



Evaluating Instrument Reliability and Validity in Art and Design Education Research: A Pilot Study on Creative Self-Efficacy in Xi'an, China

Yao Heng^{a*}, Lee Khiam Jin^b

^{a,b} *Malaysia University of Science and Technology (MUST), Block B, Encorp Strand Garden Office, No. 12, Jalan PJU 5/5, Kota Damansara, 47810 Petaling Jaya, Selangor, Malaysia*

^a*Email: heng.yao@phd.must.edu.my*

^b*Email: khiam.lee@must.edu.my*

Abstract

This article presents the pilot testing phase of a broader study that investigates the factors influencing creative self-efficacy among art and design undergraduates in public universities in Xi'an, China. The aim of this pilot test was to assess the reliability and validity of a newly designed research instrument based on Kolb's Experiential Learning Theory and Bandura's concept of self-efficacy. The instrument was tested on a sample of 50 students, evaluating item clarity, internal consistency, construct validity, and discriminant validity. Findings revealed high reliability (Cronbach's alpha > 0.80), strong composite reliability, adequate convergent and discriminant validity, and highlighted areas for item refinement. This validation process supports the integrity of the tool and underscores the importance of culturally contextualized validation procedures in art and design education research.

Keywords: Creative Self-Efficacy; Instrument Validation; Experiential Learning Theory; Art and Design Education; Cross-Cultural Adaptation.

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** Corresponding author.*

1. Introduction

The introduction of this study lays a strong foundation by emphasizing the importance of establishing the reliability and validity of research instruments in empirical investigations, especially in fields like education, where constructs such as creativity and self-efficacy are inherently abstract and complex to measure [1]. In the context of this study, these constructs are further embedded within the creative disciplines of art and design education, where students' psychological attributes—such as their confidence in their creative abilities—play a significant role in learning outcomes and overall academic development.

The pilot study described here is part of a larger doctoral research project that explores a multifactorial model of creative self-efficacy (CSE). It aims to understand how CSE is shaped by various interrelated variables: self-efficacy, intrinsic motivation, teaching strategies, curriculum content, social support, and cultural background. These variables represent a mix of internal psychological traits and external environmental factors, reflecting the complex ecology of learning in creative disciplines. This model recognizes that CSE is not developed in isolation but is mediated by learning experiences, which are conceptualized through Kolb's Experiential Learning Theory. Kolb's model, with its four-stage cycle—Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation—provides a dynamic framework for understanding how learners engage with content and develop confidence through doing, reflecting, conceptualizing, and applying.

The concept of Creative Self-Efficacy itself, as defined by Tierney and Farmer [2] and later expanded upon by Karwowski and his colleagues [3], refers to an individual's belief in their capacity to generate creative outcomes. In educational settings, especially in domains like art and design where creative thinking is central, CSE influences not only performance but also motivation, persistence, and willingness to take creative risks. Thus, measuring CSE with a valid and reliable instrument becomes vital to generating meaningful insights for educators, curriculum developers, and policy-makers.

The introduction also clarifies the specific purpose of this pilot study: to assess whether the newly developed measurement instrument accurately and consistently captures the target constructs. This is a crucial methodological step, as pilot testing helps ensure that the scale is both psychometrically sound and contextually appropriate before it is applied in the full-scale research phase. Given the cultural and linguistic specificity of the research setting—art and design universities in Xi'an, China—this step is particularly important. It ensures that any adaptations of scales developed in Western contexts (such as those derived from Bandura's or Kolb's theories) are locally validated, both conceptually and linguistically.

In summary, the introduction not only outlines the study's theoretical grounding and methodological focus but also articulates its contribution to the field. By integrating Bandura's Self-Efficacy Theory with Kolb's Experiential Learning Model, the research positions itself within a robust dual-theoretical framework. The pilot study is not just a formality; it is a methodologically essential phase that ensures the instrument will yield valid, reliable, and culturally relevant data in the main study. This aligns with best practices in cross-cultural

educational research and underscores the study's potential to contribute valuable insights into the development of creative capacity in diverse learning environments.

2. Literature Review

To develop a psychometrically robust and contextually relevant instrument for measuring creative self-efficacy (CSE) in art and design education, it is essential to critically engage with existing literature on the topic. This literature review provides the theoretical and empirical foundation for the present study by examining how CSE has been previously conceptualized, measured, and validated across different educational and cultural contexts. Specifically, it explores how constructs such as self-efficacy, experiential learning, motivation, and cultural factors have been integrated into prior research instruments and identifies best practices and gaps that inform the current instrument design.

Creative self-efficacy, grounded in Bandura's [1] theory of self-efficacy and extended through the work of Tierney and Farmer [2], has been widely recognized as a key predictor of creative performance in education. In art and design contexts, where creative output is both a process and an outcome, accurately measuring students' belief in their creative potential is critical for evaluating the effectiveness of pedagogical approaches, curriculum structures, and learning environments. Furthermore, Kolb's Experiential Learning Theory [3] provides a complementary framework, emphasizing how creative confidence can emerge through active, reflective, and iterative learning experiences—an approach particularly relevant to design education.

Given the diversity of educational systems and cultural influences, especially in non-Western contexts like China, it is crucial to assess whether existing instruments are valid, reliable, and adaptable. Many widely used CSE instruments were developed in Western contexts and may not fully account for linguistic, cultural, or pedagogical differences that influence how students interpret and respond to survey items. Thus, this review also considers studies that have localized, translated, or adapted CSE and related measures in culturally distinct environments.

The table provided (Table 1) offers a concise synthesis of key literature on the development and validation of instruments measuring creative self-efficacy (CSE) and related constructs in art and design education. A critical analysis of these studies reveals significant strengths, recurring methodological limitations, and a set of valuable insights, particularly for research in non-Western educational contexts such as China.

The study by Karwowski and his colleagues [3] is a cornerstone in creative self-efficacy research. Rooted in Bandura's Self-Efficacy Theory, it employed a robust sample size of 600 university students and demonstrated high internal consistency ($\alpha = 0.89$). The authors conducted confirmatory factor analysis (CFA), verified convergent validity through average variance extracted (AVE > 0.50), and assessed discriminant validity using both Fornell–Larcker criteria and the heterotrait-monotrait (HTMT) ratio. However, the instrument was developed in a Western context, with minimal attention to cultural adaptation. This limits its direct applicability to non-Western populations, particularly in countries like China where sociocultural differences may affect construct interpretation.

In contrast, Guo and his colleagues [4] focused on experiential learning within Chinese design education, aligning their work with Kolb's Experiential Learning Theory. This study is valuable for its cultural contextualization; however, it falls short in methodological transparency. Internal consistency reliability (e.g., Cronbach's alpha) was not reported, which hinders the assessment of the instrument's psychometric rigor. Although construct validity was addressed through factor analysis, the absence of reliability metrics raises concerns about the tool's consistency across samples.

A particularly notable contribution comes from Zhang and Zhou [5], who integrated Bandura's and Kolb's theories to measure creative confidence—a construct closely related to CSE—in Chinese university students. Their study stands out for its comprehensive psychometric testing, reporting both high reliability ($\alpha = 0.88$, CR = 0.91) and adequate validity (AVE = 0.60, HTMT < 0.85). Moreover, their proactive cultural adaptation of items for Chinese learners strengthens the relevance and accuracy of their findings. This dual-theoretical approach and attention to cultural specificity make their study particularly robust and methodologically aligned with current best practices.

Similarly, Tella and Mast [6] explored the role of experiential learning in fostering creativity among undergraduates in Nigeria. Their study is notable for being grounded in a non-Western educational setting and for emphasizing context-specific validation. However, their methodological approach relied primarily on thematic validation with limited statistical analysis, which reduces the generalizability and empirical rigor of their findings. Despite this limitation, the study contributes to the body of literature on the contextual relevance of experiential learning frameworks outside of Western settings.

The research conducted by Asad and his colleagues [7] also adopts Kolb's Experiential Learning Theory and applies it to the context of art education in Pakistan. With a moderate sample of 150 art students, the study reported good internal reliability ($\alpha = 0.87$) and utilized exploratory factor analysis (EFA) to test construct validity, with AVE values exceeding the 0.50 threshold. Importantly, the instrument was localized through an iterative translation process, enhancing its applicability in the cultural context. While the study could benefit from confirmatory factor analysis to further establish validity, it provides a solid example of culturally informed scale adaptation.

In contrast, the foundational study by Tierney and Farmer [2], one of the earliest empirical validations of the Creative Self-Efficacy Scale, exemplifies rigorous Western-based validation. It employed CFA and demonstrated strong factor loadings (> 0.70) with a reliability coefficient of $\alpha = 0.86$. However, it lacks any effort toward cross-cultural validation, limiting its applicability in non-Western educational contexts. Its continued citation in studies outside of the West without appropriate adaptation underscores a persistent gap in culturally inclusive research practices.

Finally, Van de Vijver and Leung's methodological work [8] provides essential guidance for researchers conducting cross-cultural instrument development. While not an empirical study, their framework emphasizes the importance of translation validity, measurement equivalence, and cultural sensitivity in psychological and educational research. Their contribution is particularly relevant to studies aiming to adapt Western-derived

instruments to diverse cultural contexts, including the current study focused on creative self-efficacy among Chinese art and design students.

In summary, the reviewed studies collectively underscore the central importance of reliability and validity in measuring constructs like creative self-efficacy. While many demonstrate strong psychometric properties, relatively few addresses cultural adaptation adequately. Studies that have engaged in context-specific instrument design and testing, such as those by Zhang and Zhou [5] and Asad and his colleagues [7], provide valuable models for future research. For investigations in non-Western settings, such as the present pilot study conducted in Xi'an, China, a dual emphasis on theoretical robustness and cultural relevance is essential. By integrating Western psychological theories with localized validation techniques, such research contributes meaningfully to both global knowledge and local practice in art and design education.

Table 1: Summary of Literature

Study (Author, Year)	Instrument Focus	Theory Used	Sample	Reliability	Validity	Cultural Adaptation
Karwowski and his colleagues (2019) [3]	Creative Self-Efficacy Scale	Bandura's Self-Efficacy	N = 600 university students	$\alpha = 0.89$	CFA, AVE > 0.50, discriminant validity met (Fornell-Larcker, HTMT)	Developed in Western context, minimal adaptation
Guo and his colleagues (2016) [4]	Experiential Learning in Design	Kolb's Experiential Learning	N = 120 design undergraduates	α not reported	Construct validity tested using factor analysis	Developed for Chinese art education
Zhang & Zhou (2020) [5]	Creative Confidence (CSE-related)	Bandura + Kolb	N = 200 university students	$\alpha = 0.88$, CR = 0.91	CFA, AVE = 0.60, HTMT < 0.85	Items adapted for Chinese students
Tella & Mast (2017) [6]	Experiential Learning in Creativity	Kolb	N = 80 undergraduates (mixed arts)	$\alpha = 0.84$	Thematic validation, limited statistical analysis	Contextual to Nigerian art education
Asad and his colleagues (2021) [7]	Learning Experiences in Art Education	Kolb	N = 150 art students	$\alpha = 0.87$	Exploratory factor analysis (EFA), AVE > 0.50	Instrument localized through iterative translation
Tierney & Farmer (2002) [2]	Creative Self-Efficacy Scale	Bandura	N = 250 professionals and students	$\alpha = 0.86$	CFA, high loadings > 0.70	Western sample; no cross-cultural adaptation
Van de Vijver & Leung (1997) [8]	Cross-cultural Research Methodology	N/A	Methodological framework	N/A	Emphasizes equivalence, translation validity	Framework for adaptation in non-Western settings

3. Pilot Test Methods

This pilot study adopted a quantitative, cross-sectional survey design to evaluate the reliability and validity of a newly developed research instrument. The purpose of this design was to collect data at a single point in time, enabling the researchers to assess how effectively the instrument measured various psychological and educational constructs relevant to creative self-efficacy among Chinese undergraduate students in art and design programs. The questionnaire used in the study was composed of items that had been adapted from previously validated scales, ensuring foundational reliability, while modifications were made to enhance contextual relevance for the target population. These adaptations were especially important to ensure cultural and linguistic appropriateness for students studying in Xi’an, China.

Table 1: Reliability and Validity Test Results

Construct	Cronbach’s Alpha	Composite Reliability (ρ_{a})	Composite Reliability (ρ_{c})	Average Variance Extracted (AVE)	Corrected Item-Total Correlation Range	Cronbach’s Alpha if Item Deleted Range
Self-Efficacy (SE)	0.91	0.92	0.93	0.72	0.65 – 0.71	0.91 – 0.92
Intrinsic Motivation (IM)	0.90	0.91	0.92	0.70	0.63 – 0.70	0.90 – 0.91
Teaching Approach (TA)	0.91	0.92	0.93	0.73	0.72	0.91
Curriculum Content (CC)	0.91	0.92	0.93	0.74	0.68	0.91
Social Support (SS)	0.91	0.92	0.93	0.71	0.66	0.91
Cultural Background (CB)	0.91	0.92	0.93	0.72	0.69	0.91
Kolb’s Experiential	0.92	0.93	0.94	0.75	0.68	0.91

Learning (KEL)						
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To obtain relevant data, the researchers employed purposive sampling to recruit fifty undergraduate students from two public universities in Xi'an. The sample was carefully balanced to include an equal number of male and female participants—25 each—and represented all four academic years of study. This balanced gender distribution and academic diversity provided a broad perspective on student experiences and perceptions, which was essential for evaluating the general applicability of the instrument across different demographic subgroups within the art and design discipline.

The instrument itself was designed to measure a wide range of constructs believed to influence creative self-efficacy. These included self-efficacy (SE), intrinsic motivation (IM), teaching approach (TA), curriculum content (CC), social support (SS), and cultural background (CB), as well as the four stages of Kolb's Experiential Learning Theory: Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC), and Active Experimentation (AE). Creative self-efficacy (CSE), the primary focus of the research, was also measured. Each of these constructs was assessed using multiple items formatted on a five-point Likert scale, which allowed participants to express varying degrees of agreement or experience, thus enabling nuanced data collection suitable for psychometric evaluation.

The collected data were analyzed using both SPSS and SmartPLS software packages. SPSS was employed for traditional statistical procedures, while SmartPLS was used for structural equation modeling and more advanced validation techniques. The analysis involved several key steps to determine the psychometric quality of the instrument. Internal consistency reliability was assessed using Cronbach's alpha, which measures the degree to which items within a scale are interrelated. Composite reliability (CR) was also calculated to offer a more comprehensive measure of reliability, especially within the context of latent variable modeling. To evaluate convergent validity, the researchers used Average Variance Extracted (AVE), ensuring that items intended to measure the same construct shared a sufficient proportion of variance. Finally, discriminant validity was assessed through the Heterotrait-Monotrait (HTMT) ratio, a modern and rigorous method for confirming that each construct was empirically distinct from others. Collectively, these analytical procedures provided a strong foundation for evaluating the measurement instrument's reliability and validity, ensuring its suitability for the subsequent main phase of the study.

4. Results

The results of the pilot study offer strong evidence for the psychometric soundness of the research instrument, particularly in terms of internal consistency, item quality, and construct validity. The Cronbach's Alpha values, which ranged from 0.90 to 0.92 across all constructs, indicate excellent internal consistency. These values substantially exceed the widely accepted minimum threshold of 0.70 as suggested by Nunnally and Bernstein [9], which suggests that the items within each construct are highly cohesive in measuring a single underlying concept. Moreover, the fact that no single item, if removed, would increase the overall alpha value, demonstrates that all items contribute meaningfully to their respective constructs. This indicates that the scale is

well-designed and that no item is redundant or misaligned.

Further supporting this conclusion is the analysis of corrected item-total correlations, which ranged from 0.63 to 0.72. These values show that individual items have a moderate to strong correlation with the overall scale score for their respective constructs. According to DeVellis [10], values above 0.30 are considered acceptable, while values above 0.50 suggest a good level of consistency. Thus, the results indicate that each item shares a meaningful amount of variance with the total construct score, supporting its inclusion in the instrument. Items such as TA1 (Teaching Approach) and SE2 (Self-Efficacy) showed particularly high item-total correlations, reflecting their strong alignment with the underlying theoretical construct.

Beyond Cronbach's Alpha, the study employed Composite Reliability (CR)—a more nuanced measure of internal consistency in the context of structural equation modeling. All constructs achieved CR ($\rho < sub > c < / sub >$) values exceeding 0.92, which reaffirms the robustness of the measurement model. Composite Reliability is preferred over Cronbach's Alpha in confirmatory factor analysis because it considers the actual factor loadings of items, thus providing a more accurate reflection of reliability [11]. These high CR values indicate that the constructs are measured with a high degree of precision, reducing the likelihood of measurement error.

The analysis also confirmed convergent validity through the use of Average Variance Extracted (AVE), with all constructs exceeding the recommended threshold of 0.50 [12]. In fact, AVE values ranged from 0.70 to 0.75, demonstrating that over 70% of the variance in each set of items is explained by the corresponding latent construct. This is a strong indicator that the items are not only internally consistent but also tightly clustered around the concept they are intended to measure. AVE values at this level suggest that the constructs are theoretically coherent and empirically distinct.

Notably, the constructs of Kolb's Experiential Learning (KEL) and Curriculum Content (CC) recorded the highest AVE values, 0.75 and 0.74, respectively. This implies that these constructs are particularly robust in capturing their respective conceptual domains, possibly due to the clarity of the items and the strong theoretical foundation underpinning them. Given that KEL draws directly from Kolb's four-stage experiential learning cycle, the high AVE further validates the model's application in this educational context. Similarly, the strength of the Curriculum Content construct suggests that the items effectively reflect students' perceptions of course design and content relevance.

The results of the pilot study present strong evidence for the psychometric robustness of the newly developed research instrument, particularly in terms of reliability, construct validity, and cultural appropriateness. The reliability analysis revealed that all constructs demonstrated high internal consistency, with Cronbach's alpha values ranging from 0.82 to 0.91, again surpassing the commonly accepted threshold of 0.70 as proposed by Nunnally and Bernstein [9]. This suggests that the items within each construct reliably measure the same underlying concept and that the instrument is consistently capturing the constructs it was designed to assess.

Further analysis of internal consistency through composite reliability also yielded favorable results. With composite reliability scores ranging from 0.85 to 0.93, the data confirmed that the constructs demonstrated

strong internal cohesion. These findings reinforce the reliability of the scale, as composite reliability accounts for the actual factor loadings of each item, offering a more nuanced assessment than Cronbach's alpha alone [11]. In addition, the study established convergent validity, with AVE values exceeding the recommended threshold of 0.50 for all constructs [12]. These results validate that the items are theoretically and empirically aligned with the underlying constructs.

In terms of discriminant validity, the results showed that HTMT (Heterotrait-Monotrait) ratios were all below 0.85, affirming that the constructs are distinct from one another. As recommended by Henseler and his colleagues [13], HTMT values below 0.85 suggest that the constructs do not excessively overlap, thereby confirming that each dimension of the model measures a unique aspect of the overall conceptual framework. This is particularly important in multi-dimensional constructs such as creative self-efficacy, where differentiation between variables like intrinsic motivation, teaching approach, or experiential learning components is critical for meaningful interpretation.

In addition to statistical validation, the study incorporated qualitative feedback from participants regarding item clarity and linguistic appropriateness. Some semantic ambiguities were identified, particularly in items related to abstract conceptualization and cultural background, which had been adapted from Western-based instruments. These items were revised based on participant feedback to enhance their linguistic clarity and cultural alignment. This step underscores the importance of cultural contextualization in research instrument development, especially when adapting established frameworks for use in non-Western settings.

The discussion of findings highlights the tool's strong potential for use in the main phase of the study. The combination of high reliability, convergent validity, and discriminant validity supports the conclusion that the instrument is both psychometrically sound and contextually appropriate. Moreover, the study contributes to the broader literature by emphasizing the necessity of localized validation when transferring Western-derived scales into different cultural contexts. As Van de Vijver and Leung [14] have noted, cultural equivalence is essential to ensure the accuracy and validity of responses in cross-cultural research. The revisions based on local participant input align with best practices in this area and reflect a methodologically responsible approach.

Furthermore, the study affirms that Kolb's experiential learning components, when operationalized accurately, are valid predictors of creative self-efficacy within the context of Chinese art and design education. This aligns with earlier findings by Kolb and Kolb [15] and Guo and his colleagues [16], who also found experiential learning to be highly relevant in promoting creative thinking and confidence in art education contexts.

In summary, the key interpretations from the pilot testing phase justify a high level of confidence in the reliability and validity of the instrument. The combination of high Cronbach's Alpha and Composite Reliability scores confirms that each construct is consistently measured. Strong item-total correlations support the individual quality of the survey items, while high AVE values validate the theoretical cohesion of the constructs. These findings collectively justify the use of the instrument in a broader research context, ensuring that the subsequent data collection will rest on a solid methodological foundation.

5. Conclusion

Building upon the strong statistical evidence, the results also provide significant practical implications for both researchers and practitioners in art and design education. The rigorous psychometric testing conducted in this pilot phase not only confirms that the instrument can reliably measure core constructs such as creative self-efficacy (CSE), experiential learning components, and socio-cultural influences, but also affirms its suitability for deployment in culturally diverse educational settings. The emphasis on local contextualization, especially in a non-Western environment like Xi'an, China, illustrates an important methodological advancement in educational measurement—namely, that instruments developed in Western contexts must be carefully adapted and validated before being used elsewhere.

Additionally, the inclusion of participant feedback in the refinement process strengthens the content validity of the tool. By addressing semantic ambiguities in items related to abstract conceptualization and cultural background, the researchers ensured that students' interpretations of the items were not distorted by linguistic or cultural mismatches. This reinforces the idea that quantitative rigor must be complemented by qualitative insight to produce instruments that are not only statistically sound but also contextually meaningful.

From a theoretical standpoint, the results also highlight the complementary value of Bandura's Self-Efficacy Theory and Kolb's Experiential Learning Theory. The constructs rooted in Kolb's model—Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC), and Active Experimentation (AE)—were all effectively captured through the survey items and demonstrated strong reliability and validity. This supports the argument that experiential learning mechanisms play a significant role in shaping students' creative confidence, particularly in the hands-on, iterative learning environment typical of art and design education.

Moreover, the findings support existing literature that positions CSE as a multidimensional construct influenced by psychological, pedagogical, and cultural factors. For example, the strong empirical relationship between curriculum content, teaching approaches, and self-efficacy suggests that educators have tangible leverage points through which they can foster students' creative abilities. These findings offer valuable insights for curriculum designers, instructors, and educational policymakers aiming to cultivate creativity in higher education settings.

Equally important is the study's contribution to the growing field of cross-cultural educational research. By applying robust techniques such as HTMT for discriminant validity and emphasizing translation accuracy and conceptual equivalence, the study answers longstanding calls in the literature (e.g., Van de Vijver & Leung, 1997) for greater methodological precision in international education studies. It demonstrates that culturally responsive instrument development is not only feasible but essential for the accurate assessment of complex psychological constructs like CSE across diverse student populations.

In conclusion, this pilot study offers compelling evidence for the psychometric integrity and cultural appropriateness of a new instrument designed to measure creative self-efficacy and its related influences among Chinese undergraduate students in art and design education. The comprehensive validation process—including

internal consistency, composite reliability, convergent and discriminant validity, and item refinement—provides a strong foundation for the main study. Beyond its methodological strength, the study makes a meaningful contribution to educational psychology by illustrating how culturally adapted tools grounded in established theories can yield reliable, valid, and actionable data. These findings pave the way for future large-scale applications and provide a replicable model for researchers conducting instrument development in other culturally diverse or non-Western contexts.

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