



Section 3. History of education of pedagogy

DOI:10.29013/EJEAP-25-4-41-49



MODAL TRANSFORMATION AND VALUE OUTLOOK OF ONLINE LEARNING IN THE CONTEXT OF METAVERSE

*Shan Wang*¹, *Jiali Yao*²

¹ Faculty of Education, Southwest University, China

² Center for Studies of Education and Psychology of Ethnic Minorities in
Southwest China, Faculty of Education, Southwest University, China

Cite: Shan Wang, Jiali Yao. (2025). *Modal Transformation and Value Outlook of Online Learning in the Context of Metaverse*. *European Journal of Education and Applied Psychology* 2025, No 4. <https://doi.org/10.29013/EJEAP-25-4-41-49>

Abstract

The advent of the Metaverse has transformed the media ecology of online learning, freeing learners from flattened, replicative, and disciplined learning spaces into a high-fidelity simulated virtual reality world characterized by creative freedom. This paradigm shift has redefined traditional human modes of physical operation, communication, and collaboration, while reshaping the inherent modalities of online learning. From the perspective of perception, the Metaverse transcends screen-mediated visual and auditory engagement, enabling integrated five-sense connectivity. In terms of knowledge construction, it liberates individuals from inherent real-world constraints, facilitating the reconstruction of knowledge and fostering exploration of innovative possibilities. With regard to thinking patterns, the fusion of fantasy and reality in virtual environments dismantles the materialistic lens of physical thinking, replacing it with highly personalized virtual thinking that offers cognitive interpretations distinct from real-world dimensions through heterogeneous time-space perspectives. The authenticity of perceptual experiences, breakthroughs in self-cognition, and imaginative learning engagement afforded by the Metaverse demonstrate that Metaverse-based learning possesses innovative and universal educational advantages compared to traditional online learning models.

Keywords: *online learning, Metaverse-based learning, media ecology, modal transformation, value outlook*

Since major global tech giants entered the Metaverse sector in 2021, the concept has gained worldwide prominence. Academic circles tend to define it as a digital medium,

intelligent technology, or form of human social development, characterized by polysemy, complexity, and inclusivity. The Metaverse's core idea of creating a "new reality" also

offers possibilities for the comprehensive and in-depth transformation of online learning. Unlike traditional internet-based learning models, the Metaverse – a virtual reality concept that integrates “blockchain, 5G, artificial intelligence, 3D, VR/AR/XR, brain-computer interfaces, and other cutting-edge technologies of humanity” (Zhao, G.D., Yi, H.H., & Xu, Y.Z., 2021)—utilizes simulation technology to construct a “digital twin” space parallel to the physical world. With the support of various sensory experience devices, learners can engage in highly realistic interactions between humans and between humans and virtual objects (Liu, G.P., Wang, X., Gao, N., et al., 2021). This means that while the Metaverse transforms traditional modes of physical operation, communication, and collaboration, it also leads the revolution of the learning ecology, shaping an entirely new learning model distinct from traditional approaches. Therefore, researchers must adopt a more developmental perspective to assess the value of the Metaverse in empowering online learning.

I. The Metaverse Drives the Innovation of the Media Ecology in Online Learning

1.1 Scenario Innovation: High-Fidelity Simulation of Learning Environments

As a concept originating from science fiction, the Metaverse’s most anticipated feature is its ability to achieve dynamic high-fidelity simulation of humans and objects. This simulation utilizes 3D display technologies (e.g., ray tracing, real-time rendering, facial capture) and virtual devices such as VR, AR, MR, and XR to create virtual scenarios more realistic than reality itself, thereby providing learners with authentic experiences characterized by greater activity, inquiry, interactivity, and immersion (Hua, Z.X., & Fu, D.M., 2022). As a tool for technology and thinking, the Metaverse not only offers crucial support for online distance education but also poses challenges to understanding its characteristics and utilizing it appropriately. Teaching interaction lies at the core of online learning; understanding the Metaverse’s essential impact on and supportive role in the interaction

process is critical to the implementation and effectiveness of online learning. Unlike traditional two-dimensional online environments, the Metaverse constructs high-fidelity simulations through digital technology and interactive support, focusing on creating a form of “mediated reality” for learners – one that encompasses three dimensions: perceptual reality, physical reality, and virtual reality.

1.1.1 Perceptual Reality: Immersive Embodiment Through Multi-Sensory Integration

Perceptual reality stems from the Metaverse’s ability to replicate real-world scenarios using emerging media technologies such as artificial intelligence, blockchain, virtual reality, and augmented reality. It constructs the three-dimensionality and authenticity of objective material existence in virtual space, transforming the fragmented state of individual perception – caused by the overextension of single senses through media terminals – into a truly immersive, embodied state where interactivity and imagination coexist. Once learners enter the Metaverse, their physical perception is fully present, enabling them to receive real-time sensory feedback from all five senses anytime, anywhere. This is the somatic reality enabled by the real-time synchronization of information between the virtual and physical worlds.

1.1.2 Physical Reality: Precision Replication of Real-World Details

Physical reality serves as the foundation for the Metaverse’s construction of authenticity. The Metaverse can fully reproduce and accurately replicate all details of real-world scenarios – such as real-time images of school campuses under different climatic conditions and vivid, dynamic details of natural landscapes. In this new media-based online learning model, learners can create or select required learning scenarios in the Metaverse at any time without physical movement, experiencing the visible, tangible, and perceptible high-fidelity simulation of the learning environment.

1.1.3 Virtual Reality: Constructing an “Authentic” Order Through Human Modeling

Virtual reality is the purpose of the Metaverse’s production of its own “authentic” order. Modern cognitive science posits

that humans are “model-building creatures” who, through information processing, can construct models of events that have not occurred or been perceived (Yu, G. M., 2021). Drawing on existing experiences, humans actively create virtual real worlds that transcend reality and psychologically “complete” virtual reality through their established cognitive structures. In other words, virtual reality produces “authenticity” through human thinking or sensory modeling. From Jean Baudrillard’s perspective, this form of authenticity replaces reality with coded simulations, further undermining the ontological status of “objective reality”—rendering the question of whether “authenticity” exists in the traditional sense irrelevant.

1.2 Production Innovation: Decentralization of Content Creation

In a decentralized institutional framework, the way individuals establish information channels is through a “P2P-based peer-to-peer communication network that bypasses platform and government control, thereby granting each individual a cyber space coordinate with high interconnections between coordinates” (Zhao, H. X., & Zhang, Z., 2018). Every learner retains the right to participate in collaboration, and the value of the final content is not determined by online platforms or administrators. This decentralized nature transforms individuals into active producers and creators, endowing the Metaverse with communist tendencies in the realms of productive forces, production relations, and superstructure. As the core values of the Metaverse, “co-creation, sharing, and co-governance” will be integrated into the digital collaborative production and daily life of groups, enabling everyone to freely contribute their abilities and enjoy the joy of creation as if playing a game.

While Web 2.0 has achieved significant breakthroughs in co-creation and sharing – for instance, content platforms such as WeChat Official Accounts, Douyin, and Bilibili provide creators with corresponding remuneration based on content quality, view counts, and likes – homogeneous content creation has increasingly drifted toward bandwagoning, plagiarism, and vulgarization driven by traffic, click-through rates, and

capital interests. This has resulted in insufficient momentum and delayed progress in knowledge innovation. Current Web 2.0 has enhanced the convenience of knowledge access for learners, and the Internet in the Web 3.0 era will rely increasingly on the production of innovative knowledge. Ikujiro Nonaka, Hirotaka Takeuchi, and others argue that “organizations cannot create knowledge; only individuals can” (Zhang, J. Y., 2021).

Built on Web 3.0 technology, the Metaverse places greater emphasis on protecting innovative intellectual property. In its early stage, it primarily stimulates the independent piecing together of node knowledge, with the long-term goal of fostering the autonomous integration of such knowledge to achieve connection and consolidation. Unstructured knowledge collisions among learners in the Metaverse often spark creativity, while the decentralized organizational function links these knowledge fragments: one viewpoint may refine another, and one idea may serve as the answer to another question. This means that decentralized organizational effects not only integrate knowledge but also maximize the liberation of learners’ intellectual vitality, making it more likely to generate cutting-edge innovative technologies and knowledge.

1.3 Documentation Innovation: Instantaneous Mediatization of Life Experiences

Kim Sang-yun argues that the life log constitutes a form of the Metaverse. A “life log refers to the act of recording, preserving, and sometimes sharing various experiences and information related to daily life” (Kim, S. Y., 2022). Common social media platforms such as Weibo, Xiaohongshu, Douyin, and Kuaishou represent the elementary manifestation of the social Metaverse. Every individual can document their observations, thoughts, feelings, and life experiences on these platforms, enabling the exchange of experiential information in interactions between individuals, individuals and communities, communities and communities, and individuals and society – thereby fostering broader and deeper life connections. This serves as a means of documenting personal growth.

William James, the “father of American psychology,” defined the self as “the sum total

of all that he can call his own. This includes not only his body and his mental capacities, but also his clothes and his house, his wife and children, his ancestors and friends, his reputation and works, his lands and horses, his yacht and bank account. All these things give him the same emotions” (Wiley, A. P., 2011). However, these emotional self-representations are ephemeral in real-world experiences. In contrast, the advanced form of the Metaverse transcends the spatial barriers between the real and virtual worlds and the temporal constraints imposed by technology, clearly storing emotions, attitudes, and imaginations from instantaneous experiences in the image repository of the digital brain. When individuals attempt to “explain the past self to the future self from the perspective of the present self,” they no longer retrieve fragmented and incomplete “selves” from fragments of real ontological memory, but encounter the original “self” in the image repository – a self that serves as an observational sample of one’s own being.

Moreover, the Metaverse can not only document the occurrence and transformation characteristics of cognition, emotion, volition, and behavior within the framework of personal growth but also facilitate dialogue with the self stored in the brain’s image repository. Through such communication and interaction, individuals can re-understand, develop, and refine themselves. They engage in knowledge production through experiential learning in the form of this heterogeneous self, thereby creating knowledge and civilization unique to the Metaverse world through cross-temporal and cross-spatial thinking, which in turn feeds back into their own growth.

2. Characteristics of the Modal Transformation of Online Learning Empowered by the Metaverse

2.1 From Weak to Strong Experiences: Embodied Immersion Through Sensory Integration

As a virtual space integrating emerging media technologies such as VR, AR, MR, and brain-computer interfaces, the Metaverse features not only the network and application layers inherent in traditional cyber-

space but also an additional perceptual layer with tactile and sensory capabilities. Wearable haptic devices provide learners with simulations of visual, auditory, tactile, and other perceptual systems, “separating each sense from the body’s wholeness and extending it further” (Yu, G. M., & Geng, X. M., 2022). While enabling learners to obtain sensory experiences identical to those in reality, these devices also allow individuals to “constantly expand the breadth and depth of social interaction through ‘externalized’ ‘organs’” (Yu, G. M., & Geng, X. M., 2022). This integration of perceptual experiences from both virtual and physical spaces into the feedback of ontological consciousness enables individuals to refine their acquisition of personal experiences through transitions between the two realms.

Unlike current learning models relying on single-sense presence, the holistic perceptual simulation provided by VR haptic devices and brain-computer interaction tools enhances learners’ perceptual telepresence, facilitating social interaction through near-authentic embodied experiences. In high-frequency, high-creativity, and high-perception learning scenarios, learners’ sensory dimensions are extended, and their immersive experiences are significantly intensified. The physical body and digital avatar become intertwined and integrated, allowing learners to immerse themselves in learning activities tirelessly and timelessly – much like embodying a game character – thus completely ignoring thoughts and perceptions unrelated to the current task. Instead, they focus entirely on momentary perceptions, application of rules, and learning inspirations – symbolic associations fully guided by the mind. This represents the optimal state of holistic perceptual learning: a “flow experience” where the mind returns to itself.

By leveraging quasi-sensory cognitive interfaces to facilitate immersive holistic perceptual learning, the Metaverse activates learners’ ability for reflective observation. The outcome is knowledge production characterized by learners’ symbolic representation or personalized interpretation of their experiences – one that incorporates greater bodily intentionality, consciousness emergence, and imaginative dimensions.

2.2 From Cognitive Deconstruction to Cognitive Reconstruction: New Perspectives on Knowledge Through Cognitive Defamiliarization

Learning in the Metaverse entails a shift from the material real world to a visual imaginative space – one unconstrained by the logic of physical reality. All knowledge, rules, and forms within this space can be disrupted, disassembled, recombined, and reconfigured, evoking surprise and unfamiliarity toward otherwise familiar things. This constitutes the fundamental basis for the formation of cognitive defamiliarization. Such a space, where the virtual intersects with the real and dreams coexist with the extraordinary, breaks down the learning subject's perception of a world dominated by physical laws. By introducing unfamiliar elements, it disrupts inherent cognitive models and thinking habits rooted in known things and experiences.

In the Metaverse, whose core tenet is “constructing what does not exist or is impossible in reality,” knowledge that “reflects the established order of the world and leads to familiarized cognitive experience” (Tan, X. C., 2004) largely loses its persuasive power to regulate behavior, inducing confusion, unfamiliarity, and disorientation. Consequently, learning subjects must transform their thinking and cognitive models to reshape the mode of knowledge production.

First, there is a need to shift from deterministic thinking. Sang Yeming and others note that once humans move from reality to the virtual world, they transition from reality-based thinking (truth-seeking and fact-finding thinking focused on “what is” and “what is not”) to virtuality-based thinking (thinking focused on “what does not exist” and “what is impossible,” exploring “how to be”). Virtual thinking is employed to verify the unknown – transcending so-called absolute evidential principles or purely objective standards to uncover unclarified facts. Learning in the Metaverse era shifts from the graphical construction of static knowledge to the dynamic construction of knowledge. By “defamiliarizing our current experiences,” existing knowledge is transformed into an unfamiliar cognitive object for anticipation, deconstruction, and reconstruction. New interpretations distinct from real-world

dimensions emerge from the completion and imagination of existing knowledge.

Second, it is necessary to transform the familiarized experiential cognitive model. Learning subjects must first strip knowledge of its old forms from their experiential schemas, experiencing and feeling the astonishment and novelty of knowledge created in the Metaverse – such as painting, sculpture, architecture, music, poetry, and other content – thereby completing a new understanding of things (Li, J.Z., & Li, Y., 2017). In addition, learning subjects should adopt a cognitive logic of fictional surprise to “fully exert bold imagination – though not entirely scientific, such imagination can stimulate creativity and inspire inventions” (Wang, L. X., Chen, H. J., Tang, Y., & Wang, C. Q., 2007). This enables them to explore possibilities unconstrained by reality and known knowledge, breaking through current cognitive dilemmas.

Cognitive defamiliarization, in essence, “conducts a priori predictions in advance through imagination, fantasy, virtual reality, thought experiments, data analysis, etc.” (Tan, W.Z., 2022). It involves grasping the laws of dynamic changes in things amid uncertainty, thereby producing knowledge that is more futuristic and developmental.

2.3 From Substantial Thinking to Virtual Thinking: New Realistic Experiences of Upgraded Comprehension

Online learning represents a replication and extension of traditional educational spaces, with no fundamental difference between teachers’ “teaching” and students’ “learning.” Day-to-day replicative learning confines learners’ thinking to a cognitive dimension where fragmented knowledge is perceived as static and isolated. It overlooks the complex interconnections and interactions between different knowledge domains, instead dominated by a “purely substantial thinking that pursues ultimate existence, eternal ontology, and absolute truth” (Chen, Z. L., & Sang, Y. M., 2004) in guiding human social practices. From Hegel’s perspective, substantial thinking is “finite thinking, for it constantly operates within the boundaries of finite thought determinations, regards these boundaries as fixed, and does not negate them further” (Hegel, G. W. F., 1981). For learning subjects, this

means “viewing everything through the lens of substantiality” in learning activities, treating knowledge acquisition as a simple structural transplantation – thus fostering a one-sided, simplistic, and self-sufficient cognition.

Substantial thinking holds that all existence is grounded in tangible substances. However, in the Metaverse, “substance” itself is a suspended concept; all things interpenetrate and integrate in the form of data, constantly generating, perishing, and being reshaped through the coding of “0s” and “1s.” It can be said that the Metaverse constructs a de-substantialized new reality that evolves, multiplies, and develops in accordance with human subjective imagination. This entails a shift in learning objects from objective existence to virtual existence, learning venues from physical spaces to virtual spaces, and learning methods from material experiences to immersive virtual experiences. Existing substantial thinking is inadequate to address these transformations in learning elements; therefore, we need highly personalized, dynamic, and more sensory virtual thinking to transcend the constraints of substantial thinking.

For learners, upon entering the Metaverse, their thinking is algorithmically edited into virtual representations. Such virtual thinking not only possesses the virtual function of “expressing and constructing things and relationships through 0–1 digital forms” but also “shares the characteristics of discontinuity, abstractness, and formalization common to object-oriented thinking in the general sense” (Zhang, S. Y., 2010). Specifically, virtual thinking exhibits two core traits: first, an AI learning trait – capable of autonomous learning, self-proliferation, and self-evolution to seek optimal solutions to problems; second, a creative trait – a high-level cognitive ability unique to humans. Human thinking inherently possesses the functions of recognizing the unknown, interpreting the unknown, and even generating knowledge in an ontological sense.

Thus, the process of engaging in virtual thinking in the Metaverse involves leveraging the underlying logic of AI algorithms to “define a thought experiment and attempt to find a possible solution to a problem through logical extrapolation or interpolation” (Scot-

to, T., & Chen, F., 2008). This reflects that the essence of learning in the Metaverse lies in applying heterogeneous research methods derived from the humanities – such as virtuality, fantasy, and prediction – to examine reality, scrutinize whether experiential expressions still hold surreal interpretations, and thereby stimulate inspiration for uncovering unknown solutions.

4. Value Prospect of the Transition from Online Learning to Metaverse Learning

4.1 Constructing a Visualized Self-Cognitive System

The Metaverse differs from the living space of the real world; it can not only simulate reality but also construct non-existent realities. In Kim Sang-yun’s *The Metaverse Era*, the life log – one form of the Metaverse – is described as an act of documenting all facts of an individual’s self-development while creating a virtual avatar of the “self” to facilitate further self-understanding. It involves preserving, recording, and sharing various information and experiences related to one’s life. Such a Metaverse functions as a super cognitive system that helps individuals gain clarity about the “self,” serving as a space where human consciousness data can be visualized and embodied.

Consciousness constitutes the content through which individuals manifest their selves. Limited individual life can be reincarnated in digital form via brain-computer interface devices, giving rise to a virtual “self.” Learning is a crucial activity for self-improvement and self-fulfillment, relying heavily on an individual’s capacity for self-reflection. Self-reflection enables individuals to identify truthful information from their self-interpretations, correct their growth paths, and ultimately cultivate a more refined self.

When the process from self-reflection to self-improvement is situated within the Metaverse – a space capable of constructing mental processes and objects – the entire process becomes fully visualized. Specifically, when reflecting on their past selves and constructing their future selves, learners can engage in clear dialogue with their virtual avatars (embodiments of consciousness), truly

connecting “selves” from different periods for free communication. More precisely, learners can converse with their “selves” possessing original memories along a self-generated timeline, accessing the feelings, emotions, and perspectives of the “past – present – future” selves toward the same or different matters. This transforms self-interpretation from a one-way process where only the “present self” describes the “past self” to the “future self” into a multi-directional exchange where virtual “selves” from all stages can interpret themselves to the current physically alive self. Consciousness data from each stage of the “self” provides the most effective path support for the “future self” an individual aspires to become.

This visualized self-improvement process allows individuals to re-understand themselves through virtual “selves” from different stages, confront their true inner selves in original memories, and thereby obtain predictive insights into the potential “future selves” they can become. This represents a further development and sublimation of the constructivist emphasis on learners’ active constructiveness, social interactivity, and situationality in the Metaverse context. It brings learners closer to the goal of becoming comprehensively developed individuals through new forms of self-construction in the learning process.

4.2 Constructing a Subject-Centered Learning Space for Learners

The Metaverse is a dwelling place of human consciousness – a space where imaginary things can be constructed through consciousness data, with all its settings rooted in human imagination. In the view of French philosopher Gaston Bachelard, “The space grasped by the imagination is no longer the impersonal space dominated by measurement and geometric thinking. It is a space experienced by humans. It is not experienced from a positivist perspective, but in the full particularity of the imagination” (Bachelard, G., 2013). Learning in the Metaverse entails the reproduction of imagination within a space chosen and dominated by the individual; its most distinctive feature is enabling learners to enter a fully absorbed and self-forgetful “flow state.” The so-called

“flow” refers to “a state in which a person is completely immersed in an activity, ignoring the existence of other things” (Csíkszentmihályi, M., 2009). Learners in this flow state can devote their entire consciousness to the current learning activity and experience unparalleled happiness in completing the learning task – representing the peak state and ultimate experience of truly enjoying the learning process.

This learning space operates around human subjectivity, serving as an immersive learning environment that allows learners to fully exert their subjective initiative, creativity, and imagination. A subject-centered learning space is equivalent to a microcosm of the learner: it can move with the learner, record and store information in real time, and protect the learner’s learning privacy. Similar to a player’s inventory in a game – where players can access their inventory at any time across different game scenarios, with only themselves aware of its contents – the core function of a subject-centered learning space is not data storage, but the ownership of media power within it. In this micro institutional structure, the learner acts as the “creator,” holding the ownership to independently dominate the production of virtual objects. In other words, the subject-centered learning space creates a “creator” role for the learner; once entering this spatial domain, the learner naturally merges with this role and subsequently enters a self-forgetful flow state. Thus, the construction of a subject-centered learning space not only provides structural guarantee for the full exertion of learners’ subjective initiative but also serves as a power guarantee for safeguarding the privacy of learners’ autonomous, self-determined, and free learning behavior data.

4.3 Providing Digital Contexts for Individual Knowledge Innovation

Imagination is the generative driving force of the Metaverse. In this space, learning existing knowledge constitutes merely a basic act of information acquisition; the true purpose of learning in the Metaverse lies in leveraging imagination for knowledge innovation ex nihilo. Knowledge innovation through imagination inherently “depends on humans’ ability to envision how things might

develop” (Tan, W. Z., 2022); proposing new theories and hypotheses requires imaginative rehearsal. In an era where artificial intelligence can possess linear thinking and fluent language expression, imagination – as Liu Cixin noted – has become “a capacity that seems to belong only to gods, whose significance far exceeds our imagination”.

Imagination propels the development of human civilization and the evolution of knowledge; it can even be argued that “knowledge is ‘solidified’ imagination, and imagination is ‘fluid’ or ‘dynamic’ knowledge” (Zhang, X. Y., 2016). The emergence of the Metaverse further unleashes human imagination, transforming imagination – previously confined to conscious interaction – into visual manifestations. It uses uncertain foresight to prepare for unrealized realities.

Innovative knowledge resembles future fragments that humans use to influence reality; it is a new gestalt discovered through absorbing and dismantling old ones. The Metaverse breaks the circular chain of knowledge weaponization and reification under institutional authorization, freeing individ-

uals from the disciplined educational space of “learning for the sake of learning” and “knowing for the sake of knowing.” It grants individuals the freedom to fully mobilize their consciousness to construct knowledge and reshape cognition. Crucially, the datafication of consciousness in the Metaverse renders imaginative objects manifest in the present moment, becoming “an ontological creation ex nihilo” (Wang, T. E., 2020).

Imagination endows individuals with the ability to reflect the “truth of the inner subjective world” through knowledge structures derived from the depths of their consciousness. No matter how bizarre such knowledge and its structures may be, they represent the clearest and most intelligible ideas of the individual learner “I”—and “no fact can guarantee its truth except the clear and distinct perception I have of it” (Gu, L. Z., 2010). This kind of knowledge is a form of symbolic production shaped by the individual’s choice of which knowledge to incorporate into conscious feedback; it is a shared conviction decoded from “my” spiritual and meaning-making worlds.

References

- Yu, G. M., Teng, W. Q., & Zhi, H. (2022). The underlying logic and key entry points of the metaverse driving social “re-tribalization.” *Future Communication*, – 29(6). – P. 2–9, 133.
- Zhao, G. D., Yi, H. H., & Xu, Y. Z. (2021). *The metaverse*. China Translation & Publishing House.
- Liu, G. P., Wang, X., Gao, N., et al. (2021). From virtual reality to the metaverse: A new direction for online education. *Modern Distance Education Research*, – 33(6). – P. 12–22.
- Hua, Z. X., & Fu, D. M. (2022). Connotation, mechanism, framework, and application of the learning metaverse: With a focus on the learning promotion effect of avatars. *Journal of Distance Education*, – 40(1). – P. 26–36.
- Yu, G. M. (2021). The evolutionary logic of future media: Iteration, reorganization, and upgrading of “human connection”—From the “age of scenarios” to the “metaverse” and then to the “spiritual world.” *Journalism Research*, – (10). – P. 54–60.
- Zhao, H. X., & Zhang, Z. (2018). A study on the spatial narrative of WeChat Moments. *Editors’ Friend*, – (6). – P. 38–43.
- Zhang, J. Y. (2021). How does knowledge drive innovation in a decentralized context? *Enterprise Economy*, – 40(2). – P. 5–13, 2.
- Kim, S. Y. (2022). *The metaverse era* (C. Liu, Trans.). China CITIC Press.
- Wiley, A. P. (2011). *The symbolic self*. Sichuan Education Press.
- Yu, G. M., & Geng, X. M. (2022). The metaverse: A future ecological landscape of mediatized society. *Journal of Xinjiang Normal University (Philosophy and Social Sciences Edition)*, – 43(3). – P. 110–118, 2.
- Tan, X. C. (2004). Dual operations in rhetorical discourse construction: Defamiliarization and familiarization. *Journal of Fujian Normal University (Philosophy and Social Sciences Edition)*, – (5). – P. 1–6.

- Li, J. Z., & Li, Y. (2017). On the similarities and differences between “defamiliarization” and “symbolization.” *Research in Chinese Literature*, – 127(4). – P. 63–66.
- Wang, L. X., Chen, H. J., Tang, Y., & Wang, C. Q. (2007). *A history of popular science for Chinese people in modern times*. Popular Science Press.
- Chen, Z. L., & Sang, Y. M. (2004). On the virtual mode of thinking. *Dongyue Tribune*, – (1). – P. 157–160.
- Hegel, G. W. F. (1981). *The lesser logic*. Commercial Press.
- Zhang, S. Y. (2010). On the essence of virtual thinking. *Journal of Chongqing University of Posts and Telecommunications (Social Science Edition)*, – 22(6). – P. 70–75.
- Scotto, T., & Chen, F. (2008). Science fiction as thought experiment. *Science & Culture Review*, – (5). – P. 71–79.
- Bachelard, G. (2013). *The poetics of space*. Shanghai Translation Publishing House.
- Csikszentmihályi, M. (2009). *Flow: The psychology of optimal experience*. China CITIC Press.
- Tan, W. Z. (2022). Treating science fiction as an educational research paradigm. *Educational Research*, – 43(5). – P. 17–33.
- Zhang, X. Y. (2016). *An outline of imagination education (Doctoral dissertation)*. East China Normal University.
- Wang, T. E. (2020). The philosophy of world-making in the era of information civilization. *Journal of Hohai University (Philosophy and Social Sciences Edition)*, – 22(4). – P. 9–16, 105.
- Gu, L. Z. (2010). *From individual knowledge to social knowledge: A study of Rorty’s epistemology*. Shanghai People’s Publishing House.

submitted 13.12.2025;

accepted for publication 27.12.2025;

published 30.12.2025

© Shan Wang, Jiali Yao

Contact: 475953067@qq.com; 419623499@qq.com