simulate sounds of the real world but to generate a kind of logical "mutation." In the process of nonlinear training on massive data, AI spontaneously produces, during generation, frequency combinations or harmonic textures that do not exist in reality. This "emergent aesthetics" constitutes the concrete manifestation of quantum randomness in the artistic domain.

A rather intriguing phenomenon emerged across the experiments of successive cohorts in the AIGC Film and Television Innovation Program: AI performed with remarkable vividness when processing "non-natural" sound effects. It often produced peculiar textures that would be extremely difficult for a human creator to manually engineer—for example, a gritty, granular rustling with burred edges, or a fluid, all-pervasive flow like water. Most distinctive was a kind of trans-temporal atmosphere, sounding simultaneously like some ancient residue and yet carrying the bleakness of a futuristic wasteland. This blurred boundary indeed opened new pathways for sound creation. What left the deepest impression was that, when the 2024 cohort created the AI short film SFU 2042, the AI produced, almost daily, a vast quantity of audio fragments that simultaneously possessed a metallic quality, a technological sensibility, and a trans-temporal aura, many of which were used directly in the final work. Such timbral textures shattered human auditory experience grounded in physical instruments and traditional electronic instruments. By exploiting "fluctuations" within the algorithm, the AI accomplished, on the dimension of timbre, a leap from "1 to N" imitation to "creation out of nothing." This mechanism compelled students to re-examine what constitutes "beauty." In the teaching practice at Sichuan Film and Television University, students were encouraged to capture these "unanticipated emergences" and transform them into part of the narrative. This paradigm shift from imitation to transcendence not only enhanced the artistic tension of sound works but, more fundamentally, broadened the cognitive boundaries of the human "auditory landscape."

4. Paradigm reconstruction

4.1. A fundamental shift in the core philosophy of the curriculum: From "technical proficiency" to "quantum literacy"

Traditional sound art education has centered on cultivating competencies in software operation, music theory, and linear editing techniques. However, as AI automation continues to proliferate and exert its driving force, the core proposition of education is gradually shifting from "how to make" to "how to decide." At this juncture, higher education should commit itself to fostering a new type of composite capability—namely, quantum literacy. In simple terms, students need to acquire an integrative competence that spans physics (the logic of acoustic waves), algorithms (the latent space of generative models), and art (aesthetic narrative). In the practice of the AIGC Film and Television Production Innovation Program at Sichuan Film and Television University, such literacy manifested in students' ability to understand the mapping relationship between the algorithmic randomness behind prompts and the laws of physical acoustics. Faced with the infinite probabilities (the superposition state) provided by AI, the traditional "standard answer" vanishes. Students must learn to exercise aesthetic determination, grounded in a profound humanistic foundation, amidst highly ambiguous and rapidly fluctuating generative flows. This "intuition-based scientific decision-making" constitutes the fundamental differentiating competitiveness of future innovative talent. Accordingly, the teaching objective is no longer to cultivate proficient "audio-track movers" but to nurture creators equipped with algorithmic critical literacy. Students need to maintain a critical perspective in the face of technological emergence, examining whether AI-generated timbral textures align with the emotional consensus of human civilization, thereby enabling the leap from a singular skill-based education to a multifaceted competency education.

4.2. The reorganization of the curriculum system: A deeply integrated "STEAMS" model

This study demonstrates that only by breaking down disciplinary barriers can a novel pedagogical philosophy be realized. The former siloed curriculum structure must inevitably give way, and current teaching requires a more flexible, modular curriculum structure centered on sound algorithms, quantum logic, and artistic narrative. By incorporating a new dimension—Artificial Intelligence (Smart)—into the original STEAM educational framework and upgrading it into a "STEAMS" integrated model, sound art pedagogy can adapt to the information age [11]. This curriculum encompasses the following three core modules:

(1) Sound Algorithms (Technical Domain): Through an in-depth analysis of the mathematical logic involved in diffusion models and Transformer architectures for audio processing, students come to understand the essence of "noise-guided generation" technology.

(2) Quantum Logic (Theoretical Domain): By introducing foundational knowledge of nonlinear dynamics and quantum probability and employing them as a conceptual scaffold for artistic ideation, the causal constraints that bind traditional film and television creation are broken.

(3) Artistic Narrative (Curation Domain): Emphasis is placed on the "editing-then-curating" operation applied to generated content, with the aim of cultivating students' ability to construct grand narratives from a vast sea of fragments.

Beyond this, a pivotal pedagogical reform within the system is the comprehensive adoption of a "dynamic curriculum schedule." Given that AI technology currently updates with a major version approximately every three months and frequently introduces new minor features on a weekly basis, the teaching content of this system must not be rigidly fixed by semester; instead, teaching modules must be refreshed weekly in step with the technological rhythm. This agile teaching approach fundamentally resolves the longstanding problem of university teaching lagging behind industry development, truly achieving zero-latency synchronization with the technological frontier.

4.3. The reshaping of the teaching scenario: Digital twins and the quantum art laboratory

Within higher education, it is increasingly palpable that the boundaries of the traditional physical classroom are gradually dissolving, and the teaching space in higher education is rapidly evolving toward immersive scenarios characterized by "virtual-real symbiosis." This is particularly evident in the AIGC Film and Television Production Innovation Program at Sichuan Film and Television University. With the full support of the Virtual Teaching and Research Office of Radio and Television Directing at the University's School of Audiovisual and Media, the Innovation Program introduced digital twin technology, successfully transforming invisible and intangible sound parameters into visual content that can be directly observed and even interacted with. When students in the Innovation Program laboratory adjusted AI parameters, the system would render the corresponding sound field models or wave function images in real time within XR space. Such embodied interaction enabled students to intuitively perceive, through vision, the "entanglement" and "collapse" of quantum cognition, realizing the goal of "what you see is what you get, and what you get is what you hear." On this basis, the Innovation Program is advancing the construction of a Quantum Art Laboratory integrating spatial audio, generative computing clusters, and virtual simulation systems. This space is not merely a physical venue but a "petri dish for inspiration" brimming with randomness. By intervening in sound effect synthesis through quantum random number generators, the laboratory can create an absolutely non-repetitive experimental environment for students. In the classrooms of the AIGC Innovation Program, the teaching scenario is being reconstructed as a "human–machine symbiotic workshop," where students, AI agents, and teachers collectively share computational power and creative flows within the same digital network, thereby greatly catalyzing the emergence of top-tier innovative talent.

5. Teaching scenario simulation and creative mechanism validation

5.1. Teaching scenario construction: AIGC sound creation course design

Having delineated the coupling model of quantum cognition and generative AI, this study next sought to test the viability of this model by anchoring the investigation in the sound creation course of the AIGC Innovation Program. The course enrolled only students who had already acquired foundational sound production skills. Its core objective was to explore, through generative AI technology, how nonlinear creation methods and multimodal perception mechanisms could be implemented in actual teaching practice and to assess their effectiveness.

In designing the course, this study deliberately positioned "scenario-based sound generation" as the central task. Around this core, a series of creative themes—such as "Urban Soundscape Reconstruction" and "Emotional Sound Expression"—were devised, enabling students to practice with the latest audio generation tools built on diffusion models and Transformer architectures. Experience showed that the traditional linear pedagogical approach was entirely inapplicable here; therefore, the course system completely discarded the old workflow and reconstructed a new learning sequence of "generate first, then filter, then adjust, then generate again." In this way, students no longer had to fix a direction at the outset; instead, through multiple rounds of interaction with AI, they naturally discovered their own creative trajectories.

Teaching practice revealed that within this process, the role of AI had far transcended that of a mere tool. It effectively reconfigured the students' creative cognitive logic: in the past, upon receiving a topic, students would first think about how to execute a preconceived plan step by step; now, they were more inclined to diverge first and explore various different creative pathways. This indeterminacy is precisely the most precious quality of creation, and it also rendered the creative atmosphere of the entire classroom distinctly different.

5.2. Analysis of the human–AI co-creation process: An interpretation based on the quantum cognition model

Grounded in the specific teaching scenario established above, the study found the framework of quantum cognition to be particularly well suited for analyzing the human–AI co-creation process. It can disentangle an originally complex and ambiguous creative flow into a remarkably clear structure. Viewed holistically, the entire process essentially comprises three interlocking phases: latent state generation, observational collapse, and iterative evolution.

The first is the latent state generation phase. At this stage, the generative AI first analyzes the input prompt and produces, in one burst, several completely different sound proposals, instantly opening up a creative space brimming with possibilities. At this moment, the creator has not yet made any decision, holding multiple distinct creative ideas simultaneously in mind, with various directions all viable—bearing a strong resemblance to the "superposition state" described in quantum mechanics. In a nutshell, before a final choice is made, all creative possibilities coexist simultaneously without differentiation.

The next is the observational collapse phase. Here, the creator, drawing on their own aesthetic experience and the expressive intention they wish to convey, selects preferred results from the array of AI-generated outputs and makes further adjustments. Once aesthetic judgment intervenes, those possibilities originally scattered across the creative field gradually converge toward a specific direction, and the previously open creative pathways become increasingly clear and determinate. This process is, in effect, the "state collapse induced by observation"; in other words, it is the creator's cognitive choice that compresses the originally boundless probability space into a concrete result.

Practice has noted that the most valuable aspect is the iterative evolution process. Traditional creation often proceeds along a single, unswerving path, but human–AI co-creation is different: it never comes to a halt at any given node. Each time a student provides feedback to the AI or adjusts parameters, the AI generates new results, which in turn introduce new possibilities, and the student then makes new choices among these fresh possibilities. Round after round, this forms an endlessly generative creative cycle. Such a nonlinear, variability-laden process is utterly inconceivable within traditional creation paradigms.

5.3. Analysis of emergent characteristics in creative outcomes

Under the influence of the human–AI co-creation mechanism described above, students' works displayed pronounced "emergent characteristics." First, at the structural level, the sound works no longer followed a linear narrative logic; instead, they exhibited features of multi-layered superposition and discontinuous transitions, reflecting the generative model's capacity for recombination within high-dimensional space. Second, in terms of timbre and spatial expression, the AI-generated results often breached the sonic boundaries delimited by traditional experience, causing the works to assume more complex forms in spectral structure and spatial distribution—a complexity that was not entirely artificially controlled but emerged gradually through the interaction between algorithmic generation and human curation.

Thus, when analyzed from the perspective of outcome presentation, human–AI co-creation not only alters the formal characteristics of sound works but also, to a certain extent, reconstructs the creative logic itself, shifting it from an experience-driven model to a probability-driven one, and then realizing a quintessential pathway of generation through interaction.

5.4. Mechanism-based assessment of teaching effectiveness

During the implementation of the course, this paper conducted a comprehensive analysis that integrated course feedback with phased outcomes, carrying out a mechanism-based assessment of the teaching model's effectiveness across three dimensions: cognitive change, behavioral persistence, and outcome feedback (**Table 1**).

Table 1. Evaluation results of teaching effectiveness in AIGC sound creation

Dimension	Indicator	Result	Teaching change	Theoretical Correspondence
Cognitive Layer	Creative Interest	+25%	Passive → Active	Superposition State Activation
Behavioral Layer	Tool Usage Rate	93%	Short-term → Long-term	Path Solidification after Collapse
Achievement Layer	Award Performance	12 Items	Imitation → Emergence	Probabilistic Generation Advantage

(Data sourced from the AIGC Film and Television Production Innovation Program at Sichuan Film and Tele1vision University)

First, at the level of learning motivation, a comparative analysis of pre- and post-course feedback revealed a marked upward trend in students' interest in AI-assisted sound creation (an increase of approximately 25%). This indicates that the multi-path creative possibilities offered by generative artificial intelligence effectively stimulated students' willingness to explore, prompting a shift from passive task completion to active creative participation.

Second, at the level of creative behavior, upon course completion approximately 93% of students continued to use the relevant AI tools for sound creation practice, demonstrating strong behavioral persistence. This suggests that the human–AI collaborative teaching model has extended beyond the classroom context into individuals' long-term creative strategies, with the technological tools gradually internalized as part of their creative methodology.

Third, with regard to the external impact of course outcomes, during the teaching implementation period, students' course-based works received one industry award and one provincial-level academic society award, while their self-initiated creative works accumulated a total of 10 awards. These results indicate that the teaching model has gained a measure of recognition within professional evaluation systems. Although the sample size is limited, this outcome nonetheless reflects, to a certain extent, the potential role of generative artificial intelligence in expanding creative boundaries and enhancing innovative expression.

Finally, it should be noted that the data employed in this study derive primarily from observational statistics and outcome feedback within the teaching context, and a rigorously defined quantitative experimental system has yet to be established. The current analysis, therefore, is oriented more toward an interpretive validation of the creative mechanisms rather than a strict demonstration of causal relationships. That said, when viewed across the three dimensions of cognition, behavior, and outcomes, the findings still lend considerable support to the theoretical model proposed earlier in this paper.

5.5. From teaching practice to mechanism validation

Taken together with the analysis above, it is not difficult to see that, in the process of examining the pedagogical scenario of generative AI-based sound creation, rather pronounced differences emerged in cognitive structures, creative pathways, and the formal attributes of the works. These differences are not attributable merely to the introduction of technological tools but arose as the human–AI collaborative mechanism reconfigured the creative process itself.

By integrating teaching practice with the quantum cognition framework, it becomes possible to discern that, to a certain extent, the sound creation process exhibits a dynamic characteristic of “superposition, collapse, and re-generation.” This finding not only provides an entirely new theoretical perspective for understanding the participation of generative artificial intelligence in artistic creation but also furnishes a practical basis for the transformation of sound art pedagogy in higher education.

6. Conclusion

Amid the rapid development of generative artificial intelligence and its impact on the evolution of sound art creation and its pedagogical models, both sound art creation itself and its modes of teaching and learning are undergoing profound transformation. Taking quantum cognition theory as its point of departure, this paper has centered its investigation on two themes—“human–AI collaborative creation mechanisms” and “higher education paradigm transformation”—and has arrived at the following principal conclusions.

First, at the theoretical level—that is, in the course of theoretical examination—the paper introduces the quantum cognition framework into the study of sound art creation, thereby understanding the creative process as a cognitive activity characterized by indeterminacy. Through a structural analysis of the sequence of “superposition, collapse, and re-generation,” it reveals the dynamic mechanism by which creators select and adjust among a range of multiple possibilities, thereby offering a new theoretical perspective for explaining inspiration generation and decision-making processes in artistic creation.

Second, at the mechanistic level—that is, in the discussion of mechanisms—the paper constructs a model termed the “quantum cognition–generative AI coupling model.” Proceeding from the three phases of latent state generation, observational collapse, and iterative evolution, it systematically elucidates the process of human–AI co-creation. The findings indicate that generative artificial intelligence not only alters the manner in which sonic materials are generated but also reconstructs creative pathways at the cognitive level, shifting sound art from the traditional linear, experience-driven paradigm to one that is probability-driven and interaction-generated.

Furthermore, in the course of the entire teaching process, this study found that the human–AI collaborative model transformed many aspects: students’ learning motivation, their creative behavior, and ultimately the quality of the works they produced all underwent qualitative improvement. In the past, students were often passive in class, receiving a topic and thinking only of completing the task step by step; now, they actively explore various possibilities, treating AI as an extension of their own creativity rather than an external tool. More importantly, their works have received favorable evaluations in various competitions and exhibitions. These tangible changes indicate that generative artificial intelligence can indeed provide a viable pathway for the transformation of sound art education.

Finally, at the level of educational paradigms, the study finds that in the process of conducting sound art teaching in higher education, a shift should be made from a model of “skill transmission” to one of “cognitive construction,” from “tool utilization” to “human–AI collaboration,” and from “outcome orientation” to “process orientation.” Such shifts are not merely the consequence of technological development; rather, they represent a concrete manifestation, within the domain of art education, of the transformation in modes of knowledge production.

The preliminary explorations undertaken in this paper at both the theoretical and practical levels still carry certain limitations, which need to be further deepened in subsequent research. First, with respect to methodology, the study primarily draws on the analysis of teaching scenarios and observational data to support its arguments, without having yet established a rigorously defined quantitative experimental system; shortcomings therefore remain in the verification of causal relationships. In future research, expanding the sample size and introducing controlled experiments will help enhance the statistical reliability of the conclusions. Second, at the theoretical level, the quantum cognition framework adopted in this study serves primarily as a cognitive model and an interpretative tool, and its mapping relationship with actual creative behavior still requires further refined modeling—especially in terms of parametric description and computational expression, which remain insufficient. Third, at the technical level, this study's discussion of generative artificial intelligence focuses mainly on the creative mechanism level, and has not yet conducted in-depth analysis of the internal operating mechanisms of specific algorithmic architectures (such as VAE-type, Flow-based, and non-autoregressive structures); there remains considerable scope for further integration of the relevant technical details.

In summary, the integration of generative artificial intelligence with quantum cognition opens up new pathways for understanding the mechanisms of sound art creation and for advancing the transformation of higher education. As related research continues to deepen, it holds the promise of realizing a more systematic and verifiable theoretical system and exerting a sustained influence on the development of art education.

Disclosure statement

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