

Factors Influencing the Comprehensive Ability of Undergraduate Photography Students in Shanxi Province, China

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Abstract

Photography education in China is shifting from a technique-centred model towards the cultivation of comprehensive professional competence, yet the factors that shape this competence in regional institutions remain under-examined. This study examined the factors influencing the comprehensive ability of undergraduate photography students in Shanxi Province. From a population of 4,254 students enrolled across six universities, 460 questionnaires were distributed and 418 valid responses were retained (90.90%), supplemented by semi-structured interviews with 15 students. Content validity was established through expert review (IOC = 0.60–1.00), the data were confirmed as suitable for factor extraction (KMO = 0.792–0.926; Bartlett's test $p < .001$), and internal consistency was acceptable ($\alpha = 0.862–0.913$). All variables scored at a moderate level or above. Learning Attitude was highest ($M = 4.04$, $SD = 0.74$) and Photographic Creation Ability lowest ($M = 3.30$, $SD = 0.90$), with narrative expression weakest ($M = 3.19$), indicating an imbalance between technical skill and reflective capacity. Comprehensive ability was significantly correlated with Learning Attitude, Personal Interests and Employment Prospects ($r = 0.640, 0.607, 0.603$, respectively; $p < .01$). A path model with observed composite variables accounted for 27.90% of the variance in comprehensive ability. Learning Attitude showed the largest total effect ($\beta = 0.293$), operating partly through Photographic Creation Ability, while Employment Prospects mediated the influence of Learning Resources and Family Support. The dual-mediator structure one internal and creative, the other external and market-oriented suggests that intrinsic motivation and industry alignment jointly shape competence, and that raising comprehensive ability requires both individual effort and systemic institutional support.

Keywords: Comprehensive ability, Photography education, Learning attitude, Photographic creation ability, Employment prospects, Path analysis

Introduction

Higher photography education in China is being reshaped by integrated media and rapid changes in visual production. Contemporary programmes must prepare students not only to operate equipment but also to combine aesthetic judgement, conceptual development, digital production and professional communication. Recent work on Chinese higher photography education therefore calls for curricula that connect technical learning with short-video production, digital platforms, industry practice and interactive assessment (Chen, 2024). This broader orientation makes comprehensive ability a central educational outcome rather than a narrow measure of equipment proficiency.

Research relevant to photography competence supports a multidimensional definition. At the technical and compositional level, photographic quality is partly associated with recognisable design principles, even though successful images may deliberately depart from conventional rules (Wang et al., 2022). At the perceptual level, aesthetic sensitivity concerns the capacity to discriminate visual quality, and evidence from Chinese students indicates that formal artistic training can strengthen this capacity (Zhang et al., 2023). At the cognitive and creative level, aesthetic sensitivity is related to intelligence, openness to aesthetics and figural divergent thinking (Myszkowski et al., 2014). Taken together, these strands describe comprehensive ability as an integration of technical execution, aesthetic judgement and creative cognition rather than as any one component in isolation.

Learning theory suggests a mechanism by which this integration develops. Cognitive load theory describes domain-specific schemas as central to expert problem solving and explains why disconnected procedures must be organised into retrievable knowledge structures (Sweller, 1988). Project-based learning places such knowledge within student-directed inquiry and the production of authentic outputs (Bell, 2010), while control-value theory explains how learners' emotions, perceived control and task value influence engagement and achievement (Pekrun, 2006). These perspectives point to a coherent pathway: motivation sustains effort, authentic creative practice converts knowledge into performance, and perceived future relevance helps maintain engagement. Interest is consistently associated with attention, persistence and learning (Harackiewicz et al., 2016), and connected arts research further shows how interest-driven making, supportive relationships and links to academic or career opportunities operate together (Peppler et al., 2022).

In Shanxi Province, this general problem takes a specific regional form. Photography provision is distributed across institution types with markedly different resource bases—comprehensive universities, a media college, normal universities and vocational institutions—and equipment and staffing are unevenly matched to the demands of contemporary practice. Curricula continue to centre on classical photographic theory and foundational technique, with limited coverage of short-video production, aerial photography and computational image processing, so graduates absorb the cost of closing those gaps early in their careers. Student development mirrors the imbalance: some students operate professional equipment competently but produce work that is thin in conception and emotional expression, while others show strong aesthetic perception that they cannot realise technically. This local pattern parallels broader calls for Chinese higher photography education to move beyond conventional technique-centred delivery by integrating emerging media, industry-linked tasks and interactive forms of assessment (Chen, 2024).

Despite this, three gaps remain. First, most existing accounts are descriptive or conceptual and do not test the proposed relationships empirically. Second, those that are empirical typically examine one factor at a time and therefore cannot show how internal and external influences combine. Third, almost no study models the pathways through which distal

factors reach comprehensive ability, so it remains unknown whether resources and family circumstances matter directly or only insofar as they shape what students perceive about their professional futures. The present study addresses these gaps by testing an integrated model in a regional Chinese setting.

The variables in that model were selected on this basis. Five predictors are drawn from the two domains the literature identifies as consequential: the internal domain of Learning Attitude, Personal Interests and Photography Skills, which together represent motivation, disposition and executable technique; and the external domain of Learning Resources and Family Support, which represent the institutional and familial conditions under which learning occurs. Research on creative learning environments highlights the importance of appropriate resources, flexible learning settings and collaborative relationships (Davies et al., 2013), while connected arts learning emphasises the joint roles of interests, supportive relationships and career-linked opportunities (Pepler et al., 2022). Two mediators are specified because the reviewed work implies two distinct routes rather than one. Photographic Creation Ability represents the internal route, in which motivation and technique are enacted in creative production before contributing to broader competence. Employment Prospects represents the external route, in which resources and support influence competence only to the extent that students translate them into an informed reading of the labour market. Modelling both routes simultaneously allows the study to test whether internal and external influences reach comprehensive ability through different mechanisms, which single-mediator designs cannot establish.

Research Objectives

1. To examine the levels of the studied variables among undergraduate photography students in Shanxi Province.
2. To examine the direct and indirect effects of the hypothesised factors on students' comprehensive ability.
3. To propose policy recommendations for enhancing photography students' comprehensive ability.

Research Hypotheses

- H1: Learning Attitude has a direct effect on photography students' comprehensive ability.
- H2: Learning Attitude has an indirect effect on photography students' comprehensive ability through Photographic Creation Ability.
- H3: Personal Interests have an indirect effect on photography students' comprehensive ability through Photographic Creation Ability.
- H4: Photography Skills have an indirect effect on photography students' comprehensive ability through Photographic Creation Ability.
- H5: Photographic Creation Ability has a direct effect on photography students' comprehensive ability.
- H6: Learning Resources have an indirect effect on photography students' comprehensive ability through Employment Prospects.
- H7: Family Support has an indirect effect on photography students' comprehensive ability through Employment Prospects.
- H8: Employment Prospects have a direct effect on photography students' comprehensive ability.
- H9: Family Support has a direct effect on photography students' comprehensive ability.

Conceptual Framework

The model comprises five predictor variables (Learning Attitude, Personal Interests, Photography Skills, Learning Resources and Family Support), two mediator variables (Photographic Creation Ability and Employment Prospects) and one criterion variable (photography students' comprehensive ability), as shown in Figure 1.

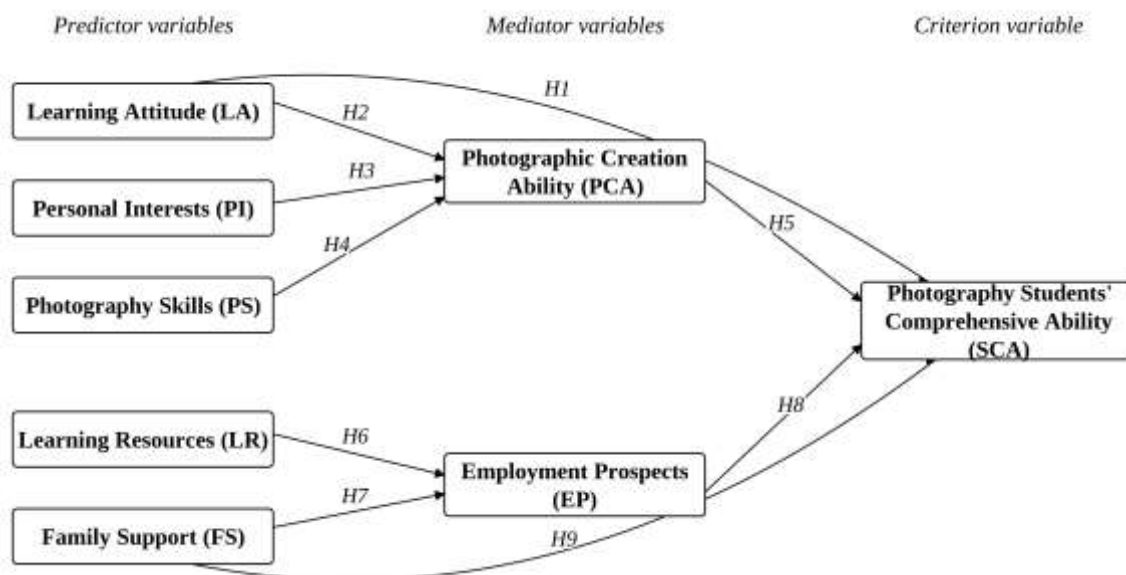


Figure 1 Conceptual framework of the research

Methodology

Research Design

The study used a cross-sectional, quantitative-dominant mixed-methods design. Questionnaire data were used to estimate the hypothesised model, and semi-structured interviews were used to interpret and contextualise the quantitative findings. Because all data were collected at a single point in time, the analysis identifies associations consistent with the hypothesised structure rather than establishing causal precedence.

Population and Sample

The population comprised undergraduate students majoring in photography at the six institutions in Shanxi Province offering photography programmes: comprehensive universities (Shanxi University, Jinzhong University), a media college (Communication University of Shanxi), normal universities (Shanxi Normal University, Taiyuan Normal University) and a vocational institution (Shanxi Vocational University of Engineering Science and Technology). Enrolment data supplied by the institutions gave a total population of 4,254 students.

Sample size was determined using Cochran's formula with a 95% confidence level ($Z = 1.96$), maximum variability ($p = q = 0.50$) and a margin of error of 5% ($e = 0.05$), yielding $n_0 = 384$. Applying the finite population correction for $N = 4,254$ gave a required sample of 353. To allow for non-response, the target was inflated using an expected effective response rate of 85%, giving 415, and 460 questionnaires were distributed.

Stratified sampling was applied with institution type as the stratum (comprehensive, media, normal and vocational), and the number of questionnaires allocated to each institution was proportional to its share of the photography enrolment. Within each stratum, the sampling frame was the institution's list of enrolled photography students ordered by student identification number; a sampling interval was computed by dividing the stratum population

by the stratum allocation, a random start was selected within the first interval, and cases were drawn at fixed intervals thereafter. Questionnaires were distributed online by academic affairs offices to the students selected in this way. Because distribution was mediated by institutional staff, an element of clustering at the institution level cannot be excluded, and this is acknowledged as a limitation. Non-response was handled by retaining the achieved sample rather than by replacement sampling; the achieved n of 418 exceeds the 353 required by the power calculation.

Research Instruments

Two instruments were used: a questionnaire on the factors affecting the comprehensive ability of photography majors, and a semi-structured interview guide.

Part 1: Respondent characteristics (checklist) — gender, institution, year of study, internship experience and duration of photography study.

Part 2: Predictor and mediator variables (five-point Likert scale) — seven constructs comprising 42 items in total.

Part 3: Criterion variable, comprehensive ability (five-point Likert scale) — 7 items.

Part 4: Two open-ended questions inviting additional views and suggestions.

The semi-structured interview guide comprised six open-ended questions covering the perceived importance of comprehensive ability, obstacles to its improvement, the use of cultural, technical and theoretical resources, suggestions for enhancement, and the perceived effectiveness of curriculum innovation and the creative climate within the institution.

The instruments were developed in English, translated into Chinese by a bilingual researcher, independently back-translated into English by a second bilingual translator who had not seen the original, and reconciled by the research team. Discrepancies concerned wording rather than meaning and were resolved by consensus before the pilot rounds.

Instrument Quality

Instrument quality was established in three distinct respects, which are reported separately because they provide different kinds of evidence.

Content validity

A draft questionnaire was reviewed by the thesis supervisor for language, accuracy and coverage of the construct definitions, and was then submitted to five experts who rated item-objective congruence. Items with an IOC index between 0.60 and 1.00 were retained.

Factorability

Kaiser–Meyer–Olkin values ranged from 0.792 to 0.926 across constructs and all exceeded the 0.60 criterion, and Bartlett’s test of sphericity was significant in every case ($p < .001$), indicating that the data were suitable for factor extraction. These statistics establish that the correlation structure is factorable; they are not evidence of construct validity.

Internal consistency

The instrument was piloted with three groups of respondents similar to the sample ($n = 60, 63$ and 60). Cronbach’s alpha ranged from 0.862 to 0.913 for the factor scales, was 0.862 for the comprehensive ability scale, and exceeded 0.85 for the instrument as a whole.

Limitation of the validity evidence

Confirmatory factor analysis was not conducted, and average variance extracted and composite reliability are therefore not reported. Content validity, factorability and internal consistency do not substitute for construct validity evidence. This limitation constrains the interpretation of the structural results and is revisited in the Limitations section.

Ethical Considerations

Permission to collect data was obtained from the Graduate School, Southeast Asia University, and the permission letter, together with the research purpose and the questionnaire, was presented to the academic affairs offices and photography department heads of the six participating institutions. Participation was voluntary and anonymous. Students were informed of the purpose of the study and of the confidentiality of their responses before completing the questionnaire, and interview participants gave permission for their interviews to be recorded and transcribed.

Data Collection

Questionnaire data were collected through the online survey platform Wenjuanxing. Of the 460 questionnaires distributed, 432 were returned. Fourteen responses were excluded because key information was missing or the response pattern showed evident non-differentiation, leaving 418 valid cases and an effective response rate of 90.9%. No imputation was required, as the retained cases were complete on all modelled variables. For the qualitative component, 15 students of differing academic standing and practical experience were selected for in-depth interviews conducted offline or online; all interviews were recorded with permission and transcribed for analysis.

Data Analysis

Descriptive statistics, correlation analysis and reliability analysis were conducted in SPSS 26.0. The hypothesised model was estimated by maximum likelihood. Because each construct was represented by a single observed composite formed from the mean of its items, rather than by multiple indicators of a latent variable, the analysis is a path analysis with observed variables rather than a latent-variable structural equation model, and it is described as such throughout. Composite scoring was adopted to preserve statistical power given the number of constructs relative to the sample size; the trade-off is that measurement error is not modelled, which tends to attenuate the estimated coefficients. Indirect effects were tested using bootstrapped estimates with bias-corrected confidence intervals.

The results are presented in five parts: (1) examination of data distribution characteristics; (2) levels of the studied variables; (3) relationships among the variables and comprehensive ability; (4) fit of the hypothesised model to the empirical data; and (5) direct and indirect effects of the causal factors on comprehensive ability.

Results

Part 1 Data Distribution Characteristics

Table 1 Means, standard deviations, coefficients of variation, skewness and kurtosis of the observed variables (n = 418)

Variable	k	M	SD	C.V. (%)	Level	Skewness	Kurtosis	p (χ^2)
SCA	7	3.86	0.73	18.78	High	−0.546	0.444	.999
LA	7	4.04	0.74	18.43	High	−0.920	1.138	.999
PI	6	4.01	0.59	14.73	High	−0.350	0.941	.994
PS	6	3.69	0.79	21.27	Moderate	−0.548	−0.041	.985
LR	6	3.78	0.68	18.18	High	−0.560	0.828	.998
FS	6	3.59	0.73	20.30	Moderate	−0.061	−0.506	.996
PCA	6	3.30	0.90	27.38	Moderate	−0.003	−1.107	.962
EP	5	4.02	0.57	14.10	High	−0.462	1.871	.998

Note: SCA = Comprehensive Ability; LA = Learning Attitude; PI = Personal Interests; PS = Photography Skills; LR = Learning Resources; FS = Family Support; PCA = Photographic Creation Ability; EP = Employment Prospects. k = number of items

Table 1 reports the descriptive statistics for the eight observed variables. All variables scored at a moderate level or above. Learning Attitude recorded the highest mean ($M = 4.04$) and Photographic Creation Ability the lowest ($M = 3.30$). Coefficients of variation ranged from 14.10% for Employment Prospects to 27.38% for Photographic Creation Ability, indicating that responses were relatively concentrated, with the widest dispersion on the lowest-scoring variable. Skewness values were negative throughout, and skewness and kurtosis remained within conventional limits for approximate normality, supporting the use of maximum likelihood estimation.

Part 2 Levels of the Studied Variables

Table 2 Means, standard deviations and levels of the studied variables (n = 418)

No.	Variable	M	SD	Level
1	Comprehensive Ability	3.86	0.73	High
2	Learning Attitude	4.04	0.74	High
3	Personal Interests	4.01	0.59	High
4	Photography Skills	3.69	0.79	Moderate
5	Learning Resources	3.78	0.68	High
6	Family Support	3.59	0.73	Moderate
7	Photographic Creation Ability	3.30	0.90	Moderate
8	Employment Prospects	4.02	0.57	High

Note: Interpretation criteria: 1.00–1.80 = very low; 1.81–2.60 = low; 2.61–3.40 = moderate; 3.41–4.20 = high; 4.21–5.00 = very high

Table 2 shows that six of the eight variables fell in the high band and two in the moderate band. Learning Attitude was highest ($M = 4.04$), followed by Employment Prospects ($M = 4.02$) and Personal Interests ($M = 4.01$). Photographic Creation Ability was the only variable in the lower part of the moderate band ($M = 3.30$) and also showed the greatest dispersion ($SD = 0.90$), indicating both a lower average level of creative production capacity and greater variation among students on this dimension than on any other. Within the comprehensive ability scale, artistic creation items scored above the scale mean while critical analysis items scored below it, and within Photographic Creation Ability the narrative expression item was lowest ($M = 3.19$). Together these patterns describe an imbalance between execution and reflection.

Part 3 Relationships Among the Variables

Table 3 Correlation matrix for the studied variables and comprehensive ability ($n = 418$)

Variable	LA	PI	PS	LR	FS	PCA	EP	SCA
LA	1.000	.590**	.506**	.437**	.440**	.346**	.516**	.640**
PI		1.000	.475**	.536**	.487**	.398**	.606**	.607**
PS			1.000	.386**	.406**	.308**	.454**	.561**
LR				1.000	.569**	.445**	.475**	.443**
FS					1.000	.492**	.446**	.511**
PCA						1.000	.425**	.445**
EP							1.000	.603**
SCA								1.000

Note: KMO = 0.931. Bartlett's test of sphericity: $df = 28$, $p < .001$. ** $p < .01$.

Table 3 presents the correlations among the studied variables. All variables were significantly and positively correlated with comprehensive ability. Learning Attitude showed the strongest association ($r = .640$), followed by Personal Interests ($r = .607$) and Employment Prospects ($r = .603$), while Photographic Creation Ability showed the weakest ($r = .445$). Inter-correlations among the predictors were moderate, ranging from .308 to .590, which is consistent with distinct but related constructs; no coefficient approached the level at which multicollinearity would threaten estimation. The KMO value of 0.931 and the significant Bartlett's test indicate that the correlation structure was suitable for factor extraction.

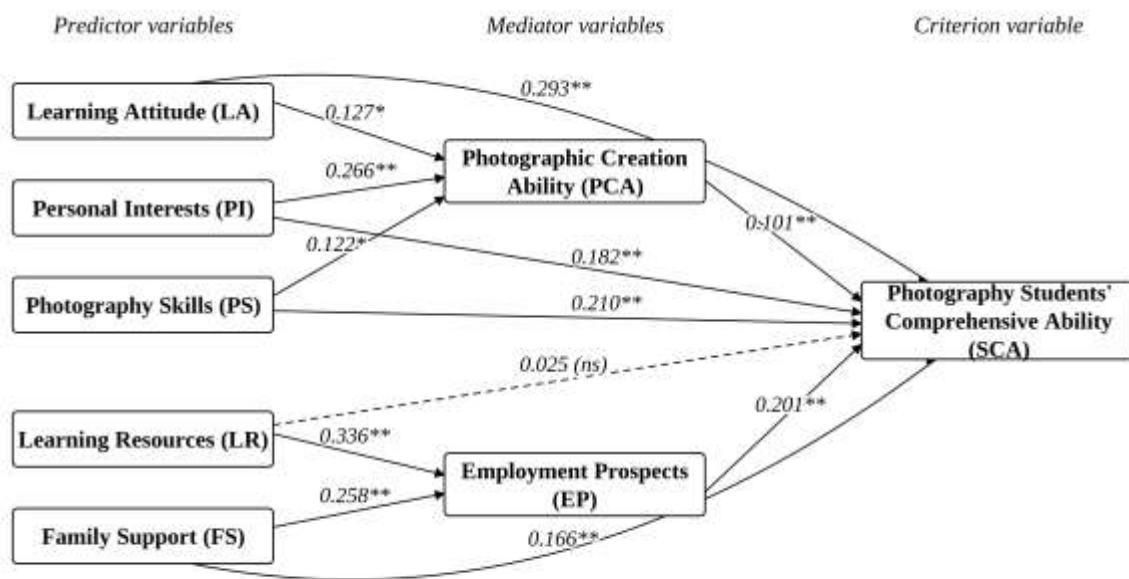
Part 4 Model Fit

Table 4 Model fit statistics

Index	Recommended criterion	Obtained value	Assessment
χ^2/df	< 3 preferred; < 5 acceptable	4.114	Acceptable
CFI	$\geq .90$	0.832	Below threshold
TLI	$\geq .90$	Not reported	Not assessed
RMSEA	$\leq .08$	Not reported	Not assessed
SRMR	$\leq .08$	Not reported	Not assessed



Model fit was mixed. The χ^2/df ratio of 4.114 falls within the range often treated as acceptable for large samples, but the comparative fit index of 0.832 falls below the conventional threshold of .90, indicating that the hypothesised structure does not reproduce the observed covariances as closely as would be required for the model to be described as well fitting. The model is therefore interpreted as providing a partial account of the relationships among the variables, and the substantive findings reported below should be read with that qualification. The direct path from Learning Resources to comprehensive ability was not statistically significant ($\beta = 0.025$) and was removed; the reported estimates are those of the respecified model. Because this respecification was data-driven rather than theory-driven, it requires confirmation in an independent sample.



Note. Dashed line = statistically non-significant path. Coefficients are standardised total effects; see Table 5 for the decomposition. * $p < .05$. ** $p < .01$.

Figure 2 Estimated path model

Part 5 Direct and Indirect Effects

Table 5 Direct, indirect and total effects on the endogenous variables

Outcome	R ²	Effect	LA	PI	PS	LR	FS	PCA	EP
PCA	.189	DE	.127*	.266**	.122*	—	—	—	—
		IE	—	—	—	—	—	—	—
		TE	.127*	.266**	.122*	—	—	—	—
EP	.594	DE	—	—	—	.336**	.258**	—	—
		IE	—	—	—	—	—	—	—
		TE	—	—	—	.336**	.258**	—	—
SCA	.279	DE	.280**	.155**	.198**	—	.114**	.101**	.201**
		IE	.013*	.027*	.012*	.067**	.052**	—	—
		TE	.293**	.182**	.210**	.067**	.166**	.101**	.201**

Note: DE = direct effect; IE = indirect effect; TE = total effect. All coefficients are standardised. * $p < .05$.

** $p < .01$.

Table 5 reports the decomposition of effects. The model accounted for 27.9% of the variance in comprehensive ability, 18.9% in Photographic Creation Ability and 59.4% in Employment Prospects. Learning Attitude had the largest total effect on comprehensive ability ($\beta = .293$), followed by Photography Skills ($\beta = .210$), Employment Prospects ($\beta = .201$), Personal Interests ($\beta = .182$) and Family Support ($\beta = .166$). Photographic Creation Ability had the smallest significant total effect ($\beta = .101$). Learning Resources reached comprehensive ability only indirectly, through Employment Prospects ($\beta = .067$), its direct path having been non-significant.

The two mediators operated on different sets of predictors. Photographic Creation Ability carried small but significant indirect effects from Learning Attitude, Personal Interests and Photography Skills, while Employment Prospects carried the effects of Learning Resources and Family Support. Employment Prospects was also the more strongly determined of the two mediators, with 59.4% of its variance explained compared with 18.9% for Photographic Creation Ability.

With respect to the hypotheses, H1, H5 and H8 were supported for the direct paths, and H2, H3, H4, H6 and H7 were supported for the indirect paths. H9, specifying a direct effect of Family Support, was supported, although the indirect route through Employment Prospects accounted for a substantial share of its total effect.

Discussions

Associations Between the Studied Variables and Comprehensive Ability

All seven factors were positively and significantly associated with comprehensive ability, with coefficients between .308 and .640. The ordering of these associations is informative. Learning Attitude was most strongly associated with comprehensive ability ($r = .640$), followed by Personal Interests ($r = .607$) and Employment Prospects ($r = .603$)—that is, two dispositional variables and one perceptual variable outranked the direct measure of technical skill ($r = .561$). This ordering is consistent with social cognitive accounts of learning, in which self-directed effort and outcome expectancies regulate the acquisition of complex competence (Bandura, 1986), and with Gardner's (1983) broader account of spatial intelligence, which is relevant to visual disciplines. It also accords with evidence that interest supports attention, persistence and learning (Harackiewicz et al., 2016), and with connected arts research linking interest-driven making to supportive relationships and academic or career opportunities (Peppler et al., 2022).

The comparatively weaker association of Photography Skills, alongside interview accounts of curricula that emphasise equipment operation over interpretive analysis, should not be read as showing that technical skill is unimportant. Photography research shows that design principles provide an important basis for image quality but that successful work also depends on judgement about when and how conventions can be departed from (Wang et al., 2022). Research on Chinese students likewise indicates that artistic training strengthens visual aesthetic sensitivity (Zhang et al., 2023), and aesthetic sensitivity itself is associated with figural divergent thinking (Myszkowski et al., 2014). Together, these findings support the interpretation that technical and aesthetic development must proceed in combination. Because the design is cross-sectional, however, these associations do not establish direction: students who are already developing broad competence may equally acquire more favourable attitudes and clearer career expectations as a result.

Model Fit and the Non-Significant Resource Path

The hypothesised structure was only partially supported by the fit statistics, and the most substantively interesting result is a negative one: the direct path from Learning Resources to comprehensive ability was not significant, while its indirect path through Employment Prospects was ($\beta = .067$). Read through Bronfenbrenner's (1979) ecological framework, this suggests that institutional provision does not act on competence as a simple input. This interpretation is compatible with research on creative learning environments, which treats resources as part of a wider configuration of pedagogy, collaboration, learner agency and external connections rather than as stand-alone inputs (Davies et al., 2013). Resources appear to matter insofar as they alter what students perceive to be possible and required in the labour market—that is, insofar as the mesosystem linking institution and industry is active. Interview accounts of a gap between teaching equipment and professional standards are consistent with this interpretation, although an equally plausible explanation is that the measure of Learning Resources captured availability rather than use, and availability may be only weakly related to the practice through which competence develops.

A similar pattern held for Family Support, whose effect was partly transmitted through Employment Prospects ($\beta = .052$). Material support appears to be associated with comprehensive ability chiefly where it is converted into industry exposure. This interpretation is consistent with connected arts learning, which emphasises supportive relationships and networks as bridges from interest-driven practice to future opportunities (Peppler et al., 2022). Interviews indicated that some students without such support achieved comparable exposure through self-directed learning and peer networks, which suggests that the mechanism is access to professional experience rather than family resources as such; however, this observation rests on a small number of interviews and should be treated as a hypothesis for further testing rather than an established finding.

The Dual-Mediator Structure

The clearest theoretical contribution of the model lies in the contrast between its two mediators. Photographic Creation Ability transmitted the effects of the internal predictors—attitude, interest and skill—whereas Employment Prospects transmitted the effects of the external predictors—resources and family support. The two routes are not interchangeable. The internal route corresponds to a project-based account of competence as something formed through authentic production (Bell, 2010), in which motivation must be enacted in creative work before it registers as broader capacity; the small size of the indirect effects through this route ($\beta = .012$ to $.027$) suggests that this conversion is currently inefficient, which is consistent with Photographic Creation Ability being the lowest-scoring variable in the study. The external route corresponds to the ecological account, in which context shapes development through the meanings students attach to it (Bronfenbrenner, 1979).

That Employment Prospects was far better explained than Photographic Creation Ability ($R^2 = .594$ versus $.189$) reinforces the point. Students' reading of the labour market is strongly conditioned by their institutional and family circumstances, whereas their creative production capacity is largely determined by factors this model does not contain. Since the full model explained 27.9% of the variance in comprehensive ability, substantial influences remain unmeasured. Interview data pointed to cross-media capability — short-video editing, visual storytelling — and to mentoring relationships as likely candidates. Alternative explanations for the unexplained variance, including omitted institutional characteristics and prior ability, cannot be ruled out with the present design.

Conclusion and suggestions

This study found that the comprehensive ability of undergraduate photography students in Shanxi Province is most strongly associated with Learning Attitude, and that external conditions such as institutional resources and family support are related to it primarily through students' perceptions of employment prospects rather than directly. The following recommendations follow from these findings.

1. For students. Given that Learning Attitude carried the largest total effect ($\beta = .293$), students would benefit from setting staged and specific goals, from deliberately strengthening the technical foundations on which creative work depends, and from developing aesthetic literacy through sustained study of established work. Because Employment Prospects also carried a substantial effect ($\beta = .201$), building a portfolio oriented towards emerging areas of practice and seeking feedback on professional platforms are likely to be productive.

2. For teachers. The weakness of Photographic Creation Ability, and the small indirect effects running through it, indicate that the conversion of motivation into creative output is the point at which current provision is least effective. Project-based assignments grounded in local subject matter, structured peer review producing a creation–feedback–iteration cycle, and workshops addressing narrative and visual storytelling target this specific weakness, which the item-level results locate in narrative expression ($M = 3.19$).

3. For institutions. Because Learning Resources influenced comprehensive ability only through Employment Prospects, investment in equipment alone is unlikely to be sufficient. Resource provision should be paired with structured industry contact partnerships with local media and cultural enterprises, involvement of practising professionals in curriculum design, and coverage of emerging fields so that provision translates into an informed reading of professional requirements. Assessment should combine process evaluation, portfolio review and industry mentor input.

4. For families and the wider community. Since the effect of Family Support ran substantially through Employment Prospects, support that provides industry exposure is likely to be more consequential than material provision alone. Encouraging participation in events such as the Pingyao International Photography Festival, together with industry–academia collaboration and mentoring schemes, can supply such exposure to students whose families cannot.

Limitations

The design is cross-sectional, so the estimated paths describe associations consistent with the hypothesised ordering rather than causal effects. Reverse causation and reciprocal influence are plausible for several relationships, particularly between attitude and ability. Constructs were modelled as observed composites rather than as latent variables with multiple indicators, so measurement error is unmodelled and coefficients are likely to be attenuated. Confirmatory factor analysis was not conducted, and construct validity evidence is therefore limited to content validity and internal consistency. The comparative fit index (0.832) falls below conventional standards, indicating that the specified structure reproduces the observed relationships only partially. Removal of the non-significant Learning Resources path was data-driven and requires cross-validation in an independent sample. Data were self-reported and collected through institutional intermediaries, introducing possible common-method variance and a degree of clustering at the institution level. The findings concern one province and one discipline, and generalisation beyond comparable settings should be cautious.

Recommendations for Future Research

1. Extend the sample across regions at different levels of economic development, and across career stages from undergraduate study to professional practice, to test whether the dual-mediator structure holds under different conditions.
2. Introduce moderators such as gender, year of study and internship experience, and collect longitudinal data capable of establishing temporal ordering in the motivation–practice–ability sequence. Disaggregating Photographic Creation Ability into technical implementation, conceptual development and narrative expression would allow the weakest link to be identified precisely.
3. Combine the survey approach with ethnographic observation and, where feasible, eye-tracking studies of aesthetic judgement, together with monitoring of industry demand, to explain the substantial variance the present model leaves unaccounted for.

New knowledge and the effects on society and communities

1. Theoretical contribution: a dual-mediator model. Existing accounts of competence formation in art education generally posit a single pathway from antecedent to outcome. This study specifies and tests two parallel mediators representing distinct mechanisms — Photographic Creation Ability as an internal, production-based route and Employment Prospects as an external, market-oriented route and finds that they carry different sets of predictors. This provides art education research with a framework capable of distinguishing influences that operate through what students make from those that operate through what students understand about their professional futures.
2. Empirical contribution: attitude outweighs technique. Learning Attitude showed a larger total effect on comprehensive ability ($\beta = .293$) than Photography Skills ($\beta = .210$). This qualifies the technique-centred assumption underlying much photography curriculum design and indicates that dispositional factors warrant explicit attention as objects of instruction rather than being treated as prerequisites students bring with them.
3. Methodological and contextual contribution. The study provides quantitative evidence on photography education in an inland Chinese province, a setting largely absent from a literature dominated by conceptual argument and by evidence from coastal metropolitan institutions, and it does so across four institution types rather than a single case.
4. Practical and social impact. For the six institutions studied, the findings function as a diagnostic instrument. They locate the weakest point in provision at narrative and interpretive capacity rather than at technical training, and they indicate that resource investment yields returns chiefly when accompanied by industry linkage. Acting on both points would address the skill–reflection imbalance documented here and strengthen the professional preparation of the regional creative workforce, with consequences for the cultural and economic development of Shanxi Province.

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