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A PRELIMINARY STUDY OF THE EFFECTS OF LEARNING STYLES ON LEARNER AUTONOMY AMONG CHINESE NON-ENGLISH MAJORS: LEARNING ENGAGEMENT AS A MEDIATOR

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Abstract: *Learner autonomy is a core outcome of higher education and a key objective in EFL pedagogy, yet its antecedents remain underexplored in Asian tertiary contexts. This preliminary study investigated how learning styles and learning engagement affected learner autonomy among non-English major undergraduates in Xi'an, China. Using a quantitative cross-sectional design, data were collected from 100 students across six universities via a validated self-report questionnaire. Partial Least Squares Structural Equation Modelling (PLS-SEM) was employed for data analysis. Results showed that the four learning style modes (Concrete Experience, Reflective Observation, Abstract Conceptualisation, and Active Experimentation) did not directly predict learner autonomy. Autonomy was found to be significantly predicted by learning engagement (β = 0.562, t = 4.021). The results of the mediation analysis indicated that the effects of abstract conceptualization and active experimentation on autonomy were significantly mediated by engagement, with coefficients of (β = 0.164, t = 2.246) and (β = 0.250, t = 2.750) respectively. These results point to engagement as a crucial psychological mechanism that connects learning styles to independent learning and offer recommendations for future large-scale studies.*

Keywords: *Learning styles, learning engagement, learner autonomy, non-English major students*

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Introduction

It is acknowledged that learner autonomy is a central outcome of higher education and a core objective of English as a Foreign Language (EFL) pedagogy, especially when it comes to developing learners' capacity for self-directed and lifelong learning (Eppendi et al., 2025). Despite its significance, fostering learner autonomy is influenced by a number of interconnected factors and is still unexplored.

Previous studies have examined learning styles, learning engagement, and learning autonomy largely in isolation or pairs. However, to the best of our knowledge, to date, empirical evidence concerning their joint effects, especially under the potential mediation of engagement, remains limited, particularly in non-Western EFL contexts such as China.

Problem Statement

Previous researchers have predominantly treated learning styles as direct predictors of learner autonomy (Al Maani, 2022; Shelton-Strong, 2017), which has produced inconclusive findings, suggesting that learning styles alone may not sufficiently explain how autonomy develops. Engagement is often examined only as an outcome rather than a mediator (Abdullah et al., 2024; Lisady & Wong, 2022). One key limitation of existing studies is the under-exploration of learning engagement as an underlying psychological mechanism through which learning styles may exert their influence on learner autonomy.

To address this gap, the present study aims to examine the direct effects of learning styles and learning engagement on learner autonomy as well as the mediating function of engagement in the relationship between learning styles and learner autonomy among Chinese non-English major undergraduates. This study will contribute to more individualized and engagement-focused EFL pedagogical practices in higher education through elucidating these relationships.

Literature Review

Learner autonomy has been widely regarded as a central goal in EFL education since Holec's (1981) foundational definition of autonomy as learners' ability to take charge of their own learning. Subsequent research has expanded this construct through lenses such as self-regulated learning (Saad & Abdullah, 2025), motivation (Felix, 2019), and sociocultural theory (Huang & Benson, 2013). These perspectives have enriched conceptual understanding and empirical findings, particularly in the Chinese EFL context, which suggest a persistent gap between learner practice and learner autonomy. Despite learner-centred curriculum reforms (Xu, 2021), many non-English majors continue to rely heavily on teacher control and external regulation (Liu et al., 2023), indicating that autonomy development remains constrained by contextual and learner-level factors.

One limitation of existing research is its emphasis on motivational or strategic predictors of autonomy, with comparatively little attention to learners' cognitive preferences. Although autonomy has been linked to motivation and learning strategies (Wong & Luo, 2021), the role of learning styles remains theoretically acknowledged but empirically underexplored. Kolb's Experiential Learning Theory (ELT) conceptualises learning as a cyclical process involving Concrete Experience, Reflective Observation, Abstract Conceptualisation, and Active Experimentation (Kolb, 1984). While prior studies suggest that active and reflective orientations may facilitate self-directed behaviours such as strategy testing and adaptive decision-making (Loeng, 2020), empirical evidence in Chinese EFL contexts is scarce and largely limited to small-scale correlational designs (Zhang et al., 2016; Wang, 2017). As a

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result, the mechanisms through which learning styles may contribute to autonomy remain insufficiently specified.

Learning engagement represents a promising explanatory mechanism in this regard. Defined as a positive, fulfilling learning state characterised by vigour, dedication, and absorption (Schaufeli et al., 2002), engagement has been consistently associated with self-regulation and sustained learning effort in both general and language-learning contexts (Zare et al., 2024). Recent studies further suggest that autonomy may emerge as an outcome of sustained engagement, particularly in learner-centred or technology-enhanced environments (Yuan & Kim, 2018). Nevertheless, engagement is typically examined either as a direct outcome or antecedent, rather than as a mediating process linking learners' cognitive orientations to autonomy development.

Theoretically, learner autonomy can be understood as the cumulative result of sustained self-regulated action (Li et al., 2024). Learning styles shape how learners perceive, process, and act upon learning experiences (Amlasri, 2022), while engagement reflects the motivational and behavioural enactment of these preferences (Zare et al., 2025). Although previous studies have explored pairwise relationships among these constructs (Han, 2021; Liu, 2021; Li, 2023), their integration within a unified mediation framework remains limited, particularly in tertiary EFL settings. Addressing this gap, the present study proposes a mediation model in which learning engagement explains how different experiential learning modes relate to learner autonomy among Chinese non-English-major undergraduates.

Guided by this theoretical model, the current study proposed the following hypotheses:
H1: Concrete experience has a positive effect on learning engagement.
H2: Reflective observation has a positive effect on the learning engagement.
H3: Abstract conceptualization has a positive effect on learning engagement.
H4: Active experimentation has a positive effect on the learning engagement.
H5: Learning engagement has a positive effect on learner autonomy.
H6: The relationship between concrete experience and learner autonomy is mediated by learning engagement.
H7: The relationship between reflective observation and learner autonomy is mediated by learning engagement.
H8: The relationship between abstract conceptualization and learner autonomy is mediated by learning engagement.
H9: The relationship between active experimentation and learner autonomy is mediated by learning engagement.

The suggested research framework for this study is depicted in Figure 1. In this model, dependent variable is learner autonomy while the independent variable is learning styles. Learning engagement acts as a mediator in the relationship between learning styles and learner autonomy.

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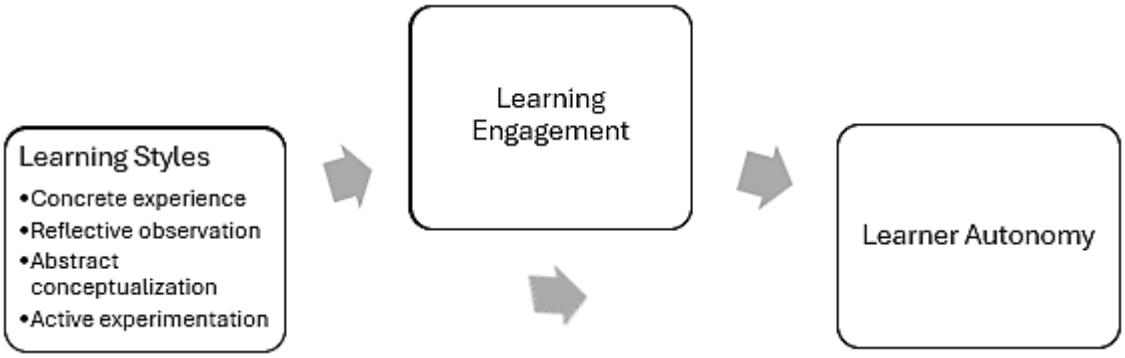

Figure 1: Research Framework of The Study

Source: Author (2026)

Methodology

This study employed a quantitative, cross-sectional design. This small-scale study intended to test the reliability and validity of the constructs as well as the relationships between learning styles, learning engagement, and learner autonomy among undergraduates in Xi'an, China, by the PLS-SEM analytic workflow prior to larger-scale research. The study used a convenience sampling method. Consistent with the objectives, the sample was restricted to 140 conveniently recruited undergraduates, with 100 providing valid responses via the WJX online survey platform.

Data were collected using a composite questionnaire comprising adapted versions of Kolb's Learning Style Inventory (LSI; Kolb, 1984), the Utrecht Work Engagement Scale–Student (UWES-S; Schaufeli et al., 2002), and the English Autonomous Learning Ability Scale (Xu et al., 2004). The two-stage Partial Least Squares Structural Equation Modelling (PLS-SEM) approach with SmartPLS 4.0 was followed, which is suitable for studies with confirmatory model analysis. The measurement model was first evaluated for reliability, convergent validity, and discriminant validity. This was followed by an assessment of the structural model to test the hypothesised relationships and provide evidence for the proposed framework.

Ethical approval was granted by the UiTM Research Ethics Committee (REC/08/2025 (PG/MR/453)). The study ensured respondents' informed consent, voluntary participation, and data anonymity throughout the data collection process.

Data Analysis and Results

Demographic Profile of Respondents

The sample consists of one hundred non-English major undergraduates from six universities in Xi'an, China. Among them, female students accounted for the majority (75%), while male students made up 25% of the sample. A comparatively equal number of participants were selected from Xi'an Traffic Engineering University (17%), Xi'an University of Posts and Telecommunications (17%), Xi'an Technological University (17%), Shaanxi Normal University (17%), Xi'an Jiaotong University (16%), and Xidian University (16%). In terms of academic background, most respondents were enrolled in engineering (40%) and science programmes (25%), followed by management (12%), education (9%), arts (7%), and literature (7%). The majority of participants were aged between 19 and 20 years (80%), with most

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entering university in 2023 (55%) or 2024 (34%). These demographic details are summarized in Table 1, which provides a comprehensive profile of the respondents involved in the study.

Table 1: Respondent Profile

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	25	25%
	Female	75	75%
School	XTEU	17	17%
	XUPT	17	17%
	XTU	17	17%
	SNNU	17	17%
	XJTU	16	16%
	XDU	16	16%
Discipline	Engineering	40	40%
	Science	25	25%
	Management	12	12%
	Education	9	9%
	Art	7	7%
	Literature	7	7%
Age	18 years	9	9%
	19 years	35	35%
	20 years	45	45%
	21 years	11	11%
Enrollment Year	2021	7	7%
	2022	4	4%
	2023	55	55%
	2024	34	34%

XTEU: Xi'an Traffic Engineering University, XUPT: Xi'an University of Post & Telecommunications, XTU: Xi'an Technological University, SNNU: Shaanxi Normal University, XJTU: Xi'an Jiaotong University, XDU: Xidian University
Source: Author (2026)

Common Method Bias (CMB) Test

The dependent and independent variables were obtained from the same respondents at the same time. Therefore, the study conducted Harman's Single-Factor Test. If one factor accounts for more than 50% of the variance, CMB is present. The results of the analysis show that there is no issue of CMV. The first factor accounts for not more than 50% of the variance, as shown in the table below:

Table 2: Common Method Bias (CMB) Test

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	cumulative %	Total	% of Variance	cumulative %
1	37.101	44.168	44.168	37.101	44.168	44.168

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Measurement Model Assessment

The measurement model's reliability and validity were evaluated following Hair et al.'s (2021) PLS-SEM guidelines. All constructs achieved Average Variance Extracted (AVE) values above the suggested threshold of 0.50, supporting convergent validity (Hair et al., 2014). Both Composite Reliability and Cronbach's alpha values exceeded the minimum criterion of 0.70 (Cronbach, 1951), confirming internal consistency reliability. All of these findings show that the measurement model satisfies recognized criteria for validity and reliability. Table 3 presents detailed findings.

Table 3: Convergent Validity

Construct	Item	Loading	Cronbach	CR	AVE
Concrete Experience	CE3	0.831	0.825	0.884	0.656
	CE5	0.834			
	CE7	0.757			
	CE8	0.814			
Reflective Observation	RO1	0.720	0.872	0.904	0.61
	RO4	0.768			
	RO5	0.825			
	RO7	0.756			
	RO10	0.785			
	RO12	0.828			
Abstract Conceptualization	AC5	0.861	0.885	0.916	0.685
	AC7	0.791			
	AC9	0.844			
	AC10	0.802			
	AC12	0.838			
Active Experimentation	AE3	0.762	0.903	0.923	0.632
	AE4	0.715			
	AE8	0.816			
	AE9	0.828			
	AE10	0.820			
	AE11	0.822			
	AE12	0.796			
Learning Engagement	EN2	0.778	0.935	0.944	0.585
	EN3	0.751			
	EN6	0.718			
	EN8	0.741			
	EN9	0.799			
	EN10	0.727			
	EN11	0.753			
	EN12	0.806			
	EN13	0.755			
	EN14	0.811			
	EN16	0.747			
	EN17	0.786			
Autonomous Learning	AL1	0.744	0.959	0.963	0.635
	AL2	0.762			
	AL4	0.846			
	AL5	0.776			

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AL6	0.829
AL7	0.745
AL8	0.853
AL11	0.789
AL12	0.814
AL13	0.736
AL15	0.800
AL16	0.777
AL17	0.875
AL18	0.806
AL19	0.787

CE: Concrete Experience, RO: Reflective Observation, AC: Abstract Conceptualisation, AE: Active Experimentation, EN: Engagement, AL: Autonomous Learning, CR: Composite Reliability, AVE: Average Variance Extracted
Source: Author (2026)

The Heterotrait-Monotrait ratio (HTMT) method was used to evaluate discriminant validity. According to Franke and Sarstedt's (2019) criterion, sufficient discriminant validity is indicated by an HTMT value less than 0.90. Discriminant validity among the constructs was confirmed because all HTMT values obtained in this study were below this 0.90 threshold, as shown in Table 4.

Table 4: HTMT Matrix

	AC	AE	AL	CE	EN	RO
AC						
AE	0.898					
AL	0.638	0.64				
CE	0.899	0.864	0.566			
EN	0.801	0.823	0.743	0.701		
RO	0.896	0.867	0.579	0.875	0.758	

CE: Concrete Experience, RO: Reflective Observation, AC: Abstract Conceptualisation, AE: Active Experimentation, EN: Engagement, AL: Autonomous Learning, CR: Composite Reliability, AVE: Average Variance Extracted
Source: Author (2025)

Structural Model Assessment

The structural model showed moderate explanatory power with an R^2 value of 0.494, which means that learning styles (CE, RO, AC, and AE) and learning engagement jointly explained 49.4% of the variance in learner autonomy, which is deemed acceptable in social science research (Hair et al., 2019). Additionally, the model demonstrated predictive relevance by a Q^2 value of 0.304, which was higher than the suggested threshold of zero (Hair et al., 2016).

Nevertheless, there was no statistically significant correlation between learner autonomy and learning styles. In particular, bias-corrected confidence intervals included zero for the effects of CE ($\beta = 0.032$, $t = 0.260$), RO ($\beta = -0.026$, $t = 0.185$), AC ($\beta = 0.101$, $t = 0.738$), and AE ($\beta = 0.089$, $t = 0.601$). As a result, hypotheses H1–H4 were not supported.

On the contrary, learning engagement showed strong support for H5 as a significant predictor of learner autonomy ($\beta = 0.562$, $t = 4.021$), with bias-corrected confidence intervals excluding zero. Table 5 presents detailed structural model results.

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Table 5: Hypothesis Testing (Direct Effects)

Hypothesis	Relationship	Beta Value (β)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	BCI LL	BCI UL	R^2	Q^2
H1	CE -> AL	0.032	0.122	0.260	-0.211	0.265	0.494	0.304
H2	RO -> AL	-0.026	0.140	0.185	-0.288	0.256		
H3	AC -> AL	0.101	0.137	0.738	-0.185	0.352		
H4	AE -> AL	0.089	0.149	0.601	-0.192	0.384		
H5	EN -> AL	0.562	0.140	4.021	0.264	0.814		

CE: Concrete Experience, RO: Reflective Observation, AC: Abstract Conceptualisation, AE: Active Experimentation, EN: Engagement, AL: Autonomous Learning
Source: Author (2026)

Mediation Analysis

Using bootstrapping techniques for PLS-SEM suggested by Hair et al. (2019), the mediation analysis investigated whether learning engagement mediated the relationships between learning styles (CE, RO, AC, and AE) and learner autonomy. Through engagement, concrete experience and reflective observation had no statistically significant indirect effects on autonomous learning. Similarly, the mediation paths RO → EN → AL (β = 0.087, t = 1.232) and CE → EN → AL (β = −0.027, t = 0.504) were unsupported because their bias-corrected confidence intervals contained zero. Thus, hypotheses H6 and H7 were not supported.

In contrast, learning engagement significantly mediated the effects of abstract conceptualisation and active experimentation on learner autonomy. With confidence intervals excluding zero, the indirect effects for AC → EN → AL (β = 0.164, t = 2.246) and AE → EN → AL (β = 0.250, t = 2.750) were statistically significant, which means H8 and H9 were supported. These results highlight engagement as a crucial mechanism that connects autonomous learning outcomes to active and conceptual learning preferences. Table 6 presents detailed results.

Table 6: Hypothesis Testing (Indirect Effects)

Hypothesis	Relationship	Beta Value (β)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	BCI LL	BCI UL
H6	CE -> EN -> AL	-0.027	0.054	0.504	-0.165	0.057
H7	RO -> EN -> AL	0.087	0.070	1.232	-0.018	0.262
H8	AC -> EN -> AL	0.164	0.073	2.246	0.048	0.348
H9	AE -> EN -> AL	0.250	0.091	2.750	0.101	0.459

CE: Concrete Experience, RO: Reflective Observation, AC: Abstract Conceptualisation, AE: Active Experimentation, EN: Engagement, AL: Autonomous Learning
Source: Author (2026)

Discussion

This preliminary study looked at how learner autonomy is influenced by learning styles and learning engagement in Chinese non-English major undergraduates. The results show a distinct pattern: learning styles only have an indirect and conditional impact through engagement, whereas learner autonomy is largely explained by learning engagement. These findings challenge preconceived notions about how individual learning preferences affect autonomous learning.

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Absence of Direct Effects of Learning Styles

Learner autonomy was not significantly impacted by any of the four learning styles (concrete experience, reflective observation, abstract conceptualization, or active experimentation). This result contradicts interpretations that link learning style preferences to the ability to learn on one's own (Ghorbel et al., 2025). Instead, learning styles appear to function as learner characteristics that do not independently translate into autonomous behaviour. This supports growing critiques that learning styles will limit explanatory power for learning outcomes without external motivation.

Learning Engagement as a Proximal Predictor of Autonomy

In contrast, learning engagement emerged as a significant direct predictor of learner autonomy, accounting for a substantial proportion of its variance. This emphasizes the importance of students' energy, dedication, and absorption investment in learning tasks by taking engagement as a proximal mechanism through which autonomy develops. This result is in line with earlier studies that found engagement to be a crucial antecedent of autonomy in EFL and higher education settings (Mohammadi et al., 2023).

From a theoretical standpoint, the result aligns with self-determination and self-regulation theories, which conceptualise autonomy as arising from sustained motivational involvement and self-directed effort rather than from static learner traits (McIntosh, 2025).

Indirect Effects via Engagement

The relationships between abstract conceptualization and learner autonomy, as well as between active experimentation and learner autonomy, were significantly mediated by learning engagement. However, this was not the case for relationships involving concrete experience or reflective observation. These results imply that learning styles' ability to promote engagement is a prerequisite for enhancing autonomy. According to Chukwuedo et al. (2025), abstract conceptualization and active experimentation may be more likely to encourage sustained engagement in language learning activities such as strategy use, problem-solving, and experiential practice, which will promote autonomy.

In contrast, experiential and reflective preferences did not result in increased autonomy through engagement, which may indicate a mismatch between these teaching philosophies and learning methods. This pattern supports the idea that engagement is an active mediating mechanism that converts learning preferences into self-directed learning outcomes rather than just an effect of learning styles. Previous studies relating engagement, autonomy, and academic performance have reported similar mediation patterns (Jiang & Peng, 2023).

Implications

All of the results point to the possibility that increasing learner autonomy in EFL contexts may be more about methodically encouraging engagement than it is about adapting instruction to learning styles. Engagement plays a crucial role in the development of autonomous learning since it is the primary means by which individual differences are given educational significance.

Conclusion and Future Directions

Although Kolb's model links autonomy to every learning style, concrete experience, reflective observation, and abstract conceptualization demonstrated relatively weaker effects. This preliminary study emphasizes the crucial role that active experimentation and learning engagement play in fostering learner autonomy among EFL students. These results broaden our

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knowledge of the psychological and behavioral aspects of autonomous learning and lay the groundwork for more extensive research.

Future research should use intervention-based studies to assess tactics that promote deep engagement and autonomous behaviors, recruit larger, more diverse samples to improve generalizability, and use longitudinal or experimental designs to investigate causal pathways between learning engagement and autonomy. The suggested mechanisms will provide validated and evidence-based pedagogical practices for various EFL contexts.

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