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Employment Prospect Perceptions and Learning Agency Among Chinese Undergraduate Art and Design Students

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Abstract

Background As the art and design industry faces overall pressure and employment adjustments in China, how students' employment evaluations relate to their current learning behaviors requires further investigation. Grounded in Social Cognitive Career Theory, this study examined the associations among employment prospect perceptions, career self-efficacy, outcome expectations, and learning agency.

Methods A cross-sectional survey was conducted from April to July 2026 with 591 undergraduate art and design students from four application-oriented universities in China. A two-stage partial least squares structural equation model was employed, modeling employment prospect perceptions as a formative higher-order construct comprising absolute and comparative evaluation components, while estimating its direct association with learning agency and indirect associations via career self-efficacy and outcome expectations. Bootstrap resampling was used for inference, and exploratory comparisons across academic majors were conducted using permutation tests with Bonferroni correction.

Results Career self-efficacy was positively associated with learning agency (β = .598, 95% CI [.488, .696]), and the specific indirect association from employment prospect perceptions to learning agency via career self-efficacy was .263 (95% CI [.205, .323]). The direct association between employment prospect perceptions and learning agency (β = .053, p = .239) and the association between outcome expectations and learning agency (β = .100, p = .101) did not reach significance. The model explained 48.0% of the variance in learning agency. After correction, none of the 18 between-major path comparisons reached significance.

Conclusions Career self-efficacy serves as an important linking factor connecting employment prospect perceptions with learning agency. The study provides evidence for applying SCCT in career preparatory learning contexts and suggests that career support may integrate employment information with professional competence experiences. The temporal order and causal direction of these associations require longitudinal research for validation.

Keywords: Employment prospect perceptions; Career self-efficacy; Outcome expectations; Learning agency; Art and design education; Social Cognitive Career Theory

Background

In recent years, art and design education and related industries in China have faced overall adjustments and employment pressures. On one hand, national development strategies prioritize science and technology innovation, with engineering and science majors receiving more policy support; on the other hand, the earlier rapid expansion in art and design enrollment has created new challenges in matching educational supply with career opportunities. The *2025 China–World Higher Education Trends Report* indicates that design programs experienced a net reduction of 305 programs, exceeding the reductions in business administration (266) and electronic information (247) [1]. Such adjustments have also appeared in institutions with strong disciplinary foundations: in 2025, Tongji University adjusted the enrollment arrangements for undergraduate programs in visual communication design, environmental design, and product design [2]. Changes in program offerings and enrollment structures have made career preparation issues more prominent for art and design students: when future opportunities in one's major are no longer taken for granted, how do students understand their employment prospects, and how do they maintain initiative and sustained engagement in current learning?

Overall pressure in the art and design field has been accompanied by a reallocation of career opportunities. Different specializations are affected to varying degrees by technological transformation, industry demand, and educational supply adjustments. For example, digital media art ranked sixth nationally in the number of new programs established over the past decade [1]; data from higher vocational program registrations show that between 2021 and 2026, the number of institutions offering environmental art design programs decreased by 15.2%, digital media art increased by 41.7%, and visual communication design remained largely stable [3]. These differences suggest that the employment information students encounter may simultaneously reflect industry pressures and localized opportunities. For students, the more immediate question is how to evaluate their major's career prospects, and how this evaluation relates to their own competence judgments, career expectations, and learning actions.

This question carries practical significance in application-oriented undergraduate education. Career preparation for art and design students is often closely connected to daily professional learning: seeking materials beyond coursework, trying new design tools, participating in practical projects, and improving work based on feedback may simultaneously serve course learning and future employment. Against the backdrop of overall industry pressure, more

pessimistic employment evaluations may undermine students' judgments about the value of learning investment, or may prompt them to proactively supplement skills and seek new development opportunities. Judging solely from macroeconomic employment conditions makes it difficult to predict how students will act; it is necessary to further examine the psychological connections between their subjective employment evaluations and current learning behaviors. This study uses learning agency to summarize this overall orientation toward proactive exploration, sustained engagement, and strategic learning.

Existing career development research provides a foundation for understanding these connections, but questions remain that require further clarification. Social Cognitive Career Theory (SCCT) emphasizes the roles of self-efficacy, outcome expectations, and contextual factors in career choice and action [4, 5]. Related meta-analyses have supported its career choice model [6, 7], and the career self-management model extends the theory to behavioral processes such as exploration, preparation, and adaptation [8, 9]. The link between academic self-efficacy and learning engagement has also been supported by research [10, 11], and studies in teacher preparation and secondary education have further examined the relationships among self-efficacy, outcome expectations, and learning engagement [12, 13]. However, for art and design students who have not yet entered the labor market, how their evaluations of employment prospects relate to current preparatory learning via these two types of beliefs still requires more specific empirical investigation.

One key question is whether competence beliefs and outcome expectations exhibit different patterns of association. Believing that one can complete professional tasks and believing that professional investment will yield satisfactory career returns are two different judgments. In contexts of employment pressure, students may still maintain confidence in their professional abilities while reserving judgment about future career benefits; or they may recognize the prospects of certain types of work but have not yet formed sufficient task competence beliefs. Existing SCCT research suggests that correlational relationships need to be understood in context [6, 9, 14]. Therefore, examining competence beliefs and outcome expectations simultaneously in the same model helps distinguish their connections with employment evaluations and current learning behaviors, rather than assuming in advance that the two types of beliefs have identical explanatory roles.

Another question involves the content of employment prospect evaluations. Research on perceived employability focuses on students' judgments of their own employment capabilities and opportunities [15, 16], but evaluating whether one can obtain work is not entirely the

same as evaluating what opportunities one's major can provide. When students understand their major's prospects, they may base judgments on positions, income, and development space, and may also refer to opportunities in other major directions. Incorporating this content into employment prospect evaluations helps more fully capture students' perceptions of the external career environment. Based on these questions, this study focuses on the relationships among employment prospect evaluations, competence beliefs, outcome expectations, and learning agency in the overall sample of art and design students, to explain the connection between career preparation and current learning against the backdrop of employment pressure.

SCCT provides a theoretical framework for constructing these relationships. Career self-efficacy (CSE) refers to individuals' judgments of their ability to successfully complete career-related tasks; outcome expectations (OE) refer to beliefs about the possible consequences of related actions [4]. For students in the career preparation stage, professional learning and practice constitute important contexts for forming and expressing these beliefs. This study treats employment prospect perceptions (EPP) as contextual opportunity evaluations and learning agency (LA) as the current preparatory learning behavioral orientation, thereby connecting understanding of the external career environment with students' current learning actions.

In SCCT's internal pathways, CSE is an important antecedent of OE: students' confidence in completing tasks helps form positive expectations about the outcomes of related actions [4, 7]. For example, students who believe they can master professional requirements and cope with practical difficulties may also be more likely to believe that their professional investment can lead to career development. Longitudinal research has provided evidence for distinguishing the temporal relationship between self-efficacy and outcome expectations [17]. At the same time, self-efficacy is closely related to effort allocation, persistence, and coping with challenges [18]; students who hold stronger competence beliefs in professional tasks are more likely to proactively try, seek resources, and persistently complete learning tasks. Therefore, CSE may be associated both with OE and directly with LA.

OE reflects students' judgments about the value of actions and future returns. According to SCCT, when students expect that career preparation can bring attractive outcomes, they are more likely to invest effort [4]. Existing research has reported associations between outcome expectations and learning participation [12, 13]. However, there is temporal and content distance between long-term career returns and current learning activities, and when

employment opportunities are uncertain, the expression of this connection warrants further examination. Including both OE and CSE in the analysis allows examination of whether students' judgments about future returns remain associated with current learning agency beyond competence beliefs.

As contextual evaluations, EPP provides an informational basis for students to judge the career consequences of professional investment [5]. Perceiving sufficient job opportunities, better income, or development space may be associated with more positive OE. Employment prospect information may also provide reference for students to evaluate their own career preparation through the employment experiences and career performance of graduates in the same major, thereby being associated with CSE [18]. This evaluation includes both judgments about one's own major's opportunities and relative comparisons with other majors, echoing social comparison and relative deprivation research's attention to reference groups [19, 20]. Therefore, this study conceptually retains both absolute evaluation and comparative evaluation content for one's major, with specific operationalization of EPP, CSE, OE, and LA explained in the Methods section.

Based on the above framework, this study proposes the following hypotheses:

H1 (CSE→OE): Career self-efficacy is positively associated with outcome expectations.

H2 (EPP→OE): Employment prospect perceptions are positively associated with outcome expectations.

H3 (EPP→CSE): Employment prospect perceptions are positively associated with career self-efficacy.

H4 (CSE→LA): Career self-efficacy is positively associated with learning agency.

H5 (OE→LA): Outcome expectations are positively associated with learning agency.

H6 (EPP→CSE→LA indirect association): Employment prospect perceptions exhibit a positive indirect association with learning agency via career self-efficacy.

H7 (EPP→OE→LA indirect association): Employment prospect perceptions exhibit a positive indirect association with learning agency via outcome expectations.

This study uses cross-sectional survey data from 591 undergraduate art and design students at four application-oriented universities in Changsha and Wuhan, China, employing PLS-SEM to simultaneously estimate the direct association between EPP and LA, as well as indirect associations via CSE, via OE, and via CSE then OE. The direct path is retained, allowing the

connection between employment evaluations and learning agency not to be predetermined as entirely realized through the two types of beliefs. The main contribution of the study lies in incorporating employment prospect perceptions into a career preparatory learning framework and distinguishing the associations of competence beliefs and outcome expectations within the same model, thereby providing evidence for career support and learning guidance for art and design students. Additionally, an auxiliary exploratory comparison across three major specializations was conducted without directional hypotheses.

Methods

Participants and Procedure

This cross-sectional survey was conducted from April to July 2026 at four application-oriented universities in Changsha and Wuhan, China, recruiting students through courses related to environmental art design, digital media art, and visual communication design. Participants provided informed consent after learning about the research purpose and the principles of anonymity and voluntary participation. All participants were at least 18 years old.

604 questionnaires completed all 27 analytical items; after excluding 13 straight-line response questionnaires, 591 valid questionnaires were included in the final analysis. The 27 items included in the analysis had no missing values. The sample was stratified by major and randomly split (random seed: 20260929), with 296 used for exploratory measurement evaluation and 295 for subsample sensitivity analysis; the main structural analysis and major comparison used all 591 participants. The split separated exploratory measurement checking from the internal sensitivity analysis. All eligible observations were retained for the main model to estimate the associations in the full sample. The 295-person subsample was therefore part of the main sample, and its analysis assessed sensitivity to sample composition rather than replication in an independent cohort.

Measures

The questionnaire was assembled for this study, combining study-developed items with contextual adaptations of published measures. This analysis used 27 items to measure four constructs, all employing a five-point scale: 1 indicates "strongly disagree," 5 indicates "strongly agree," and 3 is labeled "uncertain." Item development and contextual adaptation included expert review and a pilot test with 80 students. Each construct was operationalized

according to career preparation and professional learning contexts [21]. The English-language version of the 27 questionnaire items included in the analysis is provided in Additional file 2 (Supplementary_Questionnaire_English.docx). The Chinese administered wording and corresponding English translations are also provided in Supplementary Table S6.

Employment Prospect Perceptions (EPP) were measured using 7 items developed for this study. The measure draws on SCCT's treatment of contextual supports [4, 5], with the comparative component informed by the social comparison perspective [20]. The absolute evaluation component includes 3 items covering job availability, income competitiveness, and career opportunity diversity. The comparative evaluation component includes 4 items explicitly evaluating employment prospects relative to other design specializations. Here, absolute evaluation refers to the opportunities available within one's own specialization, including the competitiveness of graduates' income within design-related work; comparative evaluation explicitly positions the specialization against other design specializations. Both components capture subjective appraisals rather than objective labor-market indicators. EPP is modeled in stage two as a higher-order composite construct formed by these two first-order components.

Outcome Expectations (OE) were measured using a study-specific set of 6 items addressing personal career-related expectations within the SCCT framework [4, 21]. The Vocational Outcome Expectations scale [22] served as a reference for this measure. The resulting item set covers anticipated employment satisfaction, income, returns on educational investment, and career success, alongside judgments about meeting employer requirements and the continued applicability of professional skills. OE is interpreted with reference to this career preparation content.

Career Self-Efficacy (CSE) was measured using 6 items adapted from Rigotti et al.'s short version of the Occupational Self-Efficacy Scale [23]. Considering that students are in the career preparation stage, the original scale's work contexts were rewritten to professional learning and practice contexts, examining beliefs about problem-solving, meeting demands, achieving goals, and remaining calm when facing difficulties. This study refers to this professional task competence belief oriented toward career preparation as career self-efficacy.

Learning Agency (LA) was measured using a study-specific set of 8 items informed by research on agentic engagement [24, 25], self-regulated learning [26, 27], and academic motivation [28]. The measure operationalizes learning agency as an overall orientation toward proactive exploration, sustained engagement, and strategic learning in professional education, combining content on learning engagement and proactive action [29, 30]. The items address seeking resources beyond coursework, adjusting learning priorities, investing time and effort, persisting with tasks, trying new tools or methods, participating in extracurricular practice, seeking guidance and feedback, and maintaining enthusiasm for professional learning. These content areas describe the scope of the item set rather than separate subscales. The items concern students' own learning actions and engagement; they do not directly assess grades, externally rated design performance, or subsequent employment outcomes. This study focuses on the overall agentic orientation reflected by these responses, setting LA as a single reflective construct in the structural model.

Analytical Approach

Individual students served as the unit of analysis. SmartPLS 4 was used to estimate PLS-SEM, using the path weighting scheme and reporting standardized results [31]. Considering that the research includes both reflective constructs and a formative higher-order EPP, a disjoint two-stage approach was adopted [32]: stage one estimates two reflective EPP components along with CSE, OE, and LA, with the two EPP components each connected to CSE, OE, and LA while setting CSE→OE, CSE→LA, and OE→LA paths; stage two uses saved stage-one EPP component scores as formative indicators to compose higher-order EPP.

Reflective measurements were evaluated through item loadings, internal consistency, average variance extracted (AVE), and HTMT [31, 33]; formative higher-order EPP was evaluated through component weights and variance inflation factors (VIF). The 296-person subsample used parallel analysis, minimum residual extraction, and oblique rotation for exploratory measurement checking, with polychoric correlations used for ordinal sensitivity checking; the full sample employed ordinal CFA with WLSMV estimation to examine the measurement structure of the two reflective EPP components and CSE, OE, and LA. This CFA does not evaluate the stage-two formative composite relationship, with key diagnostic results in the Supplementary Materials' "Measurement Structure Diagnostic Notes."

The structural model includes six paths: EPP→CSE, EPP→OE, EPP→LA, CSE→OE, CSE→LA, and OE→LA, simultaneously estimating the direct association between EPP and

LA, specific indirect associations via CSE, via OE, and via CSE then OE, while reporting total indirect and total associations. 10,000 Bootstrap resamples were used with a fixed seed, two-tailed tests, and 95% percentile confidence intervals. Stage-two Bootstrap is conditional on saved stage-one scores and does not re-estimate stage one in each resample [34]. Internal VIF, R^2, adjusted R^2, f^2, and descriptive fit indices SRMR and NFI are reported. Each structural coefficient represents a conditional association after accounting for the other predictors of the same endogenous construct. Path coefficient magnitudes are compared descriptively without additional testing of differences between path coefficients; a significant path and a non-significant path are not treated as evidence that the two coefficients differ significantly.

The 295-person subsample uses the same structural model for sensitivity analysis. Major comparison uses all 591 participants, with each group employing the same indicators, measurement settings, and algorithm settings. Measurement invariance is first evaluated through MICOM (Measurement Invariance of Composite Models) for both stages [35], then path differences across the three major pairings are compared using permutation tests. Each major pairing uses 10,000 permutations; Bonferroni correction is applied to the 18 path difference tests (6 paths × 3 pairings), with corrected p-value = min(1, original p × 18).

Use of Artificial Intelligence

OpenAI Codex assisted with analytical scripts, tabulation, literature organization, and manuscript drafting and editing. The authors are responsible for the analysis, interpretation, and final content.

Results

Sample Characteristics and Measurement Evaluation

The main sample includes 226 environmental art design students, 154 digital media art students, and 211 visual communication design students; 440 (74.5%) were female. Table 1 presents characteristics of the full sample and the 295-person sensitivity subsample. The 27 analytical items had no missing responses.

Table 1 Participant Characteristics

Characteristic	Main Analysis N=591 n(%)	Sensitivity Subsample n=295 n(%)
Environmental Art Design	226 (38.2)	113 (38.3)
Digital Media Art	154 (26.1)	77 (26.1)

Visual Communication Design	211 (35.7)	105 (35.6)
First Year	94 (15.9)	50 (16.9)
Second Year	290 (49.1)	145 (49.2)
Third Year	207 (35.0)	100 (33.9)
Male	151 (25.5)	70 (23.7)
Female	440 (74.5)	225 (76.3)
Has Practical Experience	150 (25.4)	75 (25.4)
No Practical Experience	441 (74.6)	220 (74.6)

Note: Practical experience refers to internships or practice experience related to the major. The sensitivity subsample is included within the complete main analysis sample.

Table 2 summarizes reliability indicators for the five reflective constructs, comprising the two EPP components, CSE, OE, and LA. Composite reliabilities for the EPP absolute evaluation component and comparative evaluation component were .850 and .930, respectively, with AVE of .655 and .769, respectively. CSE, OE, and LA also showed satisfactory internal consistency, with rho_C ranging from .911 to .943. Standardized loadings are shown in Supplementary Table S1.

Table 2 Descriptive Statistics and Reflective Measurement Quality

Measure	Mean	SD	Alpha	rho_A	rho_C	AVE
EPP Absolute	2.85	0.74	.738	.757	.850	.655
EPP Comparative	2.93	0.78	.900	.904	.930	.769
CSE	3.54	0.61	.921	.923	.938	.716
OE	3.17	0.72	.927	.929	.943	.734
LA	3.57	0.54	.888	.892	.911	.562

Note: N = 591. Means and standard deviations are unweighted item averages. EPP component measures come from stage one; CSE, OE, and LA measures come from the main stage-two model. Reliability and AVE apply to reflective measurements, not to the higher-order formative EPP.

HTMT values involving CSE, OE, and LA were all below .85, as were their relationships with EPP components. The relationship between the two EPP components was relatively close (HTMT = .901, 95% CI [.850, .951]), indicating that although the two have different content emphases, their empirical distinction is limited (Supplementary Table S2). Both components had positive and significant formative weights in the higher-order EPP (Table 3).

Table 3 Higher-Order EPP Component Weights

Component	Weight	95% CI	p	VIF
Absolute evaluation	.458	[.300, .613]	<.001	2.206
Comparative evaluation	.613	[.458, .757]	<.001	2.206

Note: N = 591. Formative stage-two weights from the six-path main model, with 95% percentile intervals from 10,000 Bootstrap resamples. Both component scores were obtained in stage one.

Structural Associations: Strong Link Between Career Self-Efficacy and Learning Agency

Internal VIF for the six-path main model ranged from 1.000 to 2.246. The model explained 48.0% of the variance in LA (R^2 = .480, adjusted R^2 = .477), 19.3% of the variance in CSE, and 55.5% of the variance in OE. The estimated model's SRMR was .0479 and NFI was .9180. Table 4 reports the six structural paths.

CSE→LA was the numerically largest standardized coefficient among the six structural paths (β = .598, 95% CI [.488, .696], p < .001, f^2 = .416). EPP was positively associated with both CSE (β = .439) and OE (β = .449), and CSE was also positively associated with OE (β = .429), all three paths p < .001.

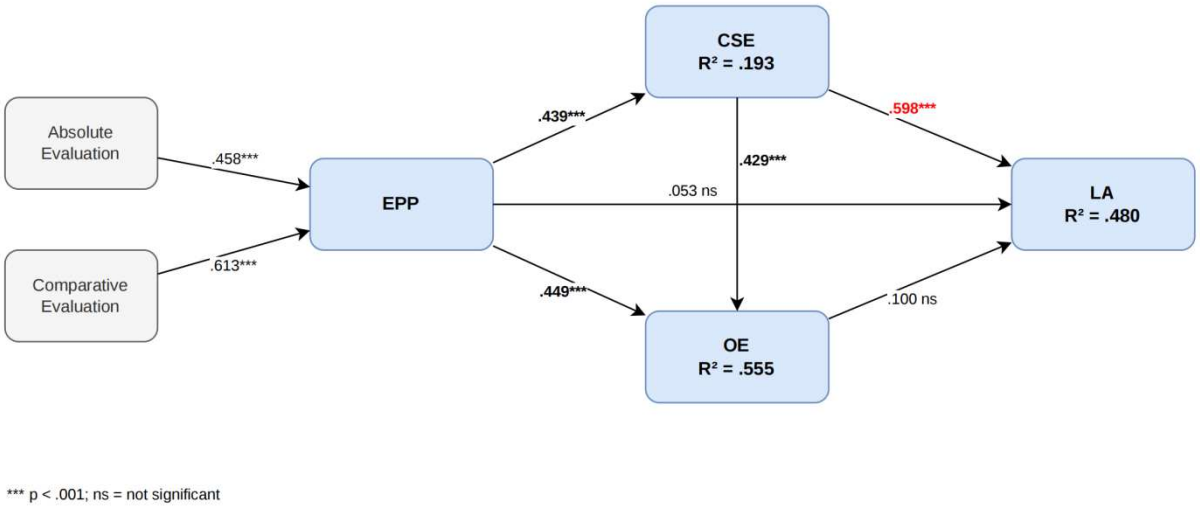
After simultaneously including CSE and OE, the direct association EPP→LA was small and did not reach significance (β = .053, 95% CI [−.035, .144], p = .239, f^2 = .003). OE→LA also was not significant (β = .100, 95% CI [−.017, .223], p = .101, f^2 = .009). H1–H4 were supported; H5 was not supported.

Table 4 Structural Associations in Main Analysis (Six-Path Model)

Path	β	95% CI	p	f^2
EPP → CSE	.439	[.355, .517]	<.001	.239
EPP → OE	.449	[.355, .537]	<.001	.366
EPP → LA	.053	[−.035, .144]	.239	.003
CSE → OE	.429	[.337, .518]	<.001	.333
CSE → LA	.598	[.488, .696]	<.001	.416
OE → LA	.100	[−.017, .223]	.101	.009

Note: N = 591. Standardized estimates; 10,000 Bootstrap resamples; two-tailed tests; 95% percentile confidence intervals. The main model includes the EPP→LA direct path. f^2 values come from the corresponding six-path algorithm report.

Figure 1. Structural associations in the full-sample six-path model. Standardized path coefficients are shown on arrows. *** p < .001; ns = not significant. R^2 values are displayed next to endogenous variables. The two lower-order components form the higher-order formative EPP construct, with external weights displayed. Reflective indicators for CSE, OE, and LA are omitted for clarity. Arrows represent the estimated model direction and do not imply confirmed causal direction. EPP = Employment Prospect Perceptions; CSE = Career Self-Efficacy; OE = Outcome Expectations; LA = Learning Agency.



Insert Figure 1 here

Indirect Associations: Career Self-Efficacy Path Supported

Table 5 shows that EPP→CSE→LA was the numerically largest specific indirect association (β = .263, 95% CI [.205, .323], p < .001). The specific indirect association via OE was .045 (95% CI [−.008, .099], p = .098), and the chained indirect association via CSE then OE was .019 (95% CI [−.003, .048], p = .146); the intervals for both latter paths included zero.

The total indirect association was .326 (95% CI [.241, .410], p < .001), and after adding the direct association, the total association was .380 (95% CI [.294, .460], p < .001). These results support H6 but do not support H7; the statistical connection between EPP and LA is mainly reflected in the indirect path via CSE.

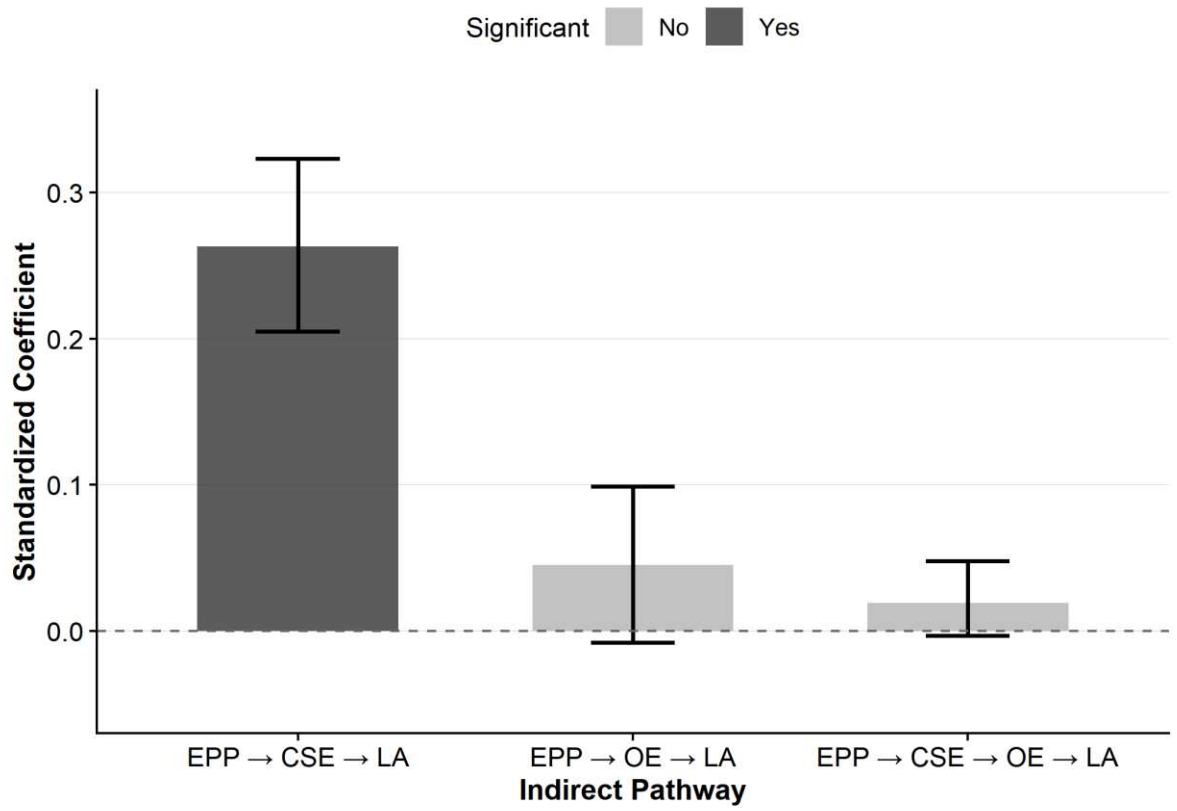
Table 5 Specific Indirect, Total Indirect, and Total Associations Between EPP and LA (Six-Path Model)

Association	Estimate	95% CI	p
EPP → CSE → LA	.263	[.205, .323]	<.001
EPP → OE → LA	.045	[−.008, .099]	.098
EPP → CSE → OE → LA	.019	[−.003, .048]	.146
EPP → LA Total Indirect	.326	[.241, .410]	<.001
EPP → LA Total Association	.380	[.294, .460]	<.001

Note: N = 591. Standardized estimates; 95% percentile intervals from 10,000 Bootstrap resamples. Total indirect association is the sum of the three specific indirect associations, and total association is the sum of the direct and total indirect associations; components rounded and summed may differ from totals by .001. Each interval comes from corresponding Bootstrap output.

Figure 2. Specific indirect associations from EPP to LA. Bars represent standardized coefficients for each indirect pathway. Error bars show 95% percentile confidence intervals

from 10,000 Bootstrap resamples. The indirect association via CSE was significant ($p < .001$), while associations via OE and the chain via CSE→OE were not significant (intervals include zero). EPP = Employment Prospect Perceptions; CSE = Career Self-Efficacy; OE = Outcome Expectations; LA = Learning Agency.



Insert Figure 2 here

Subsample Sensitivity Analysis

In the 295-person subsample, CSE→LA was .630 (95% CI [.479, .752]), and the specific indirect association via CSE was .253 (95% CI [.176, .330]), both $p < .001$. EPP→LA and OE→LA did not reach significance, with the overall pattern similar to the full sample (Supplementary Table S3). This result provides an internal sensitivity check and does not constitute independent sample validation.

Exploratory Major Comparison

All three major pairings did not reject composite invariance in MICOM step two for both stages, supporting structural path comparison (Supplementary Table S4). After Bonferroni correction, none of the 18 path difference tests reached the .05 level (Supplementary Table S5). Among them, the EPP→OE coefficients for digital media art and visual communication

design were .198 and .583, respectively, with a difference of −.385, original p = .0029, corrected p = .0522. The comparisons did not provide evidence of between-major path differences after adjustment for multiple testing.

Discussion

Link Between Career Self-Efficacy and Preparatory Learning

Career self-efficacy was positively associated with learning agency, and the specific indirect association linking employment prospect perceptions to learning agency through career self-efficacy was supported. The internal subsample analysis showed a similar pattern. Taken together, these findings connect students' evaluations of future opportunities with their beliefs about handling professional tasks and their reported engagement in current learning. The central finding concerns this relationship during career preparation, as students develop professional capabilities in preparation for future work.

The positive CSE–LA association is consistent with SCCT's emphasis on efficacy beliefs [4, 5] and with evidence linking academic self-efficacy to engagement. Fatimah et al.'s meta-analysis of 24 studies reported a positive association between academic self-efficacy and academic engagement [10]. The present study examines a more specifically defined setting: efficacy beliefs concern professional learning and practice, while LA includes resource seeking, adjustment of learning priorities, persistence, and feedback seeking. This places the efficacy–engagement relationship within the preparation for professional work, alongside students' evaluations of employment opportunities. It does not imply that the present LA measure and conventional academic engagement measures are interchangeable.

The task content helps interpret this association in art and design education. For example, revising a portfolio project can involve identifying a design problem, learning an unfamiliar tool, and responding to critique. These activities connect the competence judgments assessed by CSE with the proactive learning orientation assessed by LA. A student who believes that a difficult task is manageable may be more willing to seek feedback or persist through revision. Conversely, successful learning experiences may also strengthen competence beliefs. This reciprocal interpretation is compatible with self-efficacy theory [11, 18], although the present cross-sectional model does not distinguish the directions of influence.

After simultaneously considering CSE and OE, the direct association between EPP and LA was not significant. Together with the supported indirect association through CSE, this

pattern identifies competence beliefs as an important link between employment evaluations and learning in the current model. It does not establish complete causal mediation or show that employment opportunities matter only through self-efficacy.

Link Between Outcome Expectations and Current Learning Behavior

Employment prospect perceptions and career self-efficacy were both positively associated with outcome expectations, but the conditional OE–LA association and the indirect associations involving OE were not supported. This pattern differs from findings in some related educational settings. Shang et al. identified occupational self-efficacy and vocational outcome expectations as mediators of the relationship between career calling and learning engagement among Chinese preservice teachers [12]. Woreta et al. found indirect associations through academic self-efficacy and outcome expectations between peer context and academic engagement among Ethiopian secondary school students [13]. Those studies examined different contextual predictors, populations, and measures. Their results therefore provide comparisons for interpreting the present findings rather than a basis for expecting identical pathways.

One relevant distinction is the connection between the expected outcome and the learning action. In this study, OE concerns anticipated employment and career returns, whereas LA concerns actions students can undertake during their current studies. Students may regard a career outcome as desirable without identifying a particular learning action that will secure it. Shared explanatory information among EPP, CSE, and OE may also contribute to the non-significant conditional association. The result thus concerns the additional association of this OE measure with LA within the specified model, rather than the general motivational value of career expectations.

Fouad and Guillen emphasized the need to specify the outcomes addressed by outcome expectation measures [36]. Here, the items include both anticipated returns and judgments about competence fit and skill applicability. This content should inform the comparison with earlier studies. Distinguishing near-term learning gains from longer-term career returns could help test whether expectations more closely tied to particular learning tasks have clearer associations with those actions. Temporal distance is a plausible explanation to investigate, but it was not directly measured in this study.

Theoretical Implications

The study contributes to SCCT research by examining how perceived opportunities relate to ongoing learning during career preparation. Its focus is on the connection between career-related judgments and actions within professional education, extending the discussion of career development to students' current resource seeking, persistence, and adaptation. This focus is consistent with the career self-management perspective, which encompasses preparation and adaptive behavior [8, 9]. The contribution lies in specifying and examining these associations in art and design education, rather than treating learning as merely a preliminary stage outside career development.

EPP also makes the object of the contextual evaluation explicit. Students evaluate the opportunities associated with their specialization, while CSE concerns their ability to meet professional task demands. The distinction allows perceived opportunities and competence beliefs to be considered together without treating a favorable employment outlook as equivalent to confidence in one's own abilities. The EPP measure retains both evaluations of opportunities within the specialization and explicit comparisons with other design specializations. Their close empirical relationship indicates that the contribution of this distinction is content coverage, rather than evidence for two independent psychological processes. EPP remains an individual perception of opportunities; the model does not estimate the effect of objective industry contraction on learning.

Considering CSE and OE simultaneously further clarifies the study's contribution. The supported association through CSE and the unsupported associations through OE show which proposed links received evidence under the current operationalizations. They do not establish a statistically tested superiority of one belief over the other. Likewise, the exploratory comparisons did not detect between-major path differences after correction, so the main contribution concerns the overall pattern in the sampled art and design students. Whether this pattern varies across educational or employment contexts remains open.

Practical Implications

The findings suggest that career support could connect employment information with concrete opportunities to assess and develop professional competence. In portfolio consultations, advisers can relate job task requirements to students' existing work and identify specific revision goals. In instructional feedback, teachers can help students recognize what they can already accomplish and what the next manageable task involves. Professional

practice can provide progressively demanding tasks, feedback, and opportunities for reflection. These approaches are consistent with the emphasis on mastery experiences in self-efficacy theory and with feedback research [18, 37]; their effects on learning agency require intervention testing.

For example, a discussion of changing design requirements could lead to selecting a relevant skill, applying it in a project, obtaining feedback, and reviewing the improvement in the work. This provides a concrete way to connect career information with present learning decisions. The aim would be to help students form competence judgments grounded in their work, rather than simply encourage more optimistic expectations about employment. Such support should remain attentive to the opportunities, resources, and constraints students actually face.

The non-significant conditional OE–LA association does not justify withdrawing employment information or career guidance. EPP was positively associated with both CSE and OE, making the interpretation of that information relevant to the broader pattern. Advisers can help students distinguish information about the availability of opportunities, judgments about their own preparation, and expectations about future returns. Discussing these questions separately may make learning goals more concrete while retaining a realistic view of employment uncertainty.

Limitations and Future Research

This study's cross-sectional self-report data support associations among variables but cannot yet determine their temporal order and may be subject to common method bias [38]. The sample comes from four application-oriented universities in two cities, with the 295-person subsample constituting an internal check; the analysis did not include demographic covariates and did not model institutional or class clustering. Future work can use broader longitudinal samples combined with course records or portfolio evaluations to test the temporal order and scope of applicability of these connections.

Measurement results should be understood in combination with this study's operationalization scope: CSE is oriented toward professional tasks in career preparation, and LA reflects overall learning agentic orientation. Exploratory parallel analysis of LA suggested two factors, and existing evidence is not yet sufficient to confirm strict unidimensionality, so this paper's LA results are limited to the current overall construct specification. Some OE items also include competence fit content; subsequent work can further distinguish competence

judgments from outcome expectations and test measurement structure in independent samples.

Conclusions

This study connects perceived employment opportunities with current learning agency among Chinese undergraduate art and design students through a model of career self-efficacy and outcome expectations. Career self-efficacy was positively associated with learning agency and formed a supported specific indirect link with employment prospect perceptions. The direct EPP–LA association and the paths to LA involving outcome expectations were not supported. Within the current measures, these findings identify professional task competence beliefs as a relevant connection between career preparation and everyday learning. They suggest that career support could pair realistic employment information with project work, feedback, and opportunities to develop competence. Longitudinal and intervention studies are needed to establish temporal direction and test whether such support strengthens learning agency.

Abbreviations

AVE, Average Variance Extracted; CFA, Confirmatory Factor Analysis; CFI, Comparative Fit Index; CI, Confidence Interval; CSE, Career Self-Efficacy; DMA, Digital Media Art; EAD, Environmental Art Design; EFA, Exploratory Factor Analysis; EPP, Employment Prospect Perceptions; HTMT, Heterotrait-Monotrait Ratio; LA, Learning Agency; MICOM, Measurement Invariance of Composite Models; OE, Outcome Expectations; PLS-SEM, Partial Least Squares Structural Equation Modeling; RMSEA, Root Mean Square Error of Approximation; SRMR, Standardized Root Mean Square Residual; SCCT, Social Cognitive Career Theory; VCD, Visual Communication Design; VIF, Variance Inflation Factor.

Declarations

Ethics Approval and Consent to Participate

This study employed anonymous, non-interventional surveys covering employment perceptions, career beliefs, and learning behaviors related to students' majors. The authors, pursuant to Article 32 of the *Ethical Review Measures for Life Science and Medical Research Involving Humans* regarding exemption for research using anonymized information data, consider this study to fall under the exemption category [39]. This study did not obtain

institutional ethics approval or an institutional exemption determination. All participants were at least 18 years old and provided informed consent after learning about the research purpose and the principles of anonymity and voluntary participation.

Consent for Publication

Not applicable.

Availability of Data and Materials

The datasets analyzed in the current study are available from the corresponding author upon reasonable request.

Competing Interests

The authors declare no competing interests.

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Authors' Contributions

JJ (Juanjuan Jiang): Conceptualization, Methodology, Writing – original draft, Writing – review & editing.

LJ* (Jiao Li): Investigation, Writing – review & editing, Project administration, Supervision.

JJw (Jianwu Jiang): Formal analysis, Data curation.

LY (Yujie Li): Resources, Writing – review & editing.

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All authors read and approved the final manuscript.

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Supplementary Information

The accompanying supplementary materials provide Supplementary Tables S1–S6, sequentially reporting reflective indicator loadings, stage-one HTMT, the 295-person subsample estimates, two-stage composite invariance, major path difference tests, and the Chinese administered items and English translations of the 27 items included in the analysis. The supplementary materials also provide a brief note reporting measurement structure diagnostics. Additional file 2 (Supplementary_Questionnaire_English.docx) provides a standalone English-language version of the 27 questionnaire items included in the analysis.

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