



More than the sum? A configurational approach to basic psychological needs, mindset, and buoyancy in EFL engagement

Long Qian & Xuyan Qiu

To cite this article: Long Qian & Xuyan Qiu (21 Feb 2026): More than the sum? A configurational approach to basic psychological needs, mindset, and buoyancy in EFL engagement, *Innovation in Language Learning and Teaching*, DOI: [10.1080/17501229.2026.2630272](https://doi.org/10.1080/17501229.2026.2630272)

To link to this article: <https://doi.org/10.1080/17501229.2026.2630272>



© 2026 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



[View supplementary material](#)



Published online: 21 Feb 2026.



[Submit your article to this journal](#)



Article views: 728



[View related articles](#)



[View Crossmark data](#)



Citing articles: 1 [View citing articles](#)

More than the sum? A configurational approach to basic psychological needs, mindset, and buoyancy in EFL engagement

Long Qian ^{a,b} and Xuyan Qiu ^c

^aSchool of Foreign Languages, Wuhan University of Technology, Wuhan, People's Republic of China;

^bFaculty of Humanities, The Hong Kong Polytechnic University, Hong Kong, People's Republic of China;

^cDepartment of English and Communication, The Hong Kong Polytechnic University, Hong Kong, People's Republic of China

ABSTRACT

Given the pivotal role of learner engagement in shaping second language (L2) development, identifying its motivational underpinnings is of growing interest. However, research has largely focused on isolated variables, offering limited insight into how multiple learner factors interact. This study addresses this gap by examining how three motivational constructs – basic psychological needs (autonomy, competence, and relatedness), language mindset (growth vs. fixed), and academic buoyancy – independently and configurationally influence L2 learner engagement. Drawing on both multiple regression and fuzzy-set Qualitative Comparative Analysis (fsQCA), this study analyzed questionnaire data from 539 college students who learn English as a Foreign Language. The results indicated that 1) competence, relatedness, growth mindset, and buoyancy positively predicted engagement, while autonomy and fixed mindset did not show statistical influence; 2) no single factor emerged as a necessary or sufficient condition for sustained engagement; 3) five distinct motivational configurations were found to lead to high engagement, showing the interactive nature of these factors and complexity of engagement. This study expands our existing knowledge about the underlying mechanism of how diverse psychological resources shape engagement by the configurational methods. These results offered practical and tailored pedagogical implications for enhancing students' engagement during L2 learning process.

ARTICLE HISTORY

Received 26 August 2025

Accepted 27 January 2026

KEYWORDS

Basic psychological needs; mindset; buoyancy; engagement; fuzzy-set qualitative comparative analysis

1. Introduction

Learner engagement, referring to second language (L2) learners' active participation and investment in the learning process (Hiver, Al-Hoorie, and Mercer 2021; Reschly and Christenson 2022), has emerged as a central focus in second language acquisition (SLA) due to

CONTACT Long Qian  long.qian@connect.polyu.hk  School of Foreign Languages, Wuhan University of Technology, Wuhan, People's Republic of China

 Supplemental data for this article can be accessed online at <https://doi.org/10.1080/17501229.2026.2630272>.

© 2026 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

its foundational role in shaping learning processes and outcomes (Hiver et al. 2024). Unlike constructs focusing on learners' desire to take actions such as motivation, engagement reflects learners' actual behavior in the classroom. It captures how they sustain attention, persist through challenges, and actively participate in learning activities, which are more relevant to L2 learning. Without such engagement, especially in skill-based, interaction-driven environments like L2 classrooms, language development is unlikely to occur even when learners possess high levels of motivation. As a result, understanding what drives engagement has become a key concern for SLA researchers and practitioners.

Compared to the extensive body of research in general education (Mercer and Dörnyei 2020), studies on the antecedents of engagement in SLA remain relatively limited. Existing literature, however, has examined isolated variables such as grit or mindset (Khajavy 2021; Sadoughi, Hejazi, and Lou 2023), or investigated two-factor combinations (e.g. motivation and emotion) but fail to examine the complex interplay of multiple variables, despite the inherently complex nature of learner engagement. Furthermore, the focus on single or two-factor predictors has yielded persistent inconsistencies across studies, suggesting that the impact of any one factor likely depends on other co-occurring conditions. To address these gaps, the present study focuses on three interrelated and theoretically grounded motivational factors-basic psychological needs (BPNs) (i.e. needs for autonomy, competence, and relatedness), mindset (i.e. beliefs that ability is fixed or improvable), and buoyancy (i.e. capacity to overcome everyday academic setbacks)-each of which has been independently linked to engagement but rarely examined in conjunction.

Given that L2 engagement is an emergent and multi-component construct, this study examines basic psychological needs (BPNs), language mindsets, and academic buoyancy as interconnected elements of a multi-layered motivational system that energizes and sustains engagement. BPNs for the foundation, representing the innate psychological 'nutrients' essential for motivation. Research grounded in self-determination theory (SDT) shows that when autonomy, competence, and relatedness are satisfied, learners invest more effort and persist in classroom tasks (Noels et al., 2000; Alamer 2022; McEown & Oga-Baldwin, 2019). Upon this foundation, mindset serves as a cognitive belief lens: language learners' views about the malleability of language ability shape their goals, affective responses to difficulty, and behavioral investment, with distinct mindset profiles linked to varying levels of engagement and achievement (Lou and Noels 2017; Lou, Chaffee, and Noels 2022). Finally, L2 academic buoyancy captures learners' regulatory capacity to sustain participation amid everyday stressors and predicts language outcomes (Yun et al., 2018). Examining these factors in combination moves beyond a piecemeal approach to offer a more holistic understanding of how foundational needs, cognitive beliefs, and practical resilience jointly foster sustained learner engagement.

Therefore, the present study aims to explore how these factors, independently and in combination, are associated with L2 engagement by employing the relatively innovative integrated approach. This study represents one of the few attempts to employ fuzzy-set Qualitative Comparative Analysis (fsQCA), a configurational method designed to capture the complex interplay among multiple conditions (Ragin 2008). By employing this configurational approach, this study moves beyond traditional variable-centered analyses to reveal how multiple motivational factors combine into distinct, equally effective pathways

to high engagement. This provides a more holistic and person-centered understanding of the complex mechanisms underpinning L2 engagement. This approach is particularly suitable for SLA, where learners exhibit diverse profiles and what contributes to engagement in one learner may not have the same effect in another. fsQCA examines how different combinations of variables work together to produce high engagement (Ragin 2008). Although recent studies have begun to apply fsQCA in SLA (Sun and Wang 2025; Xu and Feng 2024), further investigation is needed to expand its application to uncover diverse pathways to the complex and context-specific learner engagement among Chinese English as a foreign language (EFL) learners. The findings may help reveal how BPNs, mindset and buoyancy independently and jointly predict engagement, and shed further light on teaching practices from a more inclusive and integrated perspective.

2. Literature review

2.1. Engagement and L2 learning

The facilitative role of learner engagement in promoting desirable learning outcomes, such as achievement and motivation, has been extensively examined (Guo, Xu, and Chen 2023; Oga-Baldwin 2019). Disengaged learners are prone to passive learning and experience negative emotions toward English learning, which may have negative effects on their proficiency development (Mercer 2019). Since engagement can be enhanced through teachers' instructional behaviors and deliberate interventions (Reschly and Christenson 2022), understanding its antecedents is crucial for effective teaching.

In L2 learning, engagement is generally recognized as a four-dimensional construct, encompassing behavioral, cognitive, emotional, and social engagement (Hiver et al. 2024; Zou, Noughabi, and Peng 2025). Behavioral engagement refers to learners' effort and active participation during the learning process, such as attentively listening to teachers (Fredricks, Blumenfeld, and Paris 2004). Cognitive engagement refers to learners' conscious mental effort and self-regulated strategies in language learning both inside and outside classroom (Svalberg 2018). Emotional engagement reflects learners' affective states, including positive (e.g. enjoyment) or negative (e.g. frustration) emotions (Reeve 2012). Social engagement refers to learners' collaboration and interpersonal interactions with peers or teachers (Hiver et al. 2024).

Due to the significant role of engagement, a range of research examined the interpersonal and contextual variables as antecedents of engagement. Numerous studies have explored how individual variables, such as grit (Jiang and Yu 2025; Khajavy 2021; Zou, Noughabi, and Peng 2025), language mindset (Sadoughi, Hejazi, and Lou 2023; Yang and Liang 2025) and motivation (Bostwick et al. 2022; Yin and Wang 2016), promote L2 learners' engagement, while attention has also been given to the role of contextual influences on engagement, such as task factors (Qiu 2024), classroom environment (Yang and Liang 2025b), and teacher enthusiasm (Dewaele and Li 2021). Yet, to the best of the researchers' knowledge, there appear to be no studies examining the configurational relationship between BPNs, mindset, buoyancy and engagement, despite the fact that these factors are widely considered significant and fundamental interpersonal variables in language education (Dweck 2006; Reeve 2012).

2.2. Basic psychological needs and engagement

Self-Determination Theory (SDT), a motivational theory widely cited in L2 research, identifies three basic psychological needs – autonomy, competence, and relatedness – as requisites for motivation and well-being (Deci and Ryan 2000). In educational contexts, autonomy refers to the perceived sense of volition in initiating and regulating one's learning behaviors (Mercer 2019). Competence describes one's feeling of being effective and capable of mastering challenges to achieve desired learning outcomes (Deci and Ryan 2000). Relatedness denotes feeling close, connected, and a sense of belonging with others, such as peers and teachers (Deci and Ryan 2000). Understanding these three needs is important as they are innate psychological “nutrients” that energize students' motivation and foster sustained learner engagement (Niemiec and Ryan 2009).

Despite the potential predictive role of basic needs satisfaction to engagement (Benlahcene, Kaur, and Awang-Hashim 2021; Gillen-O'Neel 2021; Wang and Hui 2024), studies have yielded inconsistent results regarding how autonomy, competence, and relatedness contribute to engagement individually and together. For example, Karimi and Sotoodeh (2020) observed that the satisfaction of all three basic psychological needs indirectly predicts engagement through intrinsic motivation. Similarly, Alamer (2022) found that satisfying learners' needs for autonomy, competence, and relatedness enhanced their motivation, which in turn led to increased effort – an important indicator of engagement. However, Benlahcene, Kaur, and Awang-Hashim (2021) found that while competence and relatedness positively predicted behavioral, social, and cognitive engagement, autonomy satisfaction had no significant effect. These varying results may be explained by two key reasons. First, the BPNs likely exert their influence interactively rather than in isolation. The motivational impact of satisfying one need, such as autonomy, may be moderated by the satisfaction of another, like relatedness (Milyavskaya and Koestner 2011). Second, cultural background likely shapes the relative importance of specific needs (Markus and Kitayama 1991). While competence and relatedness are considered universally important, autonomy may carry less motivational weight in collectivist cultures, such as China (Sheikholeslami and Arab-Moghaddam 2010). Therefore, it is necessary to examine how BPNs interact with other individual difference factors among Chinese L2 learners.

2.3. Mindset and engagement

Mindset refers to learners' perceptions regarding whether their abilities can change over time (Dweck 2006), including two primary types: *fixed* (viewing abilities as static) and *growth mindsets* (believing abilities develop through effort and strategy) (Lou and Noels 2017). To engage with learning opportunities, students must believe that they can develop their competence. Without such belief, they may hesitate to commit to learning activities and perceive their efforts as meaningless, irrespective of the quality or attractiveness of materials (Mercer 2019). However, current research has primarily focused on growth mindsets, often neglecting the nuanced role that fixed mindsets may play in shaping engagement (Khajavy 2021). Comprehending how the two mindsets interact and related to learner engagement is crucial for optimizing pedagogical practices (Yeager and Dweck 2020).

While recent research has begun to explore the relationship between language mindsets and learner engagement, the findings remain inconsistent. Some studies have reported a positive link between a growth mindset and heightened engagement in language learning (Eren and Rakıcioğlu-Söylemez 2023; Guan et al. 2024; Lou and Noels 2017; Yang and Liang 2025). For instance, Lou, Chaffee, and Noels (2022) observed that Canadian university students with a growth mindset profile demonstrated significantly higher levels of engagement compared to those with fixed mindsets. However, Derakhshan et al. (2024) found no direct predictive relationship between growth mindset and learner engagement. These mixed results suggest that a single mindset alone may not directly drive engagement. Instead, the impact of mindsets might be indirect and influenced by other variables jointly. For example, when learners' BPNs are satisfied, they are more motivated and tend to hold a positive attitude toward their language learning abilities and could be more engaged. Given the dynamic and context-dependent nature of L2 learning (Lou and Noels 2020) and the insufficient research findings, it is necessary to investigate how mindset interacts with other motivational variables such as BPNs and buoyancy to underpin engagement.

2.4. Buoyancy and engagement

Academic buoyancy refers to students' capacity to cope effectively to everyday academic difficulties and setbacks (Martin and Marsh 2008). Buoyant learners tend to remain engaged because they can regulate their emotions, persist in spite of temporary failures, and continue to put effort toward long-term goals (Putwain and Wood 2023). This quality is especially relevant in test-driven EFL environments like China, where learners are often exposed to performance anxiety, peer comparison, and externally imposed goals (Putwain and Daly 2013). Within such contexts, L2 learners frequently encounter frustrating moments in the learning process such as low scores or fear of speaking, which may require the kind of adaptive capacity buoyancy provides. Therefore, understanding how buoyancy works in L2 learning is essential.

Empirical research has found a generally positive relationship between academic buoyancy and learner engagement (af Ursin, Järvinen, and Pihlaja 2021; Thomas and Allen 2021; Wang and Hui 2024; Zhao, Huang, and Hui 2025). Wang and Hui (2024) found that buoyancy positively predicted L2 learner engagement indirectly by fostering enjoyment and mitigating feelings of boredom and anxiety. Similarly, Thomas and Allen (2021) found that academic buoyancy mediated the relationship between emotional intelligence and engagement, suggesting that buoyant learners are more capable of translating emotional competencies into behavioral and emotional engagement. However, evidence from general education suggests that the role of buoyancy may vary across engagement dimensions. af Ursin, Järvinen, and Pihlaja (2021) reported that while buoyancy mediated the relationship between academic stress and cognitive engagement, its influence on emotional engagement was not statistically significant. These inconsistencies may stem from two key considerations. First, buoyancy is domain-specific. Unlike general education, L2 learning involves unique socio-linguistic stressors such as communication anxiety, meaning that L2 buoyancy specifically reflects the capacity to navigate these distinct challenges (Martin and Marsh 2008). Second, buoyancy likely interacts with other learner-level psychological constructs and exert its influence through complex, synergistic processes

rather than in isolation. To bridge these gaps, the present study adopts an integrative perspective to examine how buoyancy operates in tandem with other factors to shape L2 learner engagement.

2.5. Interplay of BPNs, mindset, buoyancy and engagement

BPNs and learner mindsets are closely interrelated constructs that may jointly related to engagement. From SDT (Deci and Ryan 2000), the satisfaction of competence, autonomy and relatedness enriches learners' intrinsic motivation and self-concept, allowing them to cultivate adaptive beliefs such as growth mindsets (Dweck 2006). Kim and Kim (2017) also found that when learners experienced meeting their BPNs, they tended to put effort into learning beyond difficulties and challenges, believing that their capacity might be improved with effort to reach their goals.

Buoyancy is also deeply intertwined with both BPNs and mindset. When learners experienced a sense of autonomy, competence, and relatedness, they are more likely to feel psychologically secure, which enables them to recover from setbacks more effectively (Aydin and Michou 2020). Furthermore, learners with growth mindsets tend to regard difficulty as natural and valuable part of the learning process. This perception aligns well with the proactive and optimistic orientation of buoyant students. Wang and Liu (2022) found that buoyancy acted as a bridge between autonomous motivation and engagement among EFL learners, suggesting that buoyant students both reflect and strengthen the motivational qualities fostered by BPNs and growth-oriented beliefs.

Given the interconnections among BPNs, mindset, and buoyancy, their combined interplay on learner engagement remains relatively underexplored. While each factor has been studied individually to some extent, research rarely considers how they interact as a system to shape engagement (Hiver, Al-Hoorie, and Mercer 2021). This lack of integrative inquiry limits our understanding of the multifaceted mechanisms through which engagement is fostered or hindered. To address this gap, the present study adopts a configurational perspective to investigate how these factors jointly shape engagement.

2.6. Theoretical framework of the present study

The present study is grounded in an integrative theoretical framework that combines insights from Self-Determination Theory (Deci and Ryan 2000), Dweck's Mindset Theory (Dweck 2006), and research on academic buoyancy (Martin and Marsh 2008) to create a multi-layered model for understanding L2 learner engagement. This framework is further informed by a complex systems perspective (Larsen-Freeman and Cameron 2008; Mason 2008), which proposes that engagement may emerge from the non-linear interplay of multiple factors rather than from single variables in isolation.

At the foundational level, we draw upon Self-Determination Theory (Deci and Ryan 2000), which posits that the satisfaction of basic psychological needs (BPNs) for autonomy, competence, and relatedness are essential 'psychological nutrients' for fostering intrinsic motivation. Within our framework, BPNs serve as the primary energizing force that underpins a learner's willingness to invest effort and participate in learning. Building upon this foundation, we incorporate Dweck's (2006) Mindset Theory. Mindset functions

as a critical cognitive lens through which learners interpret their educational experiences, particularly challenges and setbacks. A growth mindset is theorized to promote persistence and adaptive responses to difficulty, while a fixed mindset can lead to avoidance and disengagement. We propose that mindset interacts with BPNs. For instance, a supportive environment that satisfies BPNs may help cultivate a growth mindset, and a growth mindset may in turn help learners proactively seek out opportunities to enhance their competence and autonomy. Finally, we integrate the construct of academic buoyancy (Martin and Marsh 2008). Buoyancy acts as a regulatory mechanism, enabling learners to maintain their engagement despite facing minor academic adversities. It is the behavioral and emotional manifestation of a positive motivational state, likely supported by both BPN satisfaction and a growth-oriented mindset.

By synthesizing these three constructs, our framework moves beyond a piecemeal approach. It conceptualizes L2 engagement as an outcome of a complex system where foundational needs (BPNs), cognitive beliefs (mindset), and regulatory capacities (buoyancy) are interconnected. This integrative and configurational perspective justifies the use of fsQCA, as it allows us to empirically investigate the different combinations of these theoretical components that lead to high learner engagement, thereby providing a more holistic and nuanced understanding of the phenomenon.

2.7. fsQCA in language learning research

Fuzzy-set Qualitative Comparative Analysis (fsQCA) is a set-theoretic comparative method that examines how combinations of causal conditions produce an outcome (Ragin 2008; Rihoux and Ragin 2009). Unlike variance-based methods such as Structural Equation Modeling (SEM) or regression, which often assume independent and linear relationships between variables, fsQCA acknowledges the complex interdependence of factors shaping outcomes (Gligor and Bozkurt 2020). This makes it particularly well-suited for the field of SLA, where learner engagement is understood to emerge from the dynamic and non-linear interplay of diverse psychological factors (Larsen-Freeman and Cameron 2008). Rather than examining the net effect of a single cause, fsQCA seeks to identify multiple effective causal configurations that can lead to the same outcome. This principle of equifinality allows for the recognition that learners may reach similar engagement levels through diverse pathways (Fiss 2011). This is crucial for engagement research, as there is unlikely to be a single ‘magic bullet’ for motivating all learners.

Despite its methodological advantages, the application of fsQCA in L2 research has just begun to bloom. For example, Xu and Feng (2024) used fsQCA to examine how growth mindset, resilience, and engagement collectively predict L2 achievement and identified seven distinct configurations as predictors of positive outcomes. Similarly, Lu (2025) examined how different combinations of positive and negative emotions influenced Chinese college students’ willingness to communicate, identifying four emotional configurations associated with higher willingness. These studies underscore the value of fsQCA in capturing complex interaction effects and learner diversity that traditional methods often ignored (Sun and Wang 2025). However, no existing study has explored how BPNs, mindset, and buoyancy collectively contribute to L2 engagement. Moreover, the extent to which these configurational patterns align with or diverge from the independent effects of each factor remains unexplored. Addressing these gaps can provide

a more nuanced understanding of the mechanism of engagement and inform pedagogical interventions tailored to learners' diverse profiles (Sun and Wang 2025).

To this end, the present research aims to answer the following two research questions:

RQ1: How do basic psychological needs, mindset, and buoyancy predict L2 engagement independently?

RQ2: How do these factors configure jointly to foster engagement?

Building upon prior research, this study proposes the following two hypotheses:

- 1) Each basic psychological need (autonomy, competence, and relatedness), growth mindset and academic buoyancy positively predict L2 engagement.
- 2) Different combinations of basic psychological needs, mindset, and buoyancy form sufficient configurations for high L2 engagement.

3. Method

This questionnaire-based study adopted a cross-sectional design to explore the predictive and configurational effects of basic psychological needs, mindset, and buoyancy on L2 engagement.

3.1. Research site and participants

The study was conducted at a comprehensive Tier-1 public university in central China. This research site was strategically chosen because its large student body (more than 20000 undergraduate students), recruited from across the nation, represents a wide range of academic disciplines and English proficiency levels, providing a suitable context for the study. Convenience sampling was employed to collect data through an online questionnaire. The primary inclusion criterion for participation was being an undergraduate student currently enrolled in the university's compulsory College English course.

Recruitment occurred through two main channels to capture a broad and accessible sample. Initially, an open invitation to participate in an online questionnaire was distributed via student social media platforms. Second, to further diversify the convenient sample, the first author contacted five English language teachers who were teaching different cohorts of students. These teachers shared the study invitation with their respective classes, thereby including students from various years of study, majors, and proficiency levels who were readily available.

A total of 687 students voluntarily participated. Then, a data screening process was conducted to ensure data quality. We identified and removed cases exhibiting: (1) incomplete answers; (2) abnormally short completion times, defined as submission in less than two minutes; (3) inconsistent response patterns, operationalized as an absolute difference of greater than three points on the 6-point scale between the affective engagement items (items 1 & 3) and their reverse-coded counterpart (item 2); or (4) invariant response patterns (i.e. 'straight-lining'), defined as selecting the exact same response option for more than 80% of consecutive items. Application of these criteria resulted in a final valid sample of 539 participants.

The final sample included 232 male and 307 female students from various grades: 270 freshmen, 212 sophomores, 42 juniors, and 15 seniors, with a mean average age of 19.0 years ($SD = 0.92$). Participants came from six academic disciplines: life sciences (37.1%), physical sciences (23.2%), humanities (18.2%), arts (10.2%), engineering (7.8%) and social sciences (3.5%). Their average score on the English section of the College Entrance Examination was 108.4/150, indicating an intermediate proficiency level (approximately CEFR B1 – B2). On average, participants had 10.56 years of English learning experience ($SD = 1.88$). At the time of data collection, all students were enrolled in a compulsory College English course covering listening, speaking, reading, writing, and translation, following a unified curriculum designed to enhance overall English proficiency. All the participants are native Chinese speakers who had limited exposure to English outside the classroom.

3.2. Measures

The questionnaire consisted of two sections. The first section collected demographic information. The second section assessed four core constructs: BPNs (autonomy, competence, relatedness), language mindset (fixed and growth), buoyancy, and L2 learner engagement (see Appendix A). All items were rated on a six-point Likert scale (1 = *strongly disagree* to 6 = *strongly agree*). As all participants were native Chinese speakers, the original English items were first translated into Chinese by the author, then back-translated into English and reviewed by an expert in translation. No information was lost during the translation.

All measurement instruments demonstrated strong reliability and validity. The internal consistency for all constructs was high (Cronbach's $\alpha = .81 - .94 > 0.70$). Exploratory factor analysis (EFA) results showed clear factor loadings ($> .50$) for all items and confirmatory factor analysis (CFA) results further confirmed construct reliability and convergent validity (see Appendix B for details).

3.2.1. Basic psychological needs

Learners' satisfaction of autonomy, competence, and relatedness in English learning was measured using the Basic Psychological Needs of Second Language Scale (Alamer 2022). This scale has 11 items, with three items for autonomy, four items for competence, and four for relatedness. The internal consistency for the three subfactors was relatively high ($\alpha = 0.82, 0.92$ and 0.88 respectively). CFA further confirmed good construct validity ($CFI = 0.975 > 0.90$, $TLI = 0.962 > 0.90$, $RMSEA = 0.07 < 0.08$, and $SRMR = 0.06 < 0.08$) (Kline 2023).

3.2.2. Language mindset

EFL learner mindset was assessed using a modified version of the L2-specific language mindset scale (seven items) developed by Papi et al. (2019), with three items for fixed mindset and four items for growth mindset. The scale reported high reliability with Cronbach's α 0.81 for fixed mindset and 0.88 for growth mindset. CFA further confirmed good construct validity ($CFI = 0.978 > 0.90$, $TLI = 0.964 > 0.90$, $RMSEA = 0.07 < 0.08$, and $SRMR = 0.05 < 0.08$).

3.2.3. Buoyancy

To measure students' capacity to cope with everyday academic challenges in English learning, a four-item academic buoyancy scale was adapted from Martin and Marsh (2008). Minor wording modifications were made to contextualize the items for EFL learners. For example, the original item 'I don't let *study* stress get on top of me' was revised to 'I don't let *English learning* stress get on top of me.' The scale reported excellent internal reliability (Cronbach's $\alpha = 0.90$). CFA further confirmed good construct validity (CFI = 0.999 > 0.90, TLI = 0.996 > 0.90, RMSEA = 0.04 < 0.08, and SRMR = 0.01 < 0.08).

3.2.4. L2 learner engagement

Learner engagement was captured with a 15-item instrument adapted from Li, Wei, and Cai (2024), covering behavioral (five items), emotional (three items), cognitive (four items), and social (three items) dimensions. The validity and reliability of the scale have been confirmed in previous research (Zou, Noughabi, and Peng 2025). The scale reported excellent internal reliability (Cronbach's $\alpha = 0.94$). CFA further confirmed good construct validity (CFI = 0.963 > 0.90, TLI = 0.954 > 0.90, RMSEA = 0.07 < 0.08, and SRMR = 0.04 < 0.08).

3.3. Data collection

Before the survey, all participants were informed of the study's purpose, the approximate time required, and their right to withdraw at any point without penalty. They were also assured of anonymity and that their responses would not affect their course grades. Informed consent was obtained electronically before students could access the survey. With their consent, the survey link and QR code of *Wenjuanxing* (a survey platform in China) were distributed to students via various social media platforms. All the students completed the questionnaire during class time under the guidance of their instructors and the first author, ensuring high response quality and minimizing potential distractions.

3.4. Data analysis

The questionnaire data were manually reviewed and incomplete data were removed. The final dataset was then analyzed using SPSS 29 to perform reliability analysis, EFA, descriptive statistics, correlation analysis. To examine the validity of the measurement instruments, CFA was performed with AMOS 26. Subsequently, a multiple regression was conducted in SPSS 29 to examine the independent predictive effects of the motivational variables on learner engagement. The validity of this regression model was carefully verified by checking four principal statistical assumptions. Diagnostic tests confirmed that the data met the required criteria for: 1) normality of residuals, 2) homoscedasticity, 3) absence of problematic multicollinearity, and 4) independence of residuals, thereby ensuring the robustness of the findings (see Appendix C).

The data were then analyzed using fsQCA 4.1 to explore how these factors jointly predict learner engagement. Raw data were calibrated into fuzzy-set membership scores ranging from 0 (full non-membership) to 1 (full membership). This process transforms interval-scale data into set-theoretic data suitable for fsQCA (Ragin 2008). In accordance with existing fsQCA research in SLA, this study adopted the direct calibration approach which is generally recommended for its transparency and replicability (Lu

Table 1. Calibration values based on percentiles.

	Calibration thresholds		
	95th percentile	50th percentile	5th percentile
Autonomy	5.67	4.33	2.67
Competence	5.75	4	2.25
Relatedness	6	5	3.5
Fixed mindset	4.67	3.33	1.67
Growth mindset	5.02	3.75	2.48
Buoyancy	5.75	4.25	3
Engagement	5.07	3.87	2.59

2025; Rihoux and Ragin 2009). Following Ragin's (2008) guidelines, three anchor points were used for calibration: 0.95 for full membership, 0.50 as the crossover point, and 0.05 for full non-membership. To ensure no cases were excluded from the truth table due to an exact score of 0.50, a minor adjustment of +0.001 was applied to such values, as recommended by Fiss (2011). The calibration thresholds are detailed in Table 1.

4. Results

4.1. Descriptive statistics and correlation

Table 2 reports the descriptive results of all variables, including autonomy, competence, relatedness, fixed mindset, growth mindset, buoyancy, and engagement. All variables showed acceptable levels of skewness and kurtosis ($\text{skewness} < \pm 2$, $\text{kurtosis} < \pm 7$), indicating no significant departures from normality (Kline 2023).

Participants reported relatively high levels of relatedness ($M = 4.78$), autonomy ($M = 4.28$), and competence ($M = 4.10$). Growth mindset ($M = 3.77$) was higher than fixed mindset ($M = 3.24$), and buoyancy was also high ($M = 4.32$). Overall, learners demonstrated a moderately high level of engagement ($M = 3.84$), suggesting generally positive learning experiences.

As shown in Table 3, engagement was positively correlated with autonomy, competence, relatedness, growth mindset and buoyancy with medium to large effect sizes¹, while negatively correlated with fixed mindset with small to medium effect sizes. The three BPNs (autonomy, competence, relatedness) were also positively interrelated, and growth mindset was positively associated with three needs and buoyancy but negatively with fixed mindset. Although several predictors were moderately correlated at the bivariate level (see Table 3), the low VIF (ranged from 1.212–1.758) and satisfactory tolerance values (ranged from .569 to .825) suggest that these interrelations did not

Table 2. Descriptive results.

	Descriptive					
	Min	Max	Mean	SD	Skewness	Kurtosis
Autonomy	1.33	6.00	4.28	.92	−.347	.052
Competence	1.00	6.00	4.10	.98	−.379	−.005
Relatedness	1.75	6.00	4.78	.80	−.532	.514
Fixed mindset	1.00	6.00	3.24	.85	−.080	.454
Growth mindset	1.00	6.00	3.77	.85	.127	.553
Buoyancy	1.00	6.00	4.32	.86	−.280	.136
Engagement	1.00	6.00	3.84	.77	.017	.627

Table 3. The correlation matrix between variables.

	1	2	3	4	5	6
1. Autonomy	–					
2. Competence	.526**	–				
3. Relatedness	.473**	.392**	–			
4. Fixed mindset	–.229**	–.324**	–.238**	–		
5. Growth mindset	.401**	.524**	.280**	–.378**	–	
6. Buoyancy	.320**	.401**	.246**	–.210**	.447**	–
7. Engagement	.466**	.593**	.474**	–.344**	.593**	.463**

Note: ** $p < 0.01$.

introduce problematic multicollinearity (see Appendix C), and the reported coefficients therefore represent the unique predictive effects of each motivational factor on L2 engagement.

4.2. Independent predictive effects on L2 engagement

To address the first research question on how do basic psychological needs, mindset, and buoyancy predict L2 engagement independently, the multiple regression analysis was conducted. Based on the results shown in Table 4, approximately 53.80% of the variance in students’ L2 engagement was explained by autonomy, competence, relatedness, mindsets, and buoyancy. As Table 5 delineated, among the predictors, competence ($\beta = .246, p < .001$), relatedness ($\beta = .220, p < .001$), growth mindset ($\beta = .292, p < .001$), and buoyancy ($\beta = .121, p < .001$) were found to be significant and positive predictors of engagement. Notably, growth mindset showed the highest standardized coefficient among all predictors, indicating its particularly strong association with engagement. In contrast, autonomy ($\beta = .054, p = .151$) and fixed mindset ($\beta = -.058, p = .074$) did not significantly predict engagement.

4.3. Configurational antecedent for L2 engagement

To address the second research question on how do basic psychological needs, mindset, and buoyancy work jointly to foster L2 engagement, the fsQCA analysis was conducted.

Table 4. The regression results.

Model	R	R ²	Adjusted R ²	Std. Error of the Estimate
1	.733	.538	.533	.528

Predictors: autonomy, competence, relatedness, fixed mindset, growth mindset, buoyancy
Dependent Variable: engagement

Table 5. Impact of each predictor on engagement.

Paths	Standardized Coefficient	Unstandardized Coefficient	t	p
Autonomy → engagement	.054	.045	1.437	.151
Competence → engagement	.246	.195	6.290	<.001
Relatedness → engagement	.220	.213	6.409	<.001
Fixed mindset → engagement	–.058	–.053	–1.791	.074
Growth mindset → engagement	.292	.266	7.722	<.001
Buoyancy → engagement	.121	.135	4.448	<.001

4.3.1. Analysis of necessary conditions

First, a necessary condition analysis was conducted to determine if any single condition was a prerequisite for high learner engagement. A condition is deemed necessary if its consistency score is $\geq .90$ and its coverage score is $> .50$ (Ragin 2006). As shown in Table 6, none of the individual conditions (autonomy, competence, relatedness, fixed mindset, growth mindset, or buoyancy) met the necessity threshold. This finding indicates that no single factor guarantees engagement, suggesting that the outcome arises from combinatorial effects rather than isolated predictors. Therefore, a configurational approach is essential to identify the specific combinations of factors that jointly lead to high engagement.

4.3.2. Sufficiency analysis results

To identify potential combinations of conditions that contribute to learner engagement, a sufficiency analysis was conducted (Sun and Wang 2025). This analysis involves constructing a truth table that captures all logically possible combinations of causal conditions. Several threshold criteria were applied to ensure the robustness of the results. The consistency threshold of 0.80 was set to exclude causal pathways that were not strongly and consistently linked to the outcome (Ragin 2008). Next, to avoid drawing conclusions from isolated or unique instances, we adopted a frequency threshold of 2, meaning any valid pattern had to be observed in at least two cases within our sample (Ragin 2008). Finally, we applied a Proportional Reduction in Inconsistency (PRI) threshold of 0.70. This protected the analysis from contradictory results, ensuring that a single combination of factors did not simultaneously lead to both the presence and absence of the outcome (Ragin 2006). In line with established conventions in fsQCA research, the intermediate and parsimonious solutions were interpreted.

The analysis yielded five sufficient configurations for high engagement (see Table 7). The overall solution consistency was excellent at .910, indicating the configurations are reliable pathways to the outcome. The overall solution coverage was .677, meaning these five configurations collectively explain approximately 67.7% of the instances of high engagement, demonstrating strong explanatory power (Woodside 2013). Each configuration's raw coverage was also substantial, ranging from .440 to .530.

Five solutions were identified based on the presence and absence of six conditions. Solution 1 reflects a pattern in which engagement emerges through the presence of

Table 6. Analysis of necessity for the presence of engagement.

Conditions	Engagement	
	Consistency	Coverage
Autonomy	0.787	0.757
~Autonomy	0.561	0.561
Competence	0.853	0.777
~Competence	0.516	0.548
Relatedness	0.721	0.774
~Relatedness	0.607	0.547
Fixed mindset	0.615	0.616
~Fixed mindset	0.751	0.721
Growth mindset	0.809	0.789
~Growth mindset	0.555	0.547
Buoyancy	0.788	0.750
~Buoyancy	0.552	0.559

Note: '~' means 'absent'.

Table 7. Antecedent configurations for engagement.

Conditions	Solution1	Solution2	Solution3	Solution4	Solution5
Autonomy		●		●	●
Competence		●	●	●	▲
Relatedness	●	●	●	●	
Fixed mindset	○			○	○
Growth mindset	▲	●	●		●
Buoyancy	●		●	●	●
Raw coverage	0.474	0.530	0.507	0.440	0.486
Unique coverage	0.026	0.054	0.002	0.021	0.068
Consistency	0.948	0.937	0.949	0.958	0.946
Overall solution coverage	0.677				
Overall solution consistency	0.911				

Note: ● indicates the presence of a core condition, ○ represents the absence of a core condition, ▲ signifies the presence of a peripheral condition, and a blank space suggests that the condition is optional or irrelevant.

relatedness and buoyancy, combined with the absence of fixed mindset as a core condition. The presence of growth mindset serves as a peripheral contributor. This configuration suggests that strong relatedness and buoyancy can compensate for the lack of internal autonomy and competence, as long as maladaptive beliefs like fixed mindset are not present. In Solutions 2 and 3, both featured by the presence of competence, relatedness, and growth mindset as core conditions. While Solution 2 also includes autonomy, Solution 3 highlights buoyancy instead. These configurations indicate that engagement can be driven either by a full set of basic psychological needs (autonomy, competence, and relatedness) or by a combination of growth-oriented beliefs and emotional adaptability. Similar to Solution 2, Solution 4 includes all three basic psychological needs (autonomy, competence, relatedness), but distinguishes itself by additionally incorporating the absence of fixed mindset and the presence of buoyancy as core conditions. This indicates that the presence of positive psychological needs is not sufficient on its own – removal of fixed mindset and enhancing buoyancy are also critical. Finally, Solution 5 features the presence of autonomy, growth mindset, and buoyancy, along with the absence of fixed mindset as core conditions, and includes competence as a peripheral condition.

The following robustness checks confirmed the stability of the findings. Raising the consistency threshold to .85 and increasing the minimum case frequency to three produced either identical or overlapping configurations, with minimal changes in overall consistency and coverage. These outcomes confirm that the identified solutions are stable under varying analytical conditions, thereby strengthening the reliability of the results (Sun and Wang 2025).

5. Discussion, implications, and limitations

This study examined how BPNs, mindset, and academic buoyancy independently and jointly predict L2 learner engagement. It is the first to employ fsQCA method, providing new insights into how different factors combine to foster engagement.

5.1. Independent predictors for engagement

To address RQ1, the multiple regression results revealed that competence and relatedness positively predicted L2 engagement while autonomy did not improve engagement

effectively. This finding aligns with previous studies demonstrating that learners with a strong sense of competence and belonging exhibit significantly greater L2 engagement (Benlahcene, Kaur, and Awang-Hashim 2021). Learners who feel competent in their English abilities develop strong self-efficacy, which fuels the belief that effort will yield improvement and thus motivates greater persistence (Mercer 2019). Likewise, fulfilling the need for relatedness through positive interpersonal connections encourages greater effort and enthusiastic participation in L2 learning (Furrer and Skinner 2003; Skinner, Kindermann, and Furrer 2009). In contrast, autonomy need satisfaction did not significantly predict engagement in the present context. One explanation is cultural difference. The concept of autonomy, was rooted primarily in Western, individualistic cultures where personal choice and freedom from external control are highly valued. Our findings, however, align with a growing body of research suggesting that the expression and motivational impact of autonomy can differ in collectivist societies like China (Sheikholsami and Arab-Moghaddam 2010). In such contexts, students may perceive teacher-directed instruction not as a constraint on their freedom, but as a form of supportive guidance. Consequently, the pursuit of individual autonomy may be less of a primary driver for engagement compared to feelings of competence and relatedness. Furthermore, this finding may reflect the specific educational context of the study. The participating students were enrolled in College English courses, where the curriculum is often standardized with limited opportunities for student choice regarding content or assessment. In such a highly structured environment, variation in perceived autonomy might be restricted, thereby limiting its predictive power relative to engagement. In addition, the results should be interpreted with caution due to the limitation of the convenience sample, which was drawn from a single institution and relatively skewed toward freshmen and sophomores from science-related disciplines.

Learners who harbor a growth mindset tend to demonstrate higher levels of L2 engagement, whereas fixed mindsets did not significantly predict engagement in this study. This result corroborates previous research identifying growth mindset as a robust positive predictor of language learning engagement (Derakhshan et al. 2024; Lou, Chaffee, and Noels 2022). Learners with a growth mindset believe ability is malleable, viewing challenges as learning opportunities rather than threats. This perception fosters students' resilience and sustained effort, leading to heightened engagement even when facing difficulties (Yeager and Dweck 2020). Conversely, the fact that fixed mindsets were not a predictor of engagement aligns with Lou and Noels (2017), which indicates that students who believe language facility is fixed avoid challenges, withdraw effort, and take failure as a sign of fixed faults. These students tend to blame difficulties for being fixed internal factors, which means they disengage from English learning (Mercer 2019).

Learner's buoyancy positively predicted their L2 engagement, suggesting that students who are able to effectively cope with academic pressure, challenges, and occasional failure in English learning are more likely to sustain meaningful involvement (Martin and Marsh 2008). This finding resonates with earlier research showing that buoyant learners tend to be more actively engaged (Thomas and Allen 2021; Wang and Hui 2024). Buoyant students appraise everyday setbacks as controllable and temporary, which sustains adaptive achievement emotions and task focus (Pekrun 2006). In L2 contexts, such appraisals foster enjoyment and reduce anxiety – two affective states repeatedly tied to greater participation and persistence (Skinner, Kindermann, and Furrer 2009).

5.2. Configurational predictors for engagement

While the regression analysis identified which variables had the strongest independent prediction, the fsQCA results provided a more holistic and nuanced picture, revealing five distinct configurations that were sufficient for achieving high L2 engagement. This underscores the principle of equifinality: there is no single path to engagement. Instead, the results demonstrate that different psychological resources are substitutable and can compensate for one another.

In solution 1, learners who reported high levels of relatedness and buoyancy demonstrated strong engagement, even when autonomy or competence were not evident. This result suggests that social connectedness and buoyancy can compensate for lower internal motivational drivers such as autonomy and competence. This finding is consistent with prior longitudinal research that emphasizes the role of a strong sense of belonging in boosting students' belief in their ability to handle academic challenges (Bostwick et al. 2022). Such confidence helps build psychological resources, which in turn promote engagement by reducing anxiety and promoting risk-taking behaviors (Gillen-O'Neel 2021). The finding also aligns with previous research indicating that autonomy is often less emphasized in collectivist cultures, where social connection and relational obligations are strongly valued. This configuration may be particularly salient in the Chinese classrooms, where interpersonal harmony shaped by traditional Confucian values is considered a core component (Markus and Kitayama 1991).

Solution 2 indicated that L2 learners who experience all three BPNs and a growth mindset are more likely to demonstrate high engagement in English learning. This finding validates the opinion from Lou and Noels (2020) that the interaction between growth mindset and BPNs significantly contributes to positive learning outcomes. When learners feel competent, autonomous, and socially connected, they are more likely to experience intrinsic motivation, which is a key driver of deep engagement in L2 contexts (Deci and Ryan 2000). This motivation can encourage learners to engage in active strategy use and deliberate practice to achieve their goals, which, in turn, aligns with and reinforces a growth mindset when facing challenges (Mercer and Dörnyei 2020). Therefore, BPNs and growth mindset can work jointly to predict engagement.

Solution 3 demonstrated that competence, relatedness, growth mindset, and buoyancy together lead to enhanced L2 engagement even without autonomy. This pattern shows that students who feel capable and socially connected, maintain a belief in their potential for development, and bounce back enthusiastically from setbacks are particularly well-positioned to stay actively engaged in English learning. Previous research has shown that a sense of competence and relatedness were essential predictors of engagement because these conditions reinforced students' confidence, feelings of belonging, and willingness to participate (Furrer and Skinner 2003). Meanwhile, having a growth mindset helps students see challenges and failures as less scary. They are more likely to persist with sustained effort and remain motivated to improve their performance (Dweck 2006; Lou, Chaffee, and Noels 2022). Importantly, buoyancy serves as an emotional buffer which shields students from everyday academic stresses and helps learners recover from minor setbacks quickly (Martin and Marsh 2008). The joint presence of buoyancy and growth mindset may allow learners to view challenges as temporary and controllable rather than threatening. In this regard, the absence of autonomy may not

hinder engagement because students' buoyancy together with growth belief stay mutually complementary toward keeping students committed to learning English. This finding echoes Lou and Noels (2020) argument that positive psychological constructs such as buoyancy, growth mindset, and need satisfaction can work jointly to sustain learners' investment.

Solution 4 showed that BPNs and buoyancy can work jointly to promote engagement regardless of growth mindset. The finding substantiates previous research suggesting that when students experience high need satisfaction, they are more likely to exhibit buoyant responses to academic challenges, which in turn facilitates positive learning outcomes (Aydin and Michou 2020). According to SDT, the fulfillment of BPNs energizes learners' optimal functioning across cognitive and behavioral domains, including their ability to 'float on academic water' and persistent when faced with setbacks (Deci and Ryan 2000). In this sense, buoyancy can be viewed as a dynamic manifestation of self-regulated motivation that is enabled and sustained by supportive learning environments. When learners feel autonomous, competent and connected, they are more likely to feel agent and interpret difficulties as manageable, thus reducing disengagement and reinforcing their willingness to persevere (Martin and Marsh 2008).

Solution 5 revealed that learners who possess a strong sense of autonomy, growth mindset, and academic buoyancy are more likely to show sustained engagement in English learning. These three factors interact with each other in the learning process. Autonomy orientation has been identified as a precursor of growth mindset and buoyancy (Wang et al. 2025; Zhao et al. 2023). Additionally, autonomy can be promoted through autonomy orientation, growth mindset, and buoyancy at individual levels or through their mediated effect on each other (Sadoughi, Hejazi, and Lou 2023). When students who are buoyant also have autonomy, they can more easily embrace challenges with a sense of self-endorsement and facilitate growth mindset with an increase in the likelihood of subsequent effort. Autonomy orientation, growth mindset and buoyancy can therefore coexist and predict L2 engagement.

5.3. Implication for theory and research

The first implication of the present study concerns its contribution to integrated theoretical models of L2 engagement by providing empirical support for a complexity theory perspective. Our findings move beyond traditional variable-centered approaches and suggest that engagement is better understood as an emergent property arising from the non-linear interplay of multiple interconnected components (Larsen-Freeman and Cameron 2008). Specifically, by identifying five distinct configurations for high engagement, our fsQCA results provide a clear illustration of equifinality – the principle that the same outcome can be reached through different causal pathways. This demonstrates that psychological resources like competence, relatedness, and buoyancy can be substitutable and may compensate for one another within a learner's motivational system. This finding calls for a shift away from theoretical models that posit a single, universal sequence of predictors and toward more dynamic, person-centered models that can account for multiple, equally valid pathways to engagement (Hiver and Al-Hoorie 2020).

The second relates to the methodological avenues for future research that our study opens up. By combining multiple regression with fsQCA, we demonstrate the value of

a multi-methodological approach. While regression identified the average net effect of individual predictors, fsQCA revealed the complex combinations in which these factors operate synergistically (Sun and Wang 2025). Our multiple regression findings show that autonomy did not predict L2 engagement on its own but work jointly with other conditions from the fsQCA result. This highlights the limitations of relying solely on variance-based methods to understand complex phenomena and serves as a call for future research to adopt more complexity-aligned methodologies. To build more nuanced theories that reflect the lived reality of language learners, researchers are encouraged to use methods such as fsQCA, agent-based modeling, or dynamic systems modeling, which are better suited to capturing the interconnected, non-linear, and context-dependent nature of L2 learning processes (Dörnyei, 2014; Hiver and Al-Hoorie 2020).

5.4. Implications for practice

This study carries several implications for practitioners, educators and policy makers. First, the consistent importance of competence, relatedness, growth mindset, and buoyancy as independent predictors provides a clear mandate for language educators. Teachers could intentionally design learning environments that nurture these specific psychological resources. For example, to build competence, instructors can use scaffolding techniques for challenging tasks and provide process-oriented feedback that helps students see their progress (Mandouit and Hattie 2023). To foster relatedness, collaborative tasks and creating a classroom climate of mutual respect are essential. Second, and most critically, the configurational findings empower language teachers to adopt a more diagnostic and tailored approach (Tomlinson 2014). The five ‘recipes for engagement’ show that different students thrive with different combinations of support. For example, for learners with a strong sense of relatedness and high buoyancy (Solution 1), teachers can prioritize these motivational resources by designing relatively challenging group projects (Johnson and Johnson 2009). A teacher might have students perform a group role-play of an adapted Shakespearean play which encourages students to rely on each other to succeed. Thirdly, our findings also provide insights for policy makers and curriculum designers. The configurational results suggest policy makers should move beyond a ‘one-size-fits-all’ approach, instead providing a nuanced, person-centered guide to pedagogical intervention (Hiver and Al-Hoorie 2020). This involves providing teachers with professional development focused on creating multi-faceted, supportive classrooms that offer various pathways to engagement. Policies can encourage flexible curricula that allow for both structured, competence-building activities and opportunities for autonomous exploration, thereby catering to the diverse psychological profiles of learners.

5.5. Limitations and future directions

Several limitations should be acknowledged. First, by operationalizing engagement as a composite score, we were unable to examine whether motivational factors differentially predict behavioral, cognitive, emotional, and social engagement, future research could disaggregate these dimensions to capture such facet-specific patterns. Second, although the social engagement items displayed acceptable internal consistency and loaded on the

intended engagement factor in our EFA and CFA results, this reversed coded items may have introduced method effects. Future research can refine the measurement of social engagement by rephrasing the items in a positive direction to obtain a more robust assessment of social engagement. Furthermore, the calibration of fuzzy sets in this study relied on sample-based thresholds due to the lack of established external benchmarks for engagement in the SLA literature. Future research can aim to define theoretical thresholds to further validate these findings. Third, the cross-sectional design and reliance solely on self-report measures restricts the ability to examine engagement as a dynamic and evolving process. While self-reports can offer valuable insights into learners' perceptions, they are also prone to biases such as social desirability, particularly when collected at a single time point. To address this, future research could adopt longitudinal or mixed-methods designs that incorporate observational data (Hiver, Al-Hoorie, and Mercer 2021). Fourth, the study relied on a convenience sample of Chinese university EFL learners drawn from a single institution, with participants predominantly first- and second-year students and over one-third majoring in life sciences. This relatively skewed sample limits the extent to which the findings can be generalized to other year levels, disciplines, institutions, or EFL contexts. Future research can include more heterogeneous samples from various regions and educational institutions (Plonsky 2013). Lastly, although this study included participants' Gaokao (College Entrance Examination) scores as an approximate indicator of proficiency, it did not directly measure their current language proficiency at the time of data collection. The Gaokao score, while useful, is a historical measure and may not accurately reflect a student's language ability after one or more years of university study. Future research can therefore incorporate a direct and validated measure of language proficiency (e.g. C-test, Babaii and Ansary 2001).

6. Conclusion

This study employed multiple regression analysis and fsQCA to investigate how BPNs, mindset, and academic buoyancy independently and jointly shape learner engagement among Chinese EFL learners. Drawing on a configurational approach, the study provided a nuanced and holistic understanding of the mechanisms underpinning L2 engagement. Three main findings emerged. First, competence, relatedness, growth mindset, and buoyancy were found to significantly and positively predict engagement, while autonomy and fixed mindset did not exhibit statistically significant effects when examined independently. Second, no single variable was identified as a necessary or sufficient condition for high engagement. Third, five distinct configurations were identified as sufficient pathways to high engagement, showing that motivational operate dynamically and may compensate for one another across individual learner profiles. The primary theoretical contribution of this study lies in its integrated approach, which moves beyond isolated variables to reveal the complex interplay of factors that underpin L2 engagement. By demonstrating that multiple effective pathways lead to high engagement, the current study is a step toward building a more fine-grained understanding of the dynamic and non-linear nature of learner engagement. Furthermore, it pioneers the use of fsQCA to map the intricate combinations of motivational factors driving L2 engagement, paving the way for more nuanced and configurational approaches in future SLA research.

Note

1. According to Plonsky and Oswald (2014), correlation coefficient close to 0.25 is considered small, 0.40 medium, and 0.60 large.

Disclosure statement

No potential conflict of interest was reported by the author(s).

ORCID

Long Qian  <http://orcid.org/0000-0002-4498-3163>

Xuyan Qiu  <http://orcid.org/0000-0003-4368-8039>

References

- af Ursin, P., T. Järvinen, and P. Pihlaja. 2021. "The Role of Academic Buoyancy and Social Support in Mediating Associations between Academic Stress and School Engagement in Finnish Primary School Children." *Scandinavian Journal of Educational Research* 65 (4): 661–675. <https://doi.org/10.1080/00313831.2020.1739135>
- Alamer, A. 2022. "Basic Psychological Needs, Motivational Orientations, Effort, and Vocabulary Knowledge: A Comprehensive Model." *Studies in Second Language Acquisition* 44 (1): 164–184. <https://doi.org/10.1017/S027226312100005X>
- Aydın, G., and A. Michou. 2020. "Self-Determined Motivation and Academic Buoyancy as Predictors of Achievement in Normative Settings." *British Journal of Educational Psychology* 90 (4): 964–980. <https://doi.org/10.1111/bjep.12338>
- Babaii, E., & Ansari, H. (2001). The C-Test: A Valid Operationalization of Reduced Redundancy Principle?. *System*, 29(2), 209–219. [https://doi.org/10.1016/S0346-251X\(01\)00012-4](https://doi.org/10.1016/S0346-251X(01)00012-4)
- Benlahcene, A., A. Kaur, and R. Awang-Hashim. 2021. "Basic Psychological Needs Satisfaction and Student Engagement: The Importance of Novelty Satisfaction." *Journal of Applied Research in Higher Education* 13 (5): 1290–1304. <https://doi.org/10.1108/JARHE-06-2020-0157>
- Bostwick, K. C. P., A. J. Martin, R. J. Collie, E. C. Burns, N. Hare, S. Cox, A. Flesken, and I. McCarthy. 2022. "Academic Buoyancy in High School: A Cross-Lagged Multilevel Modeling Approach Exploring Reciprocal Effects with Perceived School Support, Motivation, and Engagement." *Journal of Educational Psychology* 114 (8): 1931–1949. <https://doi.org/10.1037/edu0000753>
- Deci, E. L., & Ryan, R. M. (2000). The "What" and "Why" of Goal Pursuits: Human Needs and the Self-determination of Behavior. *Psychological Inquiry*, 11(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01
- Derakhshan, A., J. Fathi, M. Pawlak, and M. Kruk. 2024. "Classroom Social Climate, Growth Language Mindset, and Student Engagement: The Mediating Role of Boredom in Learning English as a Foreign Language." *Journal of Multilingual and Multicultural Development* 45 (8): 3415–3433. <https://doi.org/10.1080/01434632.2022.2099407>
- Dewaele, J. M., & Li, C. (2021). Teacher Enthusiasm and Students' Social-Behavioral Learning Engagement: The Mediating Role of Student Enjoyment and Boredom in Chinese EFL Classes. *Language Teaching Research*, 25(6), 922–945. <https://doi.org/10.1177/13621688211014538>
- Dörnyei, Z. 2014. *The Psychology of the Language Learner: Individual Differences in Second Language Acquisition*. New York: Routledge.
- Dweck, C. S. 2006. *Mindset: The new Psychology of Success*. New York: Random House.
- Eren, A., and A. Rakıcıoğlu-Söylemez. 2023. "Language Mindsets, Perceived Instrumentality, Engagement and Graded Performance in English as a Foreign Language Students." *Language Teaching Research* 27 (3): 544–574. <https://doi.org/10.1177/1362168820958400>

- Fiss, P. C. 2011. "Building Better Causal Theories: A Fuzzy Set Approach to Typologies in Organization Research." *Academy of Management Journal* 54 (2): 393–420. <https://doi.org/10.5465/amj.2011.60263120>
- Fredricks, J. A., P. C. Blumenfeld, and A. H. Paris. 2004. "School Engagement: Potential of the Concept, State of the Evidence." *Review of Educational Research* 74 (1): 59–109. <https://doi.org/10.3102/00346543074001059>
- Furrer, C., & Skinner, E. (2003). Sense of Relatedness as a Factor in Children's Academic Engagement and Performance. *Journal of Educational Psychology*, 95(1), 148–162. <https://doi.org/10.1037/0022-0663.95.1.148>
- Gillen-O'Neel, C. (2021). Sense of Belonging and Student Engagement: A Daily Study of First-and Continuing-Generation College Students. *Research in Higher Education*, 62(1), 45–71. <https://doi.org/10.1007/s11162-019-09570-y>
- Glignor, D., & Bozkurt, S. 2020. "FsQCA versus Regression: The Context of Customer Engagement." *Journal of Retailing and Consumer Services* 52: 101929. <https://doi.org/10.1016/j.jretconser.2019.101929>
- Guan, Y., X. Zhu, L. Xiao, S. Zhu, and Y. Yao. 2024. "Investigating the Relationships between Language Mindsets, Attributions, and Learning Engagement of L2 Writers." *System* 125: 103431. <https://doi.org/10.1016/j.system.2024.103431>
- Guo, Y., J. Xu, and C. Chen. 2023. "Measurement of Engagement in the Foreign Language Classroom and Its Effect on Language Achievement: The Case of Chinese College EFL Students." *International Review of Applied Linguistics in Language Teaching* 61 (3): 1225–1270. <https://doi.org/10.1515/iral-2021-0118>
- Hiver, P., and A. H. Al-Hoorie. 2020. *Research Methods for Complexity Theory in Applied Linguistics*. Bristol: Multilingual Matters.
- Hiver, P., Al-Hoorie, A. H., & Mercer, S. 2021. *Student Engagement in the Language Classroom*. Bristol, Blue Ridge Summit: Multilingual Matters.
- Hiver, P., Al-Hoorie, A. H., Vitta, J. P., & Wu, J. (2024). Engagement in Language Learning: A Systematic Review of 20 Years of Research Methods and Definitions. *Language Teaching Research*, 28(1), 201–230. <https://doi.org/10.1177/13621688211001289>
- Jiang, H., & Yu, X. (2025). L2 Grit and Its Association with Online Learning Engagement and Interaction Strategies: A Structural Equation Model. *The Asia-Pacific Education Researcher*, 34(3), 1145–1156. <https://doi.org/10.1007/s40299-024-00929-z>
- Johnson, D. W., & Johnson, R. T. (2009). An Educational Psychology Success Story: Social Interdependence Theory and Cooperative Learning. *Educational Researcher*, 38(5), 365–379. <https://doi.org/10.3102/0013189X09339057>
- Karimi, S., and B. Sotoodeh. 2020. "The Mediating Role of Intrinsic Motivation in the Relationship between Basic Psychological Needs Satisfaction and Academic Engagement in Agriculture Students." *Teaching in Higher Education* 25 (8): 959–975. <https://doi.org/10.1080/13562517.2019.1623775>
- Khajavy, G. H. 2021. "Modeling the Relations between Foreign Language Engagement, Emotions, Grit and Reading Achievement." In *Student Engagement in the Language Classroom*, edited by P. Hiver, S. Mercer, and A. H. Al-Hoorie, 241–259. Bristol, Blue Ridge Summit: Channel View Publications.
- Kim, T. -Y, and Y.-K Kim. 2017. "The Impact of Resilience on L2 Learners' Motivated Behaviour and Proficiency in L2 Learning." *Educational Studies* 43 (1): 1–15. <https://doi.org/10.1080/03055698.2016.1237866>
- Kline, R. B. 2023. *Principles and Practice of Structural Equation Modeling*. New York: Guilford Publications.
- Larsen-Freeman, D., and L. Cameron. 2008. *Complex Systems and Applied Linguistics*. Oxford: Oxford University Press.
- Li, C., L. Wei, and J. Cai. 2024. "Life Satisfaction and L2 Engagement in Adolescents." *ELT Journal* 78 (2): 149–159. <https://doi.org/10.1093/elt/ccad054>

- Lou, N. M., K. E. Chaffee, and K. A. Noels. 2022. "Growth, Fixed, and Mixed Mindsets: Mindset System Profiles in Foreign Language Learners and Their Role in Engagement and Achievement." *Studies in Second Language Acquisition* 44 (3): 607–632. <https://doi.org/10.1017/S0272263121000401>
- Lou, N. M., and K. A. Noels. 2017. "Measuring Language Mindsets and Modeling Their Relations with Goal Orientations and Emotional and Behavioral Responses in Failure Situations." *The Modern Language Journal* 101 (1): 214–243. <https://doi.org/10.1111/modl.12380>
- Lou, N. M., and K. A. Noels. 2020. "Does My Teacher Believe I Can Improve?": The Role of Meta-lay Theories in ESL Learners' Mindsets and Need Satisfaction. *Frontiers in Psychology* 11: 1417. <https://doi.org/10.3389/fpsyg.2020.01417>
- Lu, M. (2025). A Configurational Exploration of How Emotions Influence Willingness to Communicate among Chinese EFL Learners: A fsQCA Approach. *System*, 131, 103649. <https://doi.org/10.1016/j.system.2025.103649>
- Mandouti, L., & Hattie, J. (2023). Revisiting "The Power of Feedback" from the Perspective of the Learner. *Learning and Instruction*, 84, 101718. <https://doi.org/10.1016/j.learninstruc.2022.101718>
- Markus, H. R., & Kitayama, S. 1991. "Culture and the Self: Implications for Cognition, Emotion, and Motivation." *Psychological Review* 98 (2): 224–253. <https://doi.org/10.1037/0033-295X.98.2.224>
- Martin, A. J., and H. W. Marsh. 2008. "Academic Buoyancy: Towards an Understanding of Students' Everyday Academic Resilience." *Journal of School Psychology* 46 (1): 53–83. <https://doi.org/10.1016/j.jsp.2007.01.002>
- Mason, M. (2008). Complexity Theory and the Philosophy of Education. *Educational Philosophy and Theory*, 40(1), 4–18. <https://doi.org/10.1111/j.1469-5812.2007.00412.x>
- McEown, M. S., and W. L. Q. Oga-Baldwin. 2019. "Self-Determination for all Language Learners: New Applications for Formal Language Education." *System* 86: 102124. <https://doi.org/10.1016/j.system.2019.102124>
- Mercer, S. 2019. "Language Learner Engagement: Setting the Scene." In *Second Handbook of English Language Teaching*, edited by X. Gao, 643–660. Cham: Springer International Publishing.
- Mercer, S., & Dörnyei, Z. 2020. *Engaging Language Learners in Contemporary Classrooms*. 1st ed. Cambridge: Cambridge University Press.
- Milyavskaya, M., and R. Koestner. 2011. "Psychological Needs, Motivation, and Well-Being: A Test of Self-determination Theory across Multiple Domains." *Personality and Individual Differences* 50 (3): 387–391. <https://doi.org/10.1016/j.paid.2010.10.029>
- Niemiec, C. P., and R. M. Ryan. 2009. "Autonomy, Competence, and Relatedness in the Classroom: Applying Self-determination Theory to Educational Practice." *Theory and Research in Education* 7 (2): 133–144. <https://doi.org/10.1177/1477878509104318>
- Noels, K. A., L. G. Pelletier, R. Clément, and R. J. Vallerand. 2000. "Why Are You Learning a Second Language? Motivational Orientations and Self-Determination Theory." *Language Learning* 50 (1): 57–85. <https://doi.org/10.1111/0023-8333.00111>
- Oga-Baldwin, W. L. Q. (2019). Acting, Thinking, Feeling, Making, Collaborating: The Engagement Process in Foreign Language Learning. *System*, 86, 102128. <https://doi.org/10.1016/j.system.2019.102128>
- Papi, M., A. Rios, H. Pelt, and E. Ozdemir. 2019. "Feedback-seeking Behavior in Language Learning: Basic Components and Motivational Antecedents." *The Modern Language Journal*, 103 (1), 205–226. <https://doi.org/10.1111/modl.12538>
- Pekrun, R. 2006. "The Control-Value Theory of Achievement Emotions: Assumptions, Corollaries, and Implications for Educational Research and Practice." *Educational Psychology Review* 18 (4): 315–341. <https://doi.org/10.1007/s10648-006-9029-9>
- Plonsky, L. 2013. "Study Quality in SLA: An Assessment of Designs, Analyses, and Reporting Practices in Quantitative L2 Research." *Studies in Second Language Acquisition* 35 (4): 655–687. <https://doi.org/10.1017/S0272263113000399>
- Plonsky, L., and F. L. Oswald. 2014. "How Big Is "Big"? Interpreting Effect Sizes in L2 Research." *Language Learning* 64 (4): 878–912. <https://doi.org/10.1111/lang.12079>
- Putwain, D. W., & Daly, A. L. (2013). Do Clusters of Test Anxiety and Academic Buoyancy Differentially Predict Academic Performance? *Learning and Individual Differences*, 27, 157–162. <https://doi.org/10.1016/j.lindif.2013.07.010>

- Putwain, D. W., and P. Wood. 2023. "Riding the Bumps in Mathematics Learning: Relations between Academic Buoyancy, Engagement, and Achievement." *Learning and Instruction* 83: 101691. <https://doi.org/10.1016/j.learninstruc.2022.101691>
- Qiu, X. 2024. "Revisiting the Cognition Hypothesis: the impact of task complexity on L2 learner engagement in task performance in computer-mediated and face-to-face communication." *Computer Assisted Language Learning* 37 (7): 2028–2050. <https://doi.org/10.1080/09588221.2022.2142245>
- Ragin, C. C. (2006). Set Relations in Social Research: Evaluating Their Consistency and Coverage. *Political Analysis*, 14(3), 291–310. <https://doi.org/10.1093/pan/mpj019>
- Ragin, C. C. 2008. *Redesigning Social Inquiry: Fuzzy Sets and Beyond*. Chicago: University of Chicago Press.
- Reeve, J. 2012. "A Self-determination Theory Perspective on Student Engagement." In *Handbook of Research on Student Engagement*, edited by C. Wylie, S. L. Christenson, and A. L. Reschly, 149–172. Springer.
- Reschly, A. L., & Christenson, S. L. 2022. *Handbook of Research on Student Engagement*. Cham: Springer.
- Rihoux, B., & Ragin, C. 2009. *Configurational Comparative Methods: Qualitative Comparative Analysis (QCA) and Related Techniques*. Thousand Oaks, CA: SAGE Publications, Inc.
- Sadoughi, M., S. Y. Hejazi, and N. M. Lou. 2023. "How Do Growth Mindsets Contribute to Academic Engagement in L2 Classes? The Mediating and Moderating Roles of the L2 Motivational Self System." *Social Psychology of Education* 26 (1): 241–261. <https://doi.org/10.1007/s11218-022-09744-0>
- Sheikholeslami, R., & Arab-Moghaddam, N. (2010). Relations of Autonomy and Adjustment in Iranian College Students: A Cross-Cultural Study of Self-determination Theory. *Procedia – Social and Behavioral Sciences*, 5, 1831–1835. <https://doi.org/10.1016/j.sbspro.2010.07.373>
- Skinner, E. A., T. A. Kindermann, and C. J. Furrer. 2009. "A Motivational Perspective on Engagement and Disaffection: Conceptualization and Assessment of Children's Behavioral and Emotional Participation in Academic Activities in the Classroom." *Educational and Psychological Measurement* 69 (3): 493–525. <https://doi.org/10.1177/0013164408323233>
- Sun, J., and Y. Wang. 2025. "Fuzzy-set Qualitative Comparative Analysis (fsQCA) in Second Language Acquisition: An Applied Example of Writing Engagement." *Research Methods in Applied Linguistics* 4 (1): 100193. <https://doi.org/10.1016/j.rmal.2025.100193>
- Svalberg, A. M. L. (2018). Researching Language Engagement; Current Trends and Future Directions. *Language Awareness*, 27(1-2), 21–39. <https://doi.org/10.1080/09658416.2017.1406490>
- Thomas, C. L., & Allen, K. (2021). Driving Engagement: Investigating the Influence of Emotional Intelligence and Academic Buoyancy on Student Engagement. *Journal of Further and Higher Education*, 45(1), 107–119. <https://doi.org/10.1080/0309877X.2020.1741520>
- Tomlinson, C. A. 2014. *The Differentiated Classroom: Responding to the Needs of All Learners*. Alexandria: Association for Supervision & Curriculum Development.
- Wang, W., M. A. S. Khasawneh, L. Sarabani, and S. M. Ismail. 2025. "Investigating the Influence of Positive Classroom Management Strategies on Academic Buoyancy, Academic Engagement, Psychological Well-Being and Language Achievement: Visions from EFL Learners." *European Journal of Education* 60 (3): e70149. <https://doi.org/10.1111/ejed.70149>
- Wang, X., & Hui, L. (2024). Buoyancy and Engagement in Online English Learning: The Mediating Roles and Complex Interactions of Anxiety, Enjoyment, and Boredom. *System*, 125, 103418. <https://doi.org/10.1016/j.system.2024.103418>
- Wang, Y., and H. Liu. 2022. "The Mediating Roles of Buoyancy and Boredom in the Relationship Between Autonomous Motivation and Engagement Among Chinese Senior High School EFL Learners." *Frontiers in Psychology* 13: 992279. <https://doi.org/10.3389/fpsyg.2022.992279>
- Woodside, A. G. 2013. "Moving beyond Multiple Regression Analysis to Algorithms: Calling for Adoption of a Paradigm Shift from Symmetric to Asymmetric Thinking in Data Analysis and Crafting Theory." *Journal of Business Research* 66 (4): 463–472. <https://doi.org/10.1016/j.jbusres.2012.12.021>

- Xu, J., & Feng, X. (2024). Mindsets, Resilience and Student Engagement as Predictors of L2 Achievement among Chinese English Learners: Insights from Fuzzy-set Qualitative Comparative Analysis. *System*, 124, 103358. <https://doi.org/10.1016/j.system.2024.103358>
- Yang, Y., & Liang, S. (2025a). Classroom Social Climate and Student Engagement in English as a Foreign Language Learning: The Mediating Roles of Academic Buoyancy and Academic Emotions. *The Asia-Pacific Education Researcher*, 34(3), 1123–1132. <https://doi.org/10.1007/s40299-024-00926-2>
- Yang, Y., and S. Liang. 2025b. "Contributions of Interaction, Growth Language Mindset, and L2 Grit to Student Engagement in Online EFL Learning: A Mixed-Methods Approach." *Applied Linguistics Review* 16 (6): 2871–2897.
- Yeager, D. S., and C. S. Dweck. 2020. "What Can Be Learned from Growth Mindset Controversies?" *The American Psychologist* 75 (9): 1269–1284. <https://doi.org/10.1037/amp0000794>
- Yin, H., & Wang, W. (2016). Undergraduate Students' Motivation and Engagement in China: An Exploratory Study. *Assessment & Evaluation in Higher Education*, 41(4), 601–621. <https://doi.org/10.1080/02602938.2015.1037240>
- Yun, S., P. Hiver, and A. H. Al-Hoorie. 2018. "Academic Buoyancy." *Studies in Second Language Acquisition* 40 (4): 805–830. <https://doi.org/10.1017/S0272263118000037>
- Zhao, Y., X. Huang, and L. Hui. 2025. "Academic Buoyancy and Academic Engagement in English Speaking Learning among Chinese College Students: The Mediation of Enjoyment and the Moderation of Anxiety." *Frontiers in Psychology* 16: 1680032. <https://doi.org/10.3389/fpsyg.2025.1680032>
- Zhao, Y., Huang, Z., Wu, Y., & Peng, K. 2023. "Autonomy Matters: Influences of Causality Orientations on Chinese Adolescents' Growth Mindset." *Journal of Pacific Rim Psychology* 17: 1–9. <https://doi.org/10.1177/18344909231157466>
- Zou, M., Noughabi, M. A., & Peng, C. (2025). Modeling the Associations between L2 Grit, Foreign Language Enjoyment, and Student Engagement among Chinese EFL English-Major Learners: A Control-Value Theory Perspective. *System*, 131, 103679. <https://doi.org/10.1016/j.system.2025.103679>