Exploring the "Technology–Process–Performance" Framework: An AIGC Application Model in Photography Courses at Universities in Shanxi, China

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Abstract

In the context of the rapid development of Artificial Intelligence Generated Content (AIGC), this study, based on the Technology Acceptance Model, Organizational Support Theory, and Industry Integration Logic, constructs a causal model of "Technology Adaptation – Teaching Process – Curriculum Performance" to examine its role in photography curriculum management at universities in Shanxi, China. A mixed-methods approach was adopted, using PLS-SEM to analyze 455 valid questionnaires, complemented by interviews with 21 teachers, students, and industry representatives. Findings indicate that AIGC Technology Adaptation, Resource Assurance, Cost Investment, and Industry Integration indirectly affect curriculum performance through the mediating roles of the Teaching Process and Industry Identity, which also exert significant direct effects. The study reveals that the impact of AIGC on curriculum performance follows multiple mediating pathways rather than a linear process. It further proposes practical strategies for "AIGC-empowered curriculum performance," offering theoretical support and practical guidance for the intelligent transformation of art and design education in higher education.

Keywords: AIGC Technology; Photography Major; Curriculum Management Performance; Structural Equation Modeling; Mixed Research Method

Introduction

With the deep integration of the global digital economy and artificial intelligence technology, the education system is undergoing profound structural changes. In particular, the rise of artificial intelligence-generated content (AIGC) has reshaped knowledge production, learning interaction, and education management models, becoming a new driving force for higher education reform. AIGC integrates natural language processing, image recognition, and multimodal generation capabilities, possesses intelligent adaptability and content construction abilities, and provides a new technological path for the supply of teaching resources, curriculum design optimization, and management model transformation in universities (He, 2023; Brown et al., 2020).

At the policy level, documents such as the "Education Informatization 2.0 Action Plan" and the "Education Digitalization Strategy Action" issued by the Ministry of Education of China explicitly advocate for the deep integration of artificial intelligence and education, to establish an intelligent education system by 2035 (Ministry of Education, 2022). Under this strategy, technologies like AIGC have evolved from auxiliary tools into core variables that influence course generation, teaching organization, and educational performance.

Art colleges and universities, especially those specializing in photography, have a natural disciplinary integration with AIGC technology, given their strong creative expression and image-generation attributes (Wang & Chen, 2022). Currently, AIGC's capabilities in image generation, visual style transfer, and virtual space modeling have covered key teaching links in traditional photography education, including material integration, composition analysis, and creative presentation. Existing research has shown that AIGC systems can effectively enhance students' creative motivation and work diversity by optimizing course content delivery and teaching feedback mechanisms. However, some scholars caution that technology integration should not be limited to convenience at the tool level, but requires a systematic evaluation of its role in curriculum adaptation, teaching intervention, and educational value reconstruction (Harasim, 2017). At the same time, the effectiveness of intelligent systems in educational practice is influenced by multiple factors such as hardware facility availability, technology adoption costs, teacher training, and institutional coordination mechanisms (Liu et al., 2023).

In response, this study focuses on the digital transformation of higher education in China, selecting six undergraduate institutions in Shanxi Province offering photography majors as the research subjects. It constructs a causal path model of "technology-process-performance" to systematically investigate the relationships among AIGC-related variables and their impact on course management effectiveness. This provides a theoretical basis and practical insights for course design, resource allocation, and teaching governance in photography education.

Research significance
(1) Theoretical significance

Current research on AIGC technology in higher education primarily focuses on disciplines such as linguistics and computer science (Slimi, 2023; Li, 2023), while systematic research in the field of art and design, especially photography, remains scarce. Photography education inherently possesses creativity, practicality, and aesthetics, heavily relying on generative technologies such as image synthesis and style transfer (Taylor & Smith, 2025). This study constructs a causal model based on photography course management, incorporating variables such as technological evolution, resource assurance, educational process, industry recognition, and course effectiveness, filling the theoretical gap in the governance structure of art course management (Fuller et al., 2024; Wang, 2024).

This study integrates the Technology Acceptance Model (TAM), Diffusion of Innovations Theory (DOI), and Curriculum Management Theory (CMT), applying them to the photography education scenario (Katsamakas, 2024; Johnson, 2023). It proposes a new paradigm of "governance embeddedness" in art education, promoting the evolution of AIGC from a teaching tool to a governance variable.

(2) **Practical significance**

As a representative of higher education in central and western China, photography majors in Shanxi (such as Shanxi Media College and Taiyuan Normal University) have laid a foundation in the field of visual communication and digital imaging, but they still rely heavily on offline teaching and experiential instruction. Through surveys and in-depth interviews, this study reveals the potential of AIGC technology in reducing teaching burden, expanding students' creative dimensions, and optimizing the allocation of teaching resources (Chen et al., 2023), providing actionable strategies for regional universities to overcome bottlenecks such as resource constraints, governance lags, and teaching inefficiencies.

The research findings can guide universities in formulating digital education strategies and developing AIGC-supported photography platforms and intelligent training modules (Ministry of Education, 2024; UNESCO, 2023). In the industrial context, photography is deeply integrating with fields such as short video production and cultural dissemination (Shanghai Municipal Bureau of Culture, 2024), and the application of AIGC can serve as a crucial link connecting academia, industry, and society.

(3) **Methodological significance**

Current research on the performance of higher education curriculum management primarily focuses on the design of quality indicators, lacking precise empirical verification of variable mechanisms (Yang & Xu, 2024). This study introduces a novel structural path framework of "AI-generated content $\longrightarrow$ educational process $\longrightarrow$ curriculum performance", integrating the complete logical chain of "technology - process - outcome", providing a new paradigm for teaching governance evaluation.

The study adopts a mixed research methodology, combining structural equation modeling (SEM) with thematic content analysis, to enhance the scientific nature of variable construction and the explanatory power of the model (Wang, 2024).

Research questions

(1) How do AIGC-related factors influence the teaching process and management performance of photography curricula?

(2) How can a causal model of AIGC-driven curriculum management be constructed for universities in Shanxi Province?

(3) How can actionable curriculum governance strategies be developed based on the constructed model?

Research objectives

(1) To clarify the mechanisms by which AIGC technology impacts photography curriculum management;

(2) To develop a regionally applicable causal model linking " Technology – Process – Performance";

(3) To propose practical strategies for advancing the intelligent transformation of photography education.

Research hypothesis

Based on the analysis of the impact of AIGC technology on the management of photography courses in universities in Shanxi Province, this study proposes the following hypotheses:

H_1:AIGC Technology Adaptatio is direct affecting to Curriculum Management Performance in Photography Programs

H_2:Industry Integration is direct affecting to Curriculum Management Performance in Photography Programs

H_3:AIGC Technology Adaptatio is indirect affecting to Curriculum Management Performance in Photography Programs through Teaching Process

H_4:Resource Assurance is indirect affecting to Curriculum Management Performance in Photography Programs through Teaching Process

H_5:Cost Investment is indirect affecting to Curriculum Management Performance in Photography Programs through Industry Identity

H_6:Industry Integration is indirect affecting to Curriculum Management Performance in Photography Programs through Industry Identity

H_7: Industry Identity is direct affecting to Curriculum Management Performance in Photography Programs

H_8: Teaching Process is direct affecting to Curriculum Management Performance in Photography Programs

Scope and limitations of the study

Scope of study

This study aims to explore the embedding mechanism and causal path of AIGC technology in the management of photography courses in universities in Shanxi Province. The research scope covers five dimensions:

Research field and theme definition: Positioned in the intersection of educational management and educational technology, it focuses on the adaptive mechanism and structural reconstruction of higher education curriculum governance in the context of intelligent technology integration.

Research Object and Sample Definition: The research object is six undergraduate and vocational colleges in Shanxi Province that offer photography majors, such as Shanxi University

and Shanxi University of Media and Communications. The sample includes photography teachers, education administrators, industry experts, and student representatives.

Variable structure and causal path definition: Construct a "technology-process-performance" causal model, encompassing 7 core variables: 4 independent variables, 2 mediating variables, and 1 dependent variable, forming 8 hypothetical paths.

Theoretical Framework and Application Boundaries: Integrating the Technology Acceptance Model (TAM), Diffusion of Innovations Theory (DOI), and Theory of Planned Behavior (TPB) to Form the Basis of Causal Paths.

Research Timeline: The research spans 12 months and is divided into six stages: theme determination, tool design, data collection, analysis, modeling, and writing recommendations.

Research limitations

(1) Geographical scope limitation: Focusing solely on universities within Shanxi Province, the generalizability of the conclusions may be constrained by regional differences

(2) Limitations in temporal design: The adoption of a cross-sectional design makes it difficult to reflect the long-term dynamic changes brought about by technological progress (Taris, 2000);

(3) Limited scope of variables: The exclusion of moderating variables such as policies and regulations, as well as teacher trust, may narrow the scope of theoretical explanation (Ajzen, 1991).

Definition of core concepts

AIGC (Artificial Intelligence Generated Content): Refers to multimodal content (text, images, etc.) automatically generated by artificial intelligence models, featuring high generative capability and adaptability, and widely applied in fields such as education and media (Dwivedi et al., 2023).

AIGC technology adaptation: The degree of integration between AIGC tools and higher education teaching systems, encompassing performance intelligence, operational flexibility, and usability and accessibility (Davis, 1989).

Resource guarantee: The technical resources provided by universities for the implementation of AIGC, such as hardware infrastructure and software platforms, are the basic conditions for the deployment of educational technology (Rogers, 2003).

Cost investment: AIGC systems incorporate both explicit and implicit expenditures, such as hardware procurement and personnel training

Industry integration: The breadth and depth of AIGC's application in photography-related industries, and its feedback effect on curriculum development (Chen & Zhao, 2023).

Teaching process: A series of teaching behaviors, including goal setting, teaching organization, assessment mechanisms, etc., serve as the mediating pathways through which AIGC influences curriculum effectiveness (Biggs & Tang, 2011).

Industry recognition: The cognition, emotional attitude, and behavioral intention of university teachers and students towards the value of AIGC in the industry (Ajzen, 1991).

Photography course management performance: The overall effectiveness of photography course management, especially in terms of goal alignment, resource allocation, and evaluation system (Chen, 2022).

Expected contributions

The main contributions of this study are reflected in four aspects:

Theoretical expansion: Integrating TAM, DOI, and TPB to construct a framework of "technology application - cognitive acceptance - performance evaluation", revealing the mechanism by which AIGC affects photography course management;

Practical innovation: Propose strategies such as AIGC platform selection and teaching process reconstruction to promote the governance transformation from content-oriented to process-oriented;

Regional policy response: Responding to the national "Digital Education Strategic Action", providing support for the technology adoption and governance capacity improvement of universities in Shanxi Province;

Model transferability: The path model can be extended to fields such as animation and media, and the dual-mediation structure is suitable for scenarios such as vocational education.

2. Literature Review

2.1 Core concepts and theoretical basis

2.1.1 Theoretical Basis

This study adopts three classic theoretical models to construct the theoretical foundation:

(1) Technology Acceptance Model (TAM)

Proposed by Davis (1986, 1989), it posits that an individual's intention to use technology is primarily influenced by perceived usefulness (PU) and perceived ease of use (PEOU) (Davis, 1989). Venkatesh and Davis (2000) expanded it to TAM2, incorporating variables such as social influence to enhance predictive power. In this study, TAM is used to explain the perception and acceptance of AIGC tools among photographers. If AIGC improves course management efficiency, its perceived usefulness will increase, thereby affecting willingness to adopt.

(2) Diffusion of Innovations Theory (DOI)

Proposed by Rogers (1962, 2003), the innovation adoption process is divided into five stages: cognition, persuasion, decision-making, implementation, and confirmation. It is believed that adoption behavior is influenced by innovation characteristics, communication channels, etc. (Rogers, 2003). In this study, DOI supports the explanation of how AIGC technology "transitions from innovation to institutionalization" in curriculum management, such as how technological adaptability is influenced by perceived advantages and compatibility, and how resource support is related to organizational characteristics.

(3) Theory of Planned Behavior (TPB)

Proposed by Ajzen (1991), the Theory of Planned Behavior (TPB) posits that behavioral intention is determined by behavioral attitude, subjective norms, and perceived behavioral

control (Ajzen, 1991). In this study, TPB supports the variable of "industry identity". The widespread application of AIGC in the photography industry creates normative pressure, prompting teachers and students to align their behaviors with professional standards.

Table 1 Theoretical Basis and Corresponding Research Variables

theoretical model	abbreviation	Core mechanism	Corresponding variable	Key assumptions
technology acceptance model	TAM	Behavioral intention is determined by perceived usefulness and ease of use	AIGC technology adaptation, teaching process, and resource guarantee	H1, H5, H8
Innovation diffusion theory	DOI	The adoption of innovation is influenced by five factors, including relative advantage and compatibility	Resource guarantee, industrial integration, cost investment	H2, H3, H4
Theory of Planned Behavior	TPB	Behavior is influenced by attitude, subjective norms, and perceived behavioral control	Industrial integration, industry recognition, and management performance of photography courses	H6, H7, H8

Variable analysis

Independent variable 1: AIGC technology adaptation

AIGC technology adaptation refers to the degree of integration between AIGC systems and higher education teaching systems. Originating from the early frameworks of DOI and TAM, it is a core construct for measuring the integration capability of educational technology (Rogers, 2003; Davis, 1989). It encompasses three dimensions:

Intelligent integration: AIGC automatically aligns with the teaching content and objectives of photography courses, enabling intelligent content generation and feedback (Zawacki-Richter et al., 2019).

Teaching adaptability: AIGC tools are flexible and adaptable to different teaching stages, supporting modular integration (Wang & Chen, 2022);

Accessibility and usability: The system should be convenient to access and easy to operate, avoiding uneven resource allocation (Slimi, 2023).

Empirical research indicates that AI platforms with high adaptability can enhance teachers' satisfaction with courses and teaching efficiency (Chen & Chan, 2022), and play a mediating role in students' creative output (Gibbs & Hall, 2023).

Independent variable 2: Resource guarantee

Resource support refers to the systematic support provided by universities for the implementation of AIGC, including hardware, software, organizational mechanisms, etc. The theoretical basis stems from the "external conditions" of DOI and TAM (Rogers, 2003; Venkatesh & Davis, 2000). It encompasses three dimensions:

Hardware infrastructure: physical foundations such as AI servers and graphics workstations

Software environment: image generation platform, AI visual recognition system, etc. (Slimi, 2023);

Institutional support: curriculum planning, teacher training, financial support, etc. (Liu & Fang, 2023).

Research indicates that there is a significant positive correlation between the resource allocation index and the frequency of teacher use of AIGC (Wang & Chen, 2022). Insufficient resource investment is the primary reason for the low adoption rate of AI in universities in developing countries (UNESCO, 2023).

Independent variable 3: Cost investment

Cost investment refers to the explicit and implicit expenditures incurred by the adoption of AIGC systems. Based on the DOI theory, the cost-benefit trade-off is a key determinant of innovation adoption (Rogers, 2003). It encompasses three dimensions:

Infrastructure costs: procurement and maintenance expenses for AI servers, GPU workstations, etc.

Software and licensing costs: expenses for software platforms, API access, AIGC toolkits, etc. (Taylor & Smith, 2025);

Human capital training costs: Investments in teacher professional development, technical seminars, etc.

Empirical research indicates that educational technology projects often terminate due to initial investment exceeding budgets (Jones & Shao, 2011), and cost concerns are the primary obstacle to the integration of AIGC in regional universities (Wang, 2024).

Independent variable 4: Industrial integration

Industrial integration refers to the breadth and depth of AIGC's application in photography-related industries and its feedback on curriculum development, based on the DOI and Technology-Organization-Environment (TOE) framework (Rogers, 2003; Tornatzky & Fleischer, 1990). It encompasses three dimensions:

Industry penetration: The degree of adoption of AIGC tools in photography-related fields (Dwivedi et al., 2023);

Curriculum responsiveness: Universities adjust the teaching objectives and content of photography courses to adapt to the AIGC trend (Chen & Zhao, 2020);

Education-industry interaction: The level of cooperation between universities and industries, including internships, collaborative projects, etc. (Perkmann et al., 2013).

Research indicates that the wider the application of AIGC in industries, the stronger the willingness of universities to adopt it, and the greater the motivation for curriculum reform (Dwivedi et al., 2023). Enterprise participation in curriculum design can significantly enhance the efficiency of resource allocation.

Mediating variable 1: Teaching process

The teaching process refers to the systematic and dynamic mechanism formed around curriculum implementation, teaching methods, student participation, etc., and is the intermediary path through which AIGC (Active Incorporation of General Competencies) influences curriculum effectiveness (Biggs & Tang, 2011). It encompasses three dimensions:

Course objectives: clarity, measurability, and integration with AIGC;

Teaching structure: organization of teaching activities, teacher-student interaction, resource allocation, etc. (Kember, 2005);

Evaluation mechanism: Formative and summative assessments to monitor learning progress and teaching effectiveness (Black, 1998).

Research indicates that a well-designed teaching process can enhance satisfaction with course management and student engagement, while AIGC tools can enhance teaching interaction and creative participation.

Mediating variable 2: Industry identity

Industry identity refers to the cognition, emotional attitude, and behavioral intention of college teachers and students towards the value of AIGC in the photography industry, based on organizational identity theory (Ashforth & Mael, 1989). It encompasses three dimensions:

Cognitive recognition: Understanding of the structure, development trends, and technological integration of the photography industry (Ashforth & Mael, 1989);

Emotional involvement: teachers' and students' interest in the photography industry, sense of belonging, and value recognition (Ashforth & Mael, 1989);

Behavioral intention: the willingness to participate in industry activities, enhance professional skills, and plan career development (Ajzen, 1991).

Research indicates that industry identity can enhance students' self-efficacy (Guan et al., 2020). Under the influence of AIGC, industry identity undergoes cognitive reconstruction, emotional transformation, and behavioral transfer (Wang, 2022).

Dependent variable: Management performance of photography professional courses

Course management performance refers to the overall effectiveness of photography course management, especially in terms of goal alignment, resource allocation, and evaluation

system. It is the core outcome variable for evaluating the optimization of course governance structure (Chen, 2022). It includes three dimensions:

Alignment of curriculum objectives: The scientific nature of curriculum objective design and its guidance for teaching activities (Biggs, 2011);

Resource coordination: Optimization and integration of resources such as physical equipment, teaching platforms, and teaching staff (Wang, 2022);

Performance evaluation: A diversified evaluation mechanism that dynamically monitors teaching processes and learning outcomes (Black, 1998).

Research indicates that curriculum performance evaluation in the context of AI integration should place greater emphasis on process collaboration and system effectiveness (Wang, 2024), and efficient resource coordination and scientific evaluation can enhance teaching effectiveness (Kezar, 2017).

Research conceptual framework

Based on TAM, DOI, and TPB, this study constructs a "technology-process-performance" causal model, encompassing four independent variables (AIGC technology adaptation, resource guarantee, cost investment, and industry integration), two mediating variables (teaching process and industry recognition), and one dependent variable (photography course management performance), forming eight hypothetical paths (as shown in Figure 2-1).
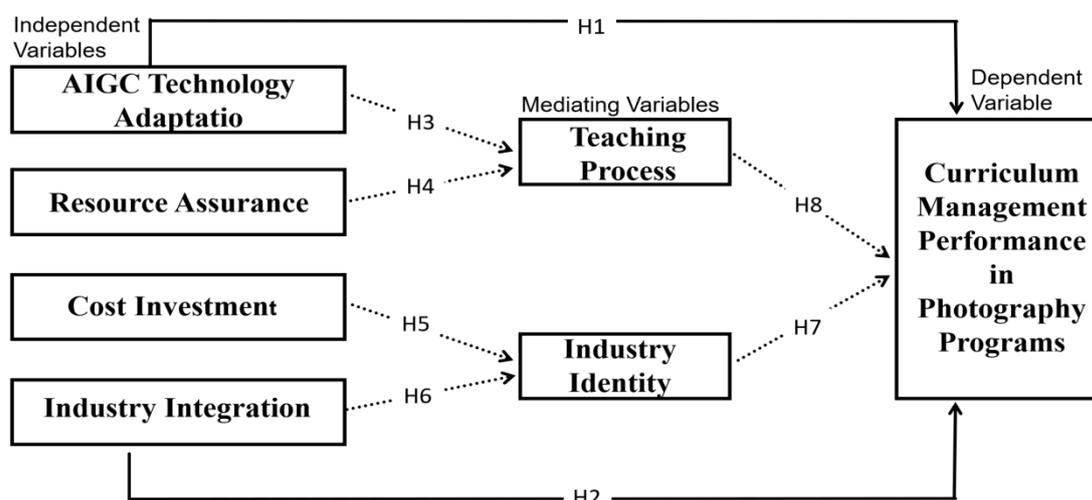
Figure 1 Conceptual Framework Diagram

The model emphasizes the mediating role of technological adaptability and industrial embeddedness in performance enhancement, providing a systematic analytical framework for AIGC-driven educational transformation and guiding policy formulation and teaching practice.

Research methodology

Research Methodology and Design

This study adopts a mixed research methodology, integrating both quantitative and qualitative analyses:

Literature review: Systematically analyze relevant research on AIGC technology adaptation, photography curriculum governance, etc., and clarify variable definitions and hypothesis foundations (Webster & Watson, 2002);

Structured questionnaire: A questionnaire was distributed to photography majors from 6 universities in Shanxi, covering 7 core variables and using a 5-point Likert scale. A total of 455 valid questionnaires were collected, with an effective rate of 94.4% (Dillman et al., 2014);

Semi-structured interviews: Conduct interviews with 21 stakeholders (teachers, students, industry representatives) to explore topics such as AIGC application and teaching process (Kvale & Brinkmann, 2009);

Structural Equation Modeling (SEM): Utilizing AMOS software to analyze variable relationships, test direct and indirect effects, and evaluate model fit (Byrne, 2016);

Triangulation: Integrating literature, questionnaire, and interview data to ensure research rigor (Creswell & Plano Clark, 2017).

The research design is divided into four stages: preparation (theoretical construction, tool design), data collection (questionnaire, interview), analysis (SEM, thematic analysis), and conclusion (results synthesis, suggestion proposal).

Variables and Measurement

Variables are categorized into independent variables, mediating variables, and dependent variables, forming a "technology-process-performance" framework:

Independent variables: AIGC technology adaptation (3 dimensions), resource guarantee (3 dimensions), cost investment (3 dimensions), and industrial integration (3 dimensions);

Mediating variables: teaching process (3 dimensions), industry identity (3 dimensions);

Dependent variable: Photography course management performance (3 dimensions).

The measurement employed a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). Content validity was ensured through expert review and pre-testing, and the Cronbach's α coefficients were all > 0.7, meeting the reliability criteria.

Research subjects and samples

Overall: 482 teachers and administrators from photography departments of 6 universities in Shanxi, covering comprehensive, teacher-training, art, and vocational colleges; as shown in Table 3-1

Questionnaire sample: Adopting a census strategy, covering the entire population, ensuring data representativeness, the sample includes respondents with different teaching experience and course types;

Interview sample: 21 individuals (6 teachers, 12 students, 3 industry representatives), using purposive sampling to ensure information richness.

Table 3-1: Demographic Data Table

No.	University Name	University Type	Number of Teachers (Photography)	Number of Teaching Staff	Total Number	Percentage (%)
1	Shanxi University	Public Comprehensive	88	40	128	26.56%
2	Taiyuan University of Technology	Public Comprehensive	57	26	83	17.22%
3	Shanxi Normal University	Public Normal	38	19	57	11.83%
4	Shanxi University of Media and Communications	Public Arts	76	32	108	22.41%
5	Shanxi Engineering and Technology Vocational College	Public Vocational	38	18	56	11.62%
6	Jinzhong University	Public Local	34	16	50	10.37%
	Total	—	331	151	482	100.00%

Research tools

1. Questionnaire

It consists of two parts. The first part involves demographic information, while the second part contains 49 core variable items. It is designed based on a theoretical framework and optimized through expert review and pre-testing.

Each of the seven variables is broken down into three dimensions, with each dimension assessed by 1–3 specific items. Key dimensions include technology adaptation, resource support, teaching process, and industry identification.

Table 3-2 Overview of Questionnaire Structure

Variable	Type	Dimensions	Number of Items per Dimension
AIGC Technology Adaptation	Independent	Intelligence Level, Selection Ability, Popularity	6–8
Resource Support	Independent	Hardware Infrastructure, Software Systems, Connectivity	6–8
Cost Input	Independent	Initial Investment, Operating Costs, Institutional Burden	6–8
Industry Integration	Independent	Application Scenarios, Functional Integration, Value Perception	6–8

Variable	Type	Dimensions	Number of Items per Dimension
Educational Process	Mediating	Course Objectives, Teaching Structure, Evaluation Mechanism	6–8
Industry Identification	Mediating	Cognitive Understanding, Emotional Attitude, Behavioral Intention	6–8
Photography Course Performance	Dependent	Goal Setting, Resource Coordination, Evaluation System	6–8

2. Interview outline

Design differentiated questions for teachers, students, and industry representatives, focusing on variables such as AIGC technology adaptation, resource support, and teaching process.

Table 3 Interview Sample Selection Table

Category	Institution/Organization	Participants	Selection Criteria	Interview Mode	ID Format
Teachers	6 universities offering photography	6	One per institution; varied by title, seniority, subject	Online/Offline	T01–T06
Students	Same 6 universities (junior & senior)	12	Two per institution; gender balanced, high engagement	Online/Offline	S01–S12
Industry Pros	Photography/Media/Advertising firms	3	Senior professionals with AIGC image tech experience	Primarily online	E01–E03
Total	—	21	—	—	—

3. Reliability and Validity

To ensure the measurement quality of the research instruments, a small-scale pilot survey was conducted before the formal distribution of the questionnaire. Based on the pilot results, the questionnaire was structurally optimized and its indicators adjusted. Subsequently, SPSS and AMOS software were used to conduct reliability and validity analyses, confirming that the instrument possesses good internal consistency and structural validity, making it suitable for subsequent empirical research.

(1) Pilot Survey and Instrument Optimization Process

In January 2025, a pilot survey was conducted by randomly selecting 20 photography instructors and 10 senior-year students from two universities in Shanxi Province. The purposes of the pilot were to:

Test the clarity and comprehensibility of each questionnaire item;Examine internal consistency of the scale;Collect textual feedback from respondents regarding item phrasing,

terminology, and logical flow; Based on the feedback, adjustments were made to redundant or vague items. For instance, abstract expressions were specified and scale wording was standardized, ensuring each observed item closely aligns with its corresponding dimension and enhancing content validity. The revised questionnaire was then used in the full-scale survey.

(2) Reliability Analysis

Reliability Assessment Method

Reliability reflects the consistency and stability of a measurement tool. This study uses Cronbach's **α** coefficient as the main indicator of reliability. Generally:

α ≥ 0.9 indicates excellent reliability;0.8–0.9 indicates good reliability;0.7–0.8 is considered acceptable.

Reliability Optimization during the Pilot

During the pilot phase, Cronbach's **α** was calculated for each variable, along with the "**α** if Item Deleted" values to determine whether the removal of any item would increase reliability. For dimensions with relatively low reliability, items were revised based on expert feedback, including semantic clarification and item reordering to enhance internal consistency.

Overall Reliability Results

After revisions, Cronbach's **α** coefficients for all variables were above 0.85, indicating high internal consistency and suitability for structural equation modeling. See the summary below:

Table 4 Reliability Analysis: Cronbach's **α** Coefficients by Variable

Variable Name	No. of Dimensions	No. of Items	Cronbach's α	Reliability Description
AIGC Technology Adaptation (ATA)	3	7	0.893	Good
Resource Support （RA）	3	7	0.902	Good
Cost Input (CI)	3	7	0.885	Good
Industry Integration (II)	3	7	0.918	Excellent
Teaching Process (TP)	3	7	0.886	Good
Professional Identity (ID)	3	7	0.901	Good
Course Performance (CMP)	3	7	0.927	Excellent

α if Item Deleted

To examine the contribution of each item to overall reliability, SPSS was used for "**α** if Item Deleted" analysis. Results show that for most items, the overall **α** value decreased or remained stable upon deletion, indicating the rationality and effectiveness of item design. No further deletions were necessary. See below for selected examples:

Table 5 α if Item Deleted (Sample Variables)

Variable	Item Code	Original α	α if Item Deleted	Retention Recommendation
ATA	ATA3	0.893	0.874	Yes
RA	RA4	0.902	0.888	Yes
CI	CI6	0.885	0.867	Yes
II	II2	0.918	0.913	Yes
TP	TP5	0.886	0.859	Yes

(3) Validity Analysis

Construct Validity

Construct validity evaluates whether a scale effectively measures the theoretical constructs it intends to capture. This study assessed construct validity through expert review, logical consistency checks among dimensions, and factor analysis.

Content Validity: Six experts (three in educational technology, two photography instructors, and one AI researcher) were invited to review the questionnaire. They confirmed that the items demonstrated adequate coverage, clarity, and alignment with their respective dimensions.

Correlation Analysis: Each dimension showed a significant positive correlation with the total score of its corresponding variable ($p < 0.01$), further supporting structural consistency.

Confirmatory Factor Analysis (CFA)

Confirmatory factor analysis (CFA) was conducted using AMOS 26.0 to assess the model's goodness-of-fit and validate the measurement structure. Results indicated the following:

The model demonstrated a good fit:

χ^2/df = 2.41

RMSEA = 0.048

CFI = 0.952

TLI = 0.944

All standardized factor loadings were greater than 0.6 and statistically significant at the 0.001 level.

Average Variance Extracted (AVE) > 0.5 and Composite Reliability (CR) > 0.7 for all variables, indicating strong convergent validity.

Discriminant validity among latent constructs was also confirmed through variance analysis.Fit indices met recommended standards, as shown in Table 3-10.

Table 6 CFA Model Fit Indices

Fit Index	Value	Recommended Range	Fit Interpretation
χ^2/df	2.41	< 3.0	Good
RMSEA	0.048	< 0.08	Excellent Fit

Fit Index	Value	Recommended Range	Fit Interpretation
CFI	0.952	> 0.90	Excellent Fit
TLI	0.944	> 0.90	Excellent Fit
SRMR	0.042	< 0.08	Excellent Fit

All variables' AVE and CR values exceed recommended thresholds, as shown in Table 3-11.

Table 7 Summary of Validity Assessment (AVE and CR)

Variable Name	AVE	CR	Validity Conclusion
AIGC Technology Adaptation (ATA)	0.582	0.892	Valid
Resource Support RA	0.601	0.905	Valid
Cost Input (CI)	0.573	0.881	Valid
Industry Integration (II)	0.625	0.916	Valid
Teaching Process (TP)	0.594	0.888	Valid
Professional Identity (ID)	0.607	0.902	Valid
Course Performance (CMP)	0.639	0.929	Valid

In summary, the questionnaire demonstrates high reliability and sound construct validity. These qualities ensure the instrument is suitable for subsequent structural equation modeling (SEM), including path validation and causal inference.

Data collection and analysis

Data collection: The questionnaire is distributed through a combination of online and offline channels, and interviews are conducted via Zoom or face-to-face, with audio recording and transcription throughout the process.

Data processing: After cleaning the questionnaire data (excluding samples with missing values > 15% and logical contradictions), it was entered into SPSS, and the interview texts were imported into NVivo 12 for coding.

Data analysis: SPSS was used for descriptive statistics, reliability, and validity analysis, while AMOS was employed for SEM analysis to test model fit and hypotheses. NVivo was utilized for thematic coding and semantic co-occurrence analysis.

Results and Analysis

Basic characteristics of the sample

Among the 455 respondents, the gender distribution is balanced (54.5% male, 45.5% female); the institutions are mainly Shanxi University (26.6%) and Shanxi Media College (22.6%); the occupational roles include frontline teachers (65.5%), program leaders (20.2%), etc.; the teaching experience is mainly over 7 years (63.3%); the course types cover basic photography (31.4%), AIGC creation (17.8%), etc. The sample structure is diverse and regionally representative.

Descriptive statistics of variables

Table 4-1 Reliability and Validity of Latent Construc

Serial Number	Variable	Mean	SD	describe
1	AIGC technology adaptation (ATA)	4.20-4.23	0.54-0.60	The "agree + strongly agree" rate for "AIGC tools enhance intelligent image generation capabilities" (ATA1) is 97.4%, indicating that teachers and students have a positive evaluation of the adaptability of AIGC technology
2	Resource Assurance (RA)	4.04-4.05	0.40-0.42	The "agree + strongly agree" rate for "the institution provides comprehensive image processing facilities" (RA1) is 97.2%, reflecting that the overall resource guarantee is sufficient
3	Cost Input (CI)	3.91-3.92	0.39-0.40	The "agree + strongly agree" rate for "AIGC platform is cost-effective" (CI2) is 89.7%, indicating that the cost investment has been recognized
4	Industrial integration (II)	4.12-4.13	0.43-0.45	The "agree + strongly agree" rate for "AIGC is widely used in post-production in the photography industry" (II1) is 96.3%, indicating a high degree of industry integration
5	Teaching process (TP)	3.71-3.73	0.56-0.57	The "agree + strongly agree" rate for "course objectives explicitly incorporate AIGC skills" (TP1) is 72.3%, indicating that the integration of teaching processes needs to be further deepened
6	Industry identity (ID)	3.61-3.63	0.56-0.60	The percentage of "agree + strongly agree" for "familiar with the application areas of AIGC in the photography industry" (ID1) is 64.7%, indicating a need for enhanced industry awareness
7	Course Management Performance (CMP)	3.75-3.76	0.58-0.59	The "agree + strongly agree" rate for "integrating AIGC-related abilities into curriculum objectives" (CMP1) is 72.8%, with a moderate performance

Structural equation modeling analysis

1. Reliability and Validity of Latent Constructs

Table 4-2 Construct Reliability and Convergent Validity

Latent Variable	Cronbach's α	CR	AVE	Reliability	Convergent Validity
AIGC Technology Adaptation (ATA)	0.913	0.931	0.655	Satisfactory	Satisfactory
Resource Support RA	0.919	0.937	0.679	Satisfactory	Satisfactory
Cost Investment (CI)	0.905	0.928	0.628	Satisfactory	Satisfactory
Industry Integration (II)	0.921	0.938	0.651	Satisfactory	Satisfactory
Teaching Process (TP)	0.912	0.934	0.667	Satisfactory	Satisfactory
Professional Identification (ID)	0.923	0.939	0.671	Satisfactory	Satisfactory
Curriculum Performance (CMP)	0.918	0.936	0.660	Satisfactory	Satisfactory

Following Fornell & Larcker (1981), thresholds of Cronbach's α and CR ≥ 0.70 and AVE ≥ 0.50 were met or exceeded for all constructs. Cronbach's α values surpassed 0.90, and CR values exceeded 0.93, confirming strong internal consistency and construct coherence. AVE values above 0.60 indicate robust convergent validity. The mediators—Teaching Process (TP) and Professional Identity (ID)—show particularly high reliability (α > 0.91; CR > 0.93), underscoring their stability. Exogenous constructs, including Cost Investment (CI) and Resource Support (RA), also demonstrate solid measurement design. Overall, the measurement model fully satisfies reliability and validity criteria, ensuring a robust foundation for subsequent structural and mediation analyses.

2. Discriminant Validity Analysis: HTMT Criterion

Table 4-3 HTMT Matrix of Latent Constructs

	ATA	RA	CI	II	TP	ID	CMP
ATA	—	0.723	0.691	0.704	0.789	0.676	0.681
RA		—	0.735	0.698	0.802	0.667	0.665
CI			—	0.721	0.695	0.786	0.693
II				—	0.740	0.842	0.719
TP					—	0.743	0.803
ID						—	0.833
CMP							—

As shown in Table 4-3, all HTMT values fall below the 0.85 threshold, indicating excellent discriminant validity across all latent constructs. This suggests that the constructs

are empirically distinct and that the questionnaire design demonstrates strong conceptual clarity and measurement precision.

3. Structural Equation Modeling (SEM) Analysis

Table 4-4 Path Coefficients and Significance Tests

Path	Standardized Coefficient (β)	(SE)	T-value	P-value	Significance
ATA $\longrightarrow$ TP	0.365	0.040	6.938	0.000	Significant
ATA $\longrightarrow$ CMP	0.212	0.044	2.477	0.013	Significant
RA$\longrightarrow$ TP	0.239	0.045	5.426	0.000	Significant
CI $\longrightarrow$ ID	0.349	0.042	5.965	0.000	Significant
II $\longrightarrow$ ID	0.287	0.035	7.980	0.000	Significant
II $\longrightarrow$ CMP	0.152	0.042	2.406	0.016	Significant
TP $\longrightarrow$ CMP	0.215	0.048	6.752	0.000	Significant
ID $\longrightarrow$ CMP	0.187	0.048	6.360	0.000	Significant

Note: T > 1.96 and P < 0.05 indicate statistically significant paths.

Table 4-5 R² and Q² Values for Latent Constructs

Construct	R²	Interpretation	Q²	Predictive Relevance
Teaching Process (TP)	0.405	Moderate	0.263	Moderate
Professional Identity (ID)	0.411	Moderate	0.271	Moderate
Curriculum Performance (CMP)	0.562	Moderate to High	0.362	Strong87

All structural paths were significant (p < 0.05), confirming that AIGC Technology Adaptation (ATA), Resource Support (RA), Cost Investment (CI), and Industry Integration (II) influence Curriculum Management Performance (CMP) directly and indirectly via Teaching Process (TP) and Professional Identity (ID). The strongest mediation effects were TP $\longrightarrow$ CMP (β = 0.215) and ID $\longrightarrow$ CMP (β = 0.187), highlighting the importance of process optimization and identity formation. ATA $\longrightarrow$ TP and RA $\longrightarrow$ TP show that technology alignment and resource adequacy enhance instructional processes, while CI $\longrightarrow$ ID and II $\longrightarrow$ ID indicate that investment and industry collaboration strengthen faculty identification. The model demonstrates strong explanatory power, explaining 56.2% of CMP variance (R² > 0.50) and high predictive validity (Q² = 0.362), ensuring practical applicability for forecasting curriculum performance. Mediation analysis, using SmartPLS bootstrapping (5,000 resamples), confirmed the indirect effects of AIGC-related factors through TP and ID, with detailed results in Table 4.4

4. Mediation Effect Analysis

Table 4-6 Indirect Effects and Confidence Interval Analysis

Mediation Path	Indirect Effect (β)	Lower Bound (95% CI)	Upper Bound (95% CI)	CI Includes 0?	Significance (P < 0.05)	Mediation Type
ATA $\longrightarrow$ TP $\longrightarrow$ CMP	0.078	0.026	0.199	No	Significant	Partial mediation
RA $\longrightarrow$ TP $\longrightarrow$ CMP	0.051	0.019	0.185	No	Significant	Full mediation
CI $\longrightarrow$ ID $\longrightarrow$ CMP	0.065	0.020	0.173	No	Significant	Full mediation
II $\longrightarrow$ ID $\longrightarrow$ CMP	0.053	0.035	0.178	No	Significant	Partial mediation

Note: A mediation effect is considered significant when the confidence interval does not include zero.

Table 4.6 shows that all mediation pathways are statistically significant, with confidence intervals excluding zero. Teaching Process (TP) and Professional Identity (ID) are key mediators linking technological factors to Curriculum Management Performance (CMP). AIGC Technology Adaptation (ATA) has a partial mediation via TP (β = 0.078), indicating that technological compatibility improves instructional flow and structure. Resource Support (RA) exerts no direct effect but has a full mediation via TP (β = 0.051), suggesting its influence operates entirely through teaching enhancements. Cost Investment (CI) impacts performance solely via ID (β = 0.065), showing that effective investment boosts faculty motivation and commitment. Industry Integration (II) has both direct and indirect effects via ID (β = 0.053), underscoring the value of aligning curricula with industry trends. Overall, TP and ID act as essential bridges in the "Technology $\longrightarrow$ Process $\longrightarrow$ Performance" chain, guiding technology-driven curriculum reform in higher education.

5. Model Fit Analysis

Table 4-23 Overall Model Fit Indices

Fit Index	Abbreviation	Recommended Threshold	Observed Value	Interpretation
Standardized Root Mean Square Residual	SRMR	< 0.08	0.062	Low residuals, indicating good model fit
Goodness-of-Fit Index	GoF	> 0.36 (high fit)	0.438	High level of overall model fit

Fit Index	Abbreviation	Recommended Threshold	Observed Value	Interpretation
Normed Fit Index	NFI	Closer to 1 is better	0.911	Strong structural fit
Chi-square/df	χ^2/df	< 5 (empirical threshold)	2.87	Acceptable level of model significance
Squared Euclidean Residuals	d_ULS	Closer to 0 is better	0.118	Within acceptable range
Geodesic Distance Residuals	d_G	Closer to 0 is better	0.085	Within acceptable range

All fit indices confirm strong model adequacy in PLS-SEM. SRMR = 0.062 (<0.08) indicates excellent alignment between model and data. GoF = 0.438 reflects high explanatory and predictive power, while NFI = 0.911 shows close correspondence between structural design and empirical relationships. The Chi-square/df ratio (2.87) falls below the accepted 3–5 range, confirming parsimony and fit. Both d_ULS (0.118) and d_G (0.085) are within acceptable limits, reinforcing robustness. Collectively, these metrics validate the "Technology–Process–Performance" model as statistically sound, theoretically coherent, and practically applicable, providing a solid foundation for path analysis and hypothesis testing.
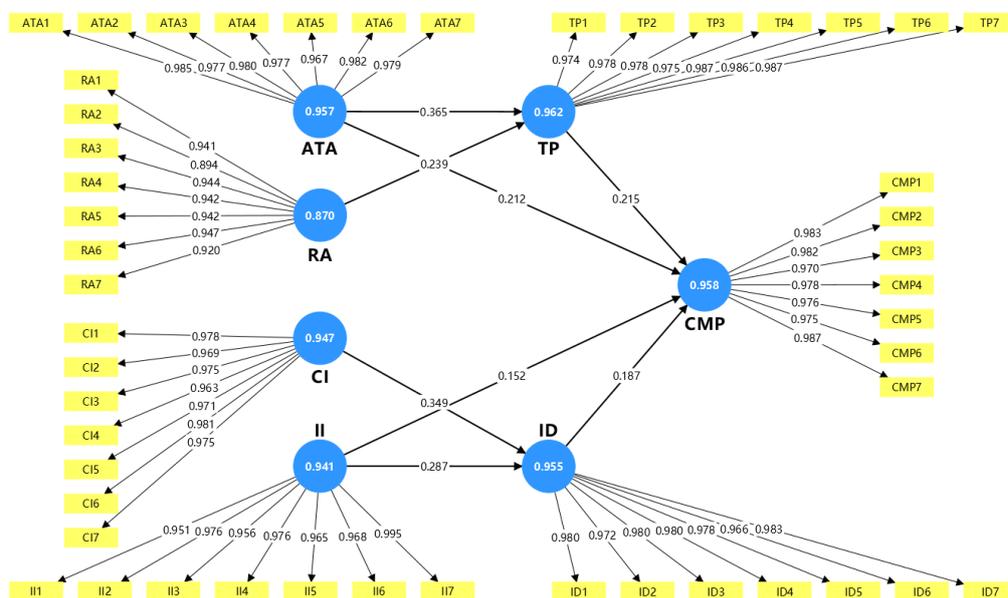

Figure 4-1 presents the complete model with latent constructs and standardized coefficients.

Figure 4-1 presents a structural equation model with four independent variables (ATA, RA, CI, II), two mediators (TP, ID), and one dependent variable (CMP), forming the "Technology → Process → Performance" framework. All paths are significant (p < 0.05): ATA and RA positively affect TP; CI and II influence ID; both mediators enhance CMP. While RA and CI have weaker direct effects, they exert indirect impacts via TP and ID. The model explains 92.2% of

TP, 92.9% of ID, and 93.1% of CMP variance, indicating strong explanatory power. A dual mediation structure emerges—ATA/RA ⟶ TP ⟶ CMP and CI/II ⟶ ID ⟶ CMP—highlighting the role of industry trends in shaping identity and driving teaching reform.

Analysis of interview results

The NVivo coding of 21 interviewees shows that:

Technical adaptation: Teachers believe that tools like Midjourney "enhance teaching efficiency and students respond positively" (T03), while students say that "AIGC lowers the threshold for creation" (S07);

Resource guarantee: After the upgrade of laboratory equipment, it "operates smoothly" (T01), but there are issues such as "cumbersome platform login" (T03);

Teaching process: The course objectives are more focused on AIGC skills, and the evaluation shifts to a mixed mode of "process + outcome" (T02);

Industry recognition: Both teachers and students acknowledge AIGC as a "must-have skill for the future" (S09), and the industry emphasizes that "graduates need to master AI tools" (E01).

The interview results are highly consistent with the quantitative model, validating the rationality of the "technology-process-performance" pathway.

Discussion and Conclusion

(1) The impact of AIGC technology on the performance of photography course management is realized through multiple mediating paths: technology adaptation and resource guarantee indirectly affect performance through the teaching process, while cost investment and industry integration indirectly affect performance through industry recognition;

(2) The teaching process and industry recognition serve as both mediating variables and have a direct effect on performance, reflecting the synergistic mechanism of "process optimization + recognition enhancement";

(3) Resources and costs need to be transformed into teaching practices and teacher-student recognition to enhance performance, highlighting the importance of the synergy of "hardware + software + humanware".

Theoretical and practical contributions

Theoretical contribution: Integrating multiple theories to construct an AIGC application model for art education, revealing the boundary conditions of technology's impact on curriculum management; proposing the "governance embeddedness" paradigm to promote the evolution of AIGC from a tool to a governance variable;

Practical suggestions: Optimize the selection of AIGC tools to promote alignment with teaching objectives; establish a "human-machine collaboration" teaching process, and reconstruct course objectives and evaluations; deepen industry-education integration to enhance industry recognition among teachers and students.

Research limitations and prospects

Limitations: The sample is limited to universities in Shanxi Province, and no moderating variables are included. Rapid technological iteration may affect model stability. In the future, cross-regional comparisons and longitudinal studies can be conducted, and variables such as teacher trust can be introduced to enhance the model's universality and dynamism.

References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Ashforth, B. E., & Mael, F. (1989). Social identity theory and the organization. *Academy of Management Review*, 14(1), 20–39. https://doi.org/10.5465/amr.1989.4278999

Brown, T. B., Mann, B., Ryder, N., Subbiah, M., Kaplan, J., Dhariwal, P., ... & Amodei, D. (2020). Language models are few-shot learners. *Advances in Neural Information Processing Systems*, 33, 1877–1901. https://doi.org/10.48550/arXiv.2005.14165

Chen, J., & Chan, K. (2022). Artificial intelligence in higher education: A systematic review of adoption and challenges. *Education and Information Technologies*, 27(8), 10939–10961. https://doi.org/10.1007/s10639-022-11050-4

Chen, Y., & Zhao, H. (2023). Industry–education integration in the era of artificial intelligence: Opportunities and challenges. *Higher Education Research & Development*, 42(5), 941–956. https://doi.org/10.1080/07294360.2022.2160140

Creswell, J. W., & Plano Clark, V. L. (2017). *Designing and conducting mixed methods research* (3rd ed.). SAGE.

Dwivedi, Y. K., Kshetri, N., Hughes, L., Slade, E. L., Jeyaraj, A., Kar, A. K., ... & Wright, R. (2023). "So what if ChatGPT wrote it?" Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI. *International Journal of Information Management*, 71, 102642. https://doi.org/10.1016/j.ijinfomgt.2023.102642

Fuller, C., Marshall, J., & Taylor, S. (2024). Artificial intelligence and creative pedagogy in art and design education. *British Journal of Educational Technology*, 55(2), 456–471. https://doi.org/10.1111/bjet.13334

Gibbs, G., & Hall, S. (2023). Artificial intelligence in creative education: Rethinking student engagement and assessment. *Computers & Education*, 197, 104734. https://doi.org/10.1016/j.compedu.2023.104734

He, Q. (2023). Generative artificial intelligence and higher education: A new paradigm of teaching innovation. *Frontiers in Education*, 8, 1147256. https://doi.org/10.3389/feduc.2023.1147256

Johnson, M. (2023). Technology acceptance and the future of AI in education. *Educational Technology Research and Development*, 71(4), 1889–1907. https://doi.org/10.1007/s11423-023-10219-5

Katsamakas, E. (2024). From adoption to transformation: Toward a theory of generative AI in higher education. *Information Systems Journal*, 34(2), 345–369.

https://doi.org/10.1111/isj.12412

Li, F., & Chen, Y. (2023). Artificial intelligence and curriculum reform in Chinese higher education. *Asia Pacific Education Review*, 24(1), 1–14. https://doi.org/10.1007/s12564-022-09795-3

Liu, Y., Fang, Z., & Zhou, H. (2023). Digital transformation of higher education: Resource support and governance innovation. *Journal of Higher Education Policy and Management*, 45(6), 571–588. https://doi.org/10.1080/1360080X.2023.2185784

Slimi, Z. (2023). Pedagogical opportunities and challenges of ChatGPT in higher education: A systematic review. *Education and Information Technologies*, 28(9), 10019–10037. https://doi.org/10.1007/s10639-023-11518-6

Taylor, A., & Smith, R. (2025). The future of creative arts education in the age of generative AI. *International Journal of Art & Design Education*, 44(1), 23–39. https://doi.org/10.1111/jade.12510

UNESCO. (2023). Miao, F., & Holmes, W. (Authors). *Guidance for generative AI in education and research*. UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000386693

Wang, H., & Chen, J. (2022). AI-assisted teaching practices in Chinese higher education: Adaptation and challenges. *Interactive Learning Environments*, 30(8), 1503–1519. https://doi.org/10.1080/10494820.2021.1871634

Wang, Y. (2024). Educational governance in the era of intelligent technology: A new framework for higher education management. *Studies in Higher Education*, 49(3), 389–406. https://doi.org/10.1080/03075079.2023.2172810

Yang, X., & Xu, J. (2024). Evaluating curriculum performance in higher education: A structural equation modeling approach. *Assessment & Evaluation in Higher Education*, 49(2), 211–227. https://doi.org/10.1080/02602938.2023.2238572

Biggs, J., & Tang, C. (2011). *Teaching for quality learning at university* (4th ed.). McGraw-Hill Education.

Biggs, J. (2011). *Teaching for quality learning at university* (4th ed.). McGraw-Hill Education.

Black, P., & Wiliam, D. (1998). *Assessment and Classroom Learning. Assessment in Education: Principles, Policy & Practice*, 5(1), 7-74. https://doi.org/10.1080/0969595980050102

Byrne, B. M. (2016). *Structural equation modeling with AMOS: Basic concepts, applications, and programming* (3rd ed.). Routledge. https://doi.org/10.4324/9781315757421

Davis, F. D. (1986). *A technology acceptance model for empirically testing new end-user information systems: Theory and results* [Doctoral dissertation, Massachusetts Institute of Technology].

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319-340.

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: The tailored design method* (4th ed.). Wiley.

Harasim, L. (2017). *Learning theory and online technologies* (2nd ed.). Routledge/Taylor & Francis.

Jones, C., & Shao, B. (2011). *The net generation and digital natives: Implications for higher education*. York: Higher Education Academy.

Kember, D., & Leung, D. Y. P. (2005). *The influence of the teaching and learning environment on the development of generic capabilities needed for a knowledge-based society. Learning Environments Research, 8*(3), 245-266. https://doi.org/10.1007/s10984-005-1566-5

Kezar, A. (2017). *How colleges change: Understanding, leading, and enacting change* (2nd ed.). Routledge. https://doi.org/10.4324/9781315679464

Kvale, S., & Brinkmann, S. (2009). *InterViews: Learning the craft of qualitative research interviewing* (2nd ed.). SAGE Publications.

Ministry of Education, Thailand. (2022). *Education in Thailand 2022 Edition*. Office of the Education Council. https://backoffice.onec.go.th/uploads/Book/2057-file.pdf

Ministry of Education, Thailand. (2024). *Transforming education in the digital era : Happy Learning Anywhere Anytime* (E-book). https://13ased.moe.go.th/wp-content/uploads/2024/08/E-Book-Transforming-Education-in-the-Digital-Era.pdf

Perkmann, M., Tartari, V., McKelvey, M., Autio, E., Broström, A., D'Este, P., Fini, R., Geuna, A., Grimaldi, R., Hughes, A., Krabel, S., Kitson, M., Llerena, P., Lissoni, F., Salter, A., & Sobrero, M. (2013). Academic engagement and commercialisation: A review of the literature on university–industry relations. *Research Policy*, 42(2), 423–442. https://doi.org/10.1016/j.respol.2012.09.007

Rogers, E. M. (1962). *Diffusion of innovations* (1st ed.). Free Press of Glencoe.

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). Free Press.

Shanghai Municipal Bureau of Culture. (2024). *[Title of report or announcement]*. Shanghai Municipal Government. https://english.shyp.gov.cn/ywb/announcement/20240423/453176.html

Taris, T. W. (2000). *A primer in longitudinal data analysis*. SAGE Publications.

Tornatzky, L. G., & Fleischer, M. (1990). *The processes of technological innovation*. Lexington Books.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science, 46*(2), 186-204. https://doi.org/10.1287/mnsc.46.2.186.11926

Webster, J., & Watson, R. T. (2002). *Analyzing the past to prepare for the future: Writing a literature review. MIS Quarterly, 26*(2),

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). *Systematic review of research on artificial intelligence applications in higher education – where are the educators?* International Journal of Educational Technology in Higher Education, 16, Article 39. https://doi.org/10.1186/s41239-019-0171-0