

The Effects of Self-regulated Strategy and its Associations on Self-efficacy for Chinese as a Second Language Acquisition in Collegiate Students

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Abstract

Previous studies have indicated a close relationship between self-efficacy and the ability to use self-regulation strategies. Specifically, the higher the ability to use self-regulation strategies, the stronger the self-efficacy. However, the factors influencing self-regulation strategies and the impact of these factors on the effectiveness of self-regulation strategy abilities have not been clearly elucidated. Based on previous research, this study incorporates potential factors affecting self-regulation strategies that have been proposed but not empirically verified. Using polynomial regression analysis on the basis of questionnaire design, the study investigates whether self-efficacy is influenced by self-regulation ability, how self-regulation affects learners, and which factors influence the effectiveness of self-regulation. A total of 187 undergraduate students learning Chinese as a second language were invited to participate in the study. The research found a positive correlation between self-efficacy and self-regulation ability, with self-monitoring and evaluation abilities playing an intermediary role between the two. Polynomial regression analysis revealed that academic performance, the use of external resources, and emotional attitudes toward Language learning all had a positive correlation with self-regulation ability. However, upon further investigation, the study found that adult learners primarily focused on using external resources to regulate themselves. At the same time, the other two factors did not have a significant statistical effect. This study provides insights for Chinese as a second language teachers,

guiding them to emphasize the regulation of adult learners' use of external language resources before, during, and after class.

Keywords: Self-regulated strategy; Self-efficacy; Chinese as a Second Language Acquisition; Collegiate Students

1. Introduction

In the context of second language acquisition (SLA), self-efficacy is conceptualized as one of the meta-cognitive strategies to attain desired learning outcomes and enhance confidence in facing challenges throughout language learning (Zakariya, 2022; Graham, 2007; Gorsuch, 2009). As a complex and significant component of the communicative language learning process, self-efficacy also plays a crucial role in guiding those preliminary learners to gain academic success by using the teacher as scaffolding (Zhang & Zou, 2022). Past research mainly focused on how self-efficacy mediated learners' agency to be successful. Numerous researchers have demonstrated that self-regulation is a key factor influencing self-efficacy in learning (Wu et al., 2024; Tur et al., 2022).

However, a discernible lacuna exists in the literature when it comes to the influence of self-regulation abilities on self-efficacy within the context of Chinese as a Second Language Education (CSL). A significant proportion of Chinese academia remains entrenched in the ESL paradigm, often marginalizing CSL (Van et al., 2024; Su et al., 2018). Moreover, among scholars who engage with CSL, there persists a pronounced inclination towards curating pedagogies from an educator-centric lens. This predisposition often marginalizes the learner's agency and offers a scant exploration into the tangible classroom implications of self-regulation (Su et al., 2023; Zhao et al., 2023).

These research directions, however, do come with their constraints. To illustrate, by 2018, the number of international students in China had surpassed 490,000, positioning China as the third most sought-after global destination for international education (Tao & Xi, 2022). It is imperative to note that a significant fraction of these students embark on learning Chinese. At the same token, given the abstract nature of Chinese, distinct from most phonetic languages, learners grapple with challenges, notably in pronunciation (Bo, 2022) and the

intricacies of writing Chinese characters (Tian, 2023). In such a milieu, learners' self-regulation abilities become pivotal, potentially influencing their self-efficacy, which in turn impacts their academic performance and emotional resonance with the learning process. Overlooking self-regulation in CSL can inadvertently widen pedagogical chasms. Furthermore, pedagogies sculpted predominantly from an educator's vantage point often inadvertently eclipse the cardinal tenet of learner-centeredness in language education (Chen & Jiang, 2023).

It is paramount to recognize learners as the linchpins of language acquisition, entrusted with the onus of outcomes. Educators must remain attuned to learners' evolving dynamics, particularly their adeptness at modulating their learning states, a cornerstone for flourishing as second language learners. It is worth noting that the ethos of language education is to immerse global citizens in diverse cultural pedagogies, ultimately seeking to enhance learners' life experiences and expand their worldviews. In the realm of language pedagogy, emphasizing learners' self-efficacy is intrinsically linked to enabling them to develop an enriched perspective on the world rather than solely achieving social prominence or innovating pedagogical techniques.

Prevailing research concerning the interplay between self-regulation abilities and self-efficacy within English as a Second Language Education (ESL) predominantly bifurcates into two distinct trajectories. The first trajectory delves into cognitive structures, examining the extent to which self-regulation abilities modulate perceived learning outcomes in modules encompassing writing, speaking, reading, and listening (Su et al., 2023). The second trajectory, anchored in Vygotsky's sociocultural theory, elucidates the nexus between self-regulation abilities and self-efficacy, further shedding light on its implications for learners' intrinsic motivation.

Consequently, this paper, underpinned by the framework of self-regulation abilities, seeks to unravel the dynamics of how these abilities shape self-efficacy within the ambit of undergraduate CSL education. This inquiry aims to reveal what factors in self-regulation will have effects on self-efficacy. It matters because, without clear recognition of the main sources of self-regulation, teachers will find it hard to implement targeted measures for their students. To educators, what they need to put more effort into is to illustrate how self-regulation ability influences self-efficacy.

2. Literature Review

2.1 Self-efficacy in The L2 Classroom Context

Self-efficacy, as defined by Bandura (1995), refers to 'the belief in an individual's capabilities to execute behavior required to achieve desired outcomes.' Bandura (1999) further describes self-efficacy as 'the foundation of human agency' (p. 28). According to Martínez et al. (2021), self-efficacy plays a crucial role in regulating one's attitude and confidence when facing challenging language learning tasks. Individuals with high self-efficacy are more likely to view difficult assignments as opportunities to expand their knowledge and reduce language learning anxiety to a moderate extent (Burns et al., 2021). Conversely, individuals with low self-efficacy tend to perceive such tasks as impossible and attribute their inability to complete them to their shortcomings. Over time, this can lead to demotivation and a sense of discouragement (Alden, 1986; Grove, 1993; Silver et al., 1995).

Some researchers argue that an essential component of L2 classrooms is to focus on students' self-efficacy (Glatz et al., 2024)), as it is linked to beliefs about future achievement expectations (Graham, 2007), recognition and satisfaction in future careers (Ran, 2022), and learning agency (Wang et al., 2023). According to Teng (2024), students with high self-efficacy not only display a proactive attitude towards learning tasks but also take the initiative to devise possible and practical plans to solve existing questions or challenging tasks. This condition helps students understand that effort, rather than assumption, is the most crucial determinant of success in language learning. At the tertiary education level, L2 classes aim to develop students' independent learning skills, cultivate their learning capabilities, and provide necessary instructions.

Consequently, students will maintain high self-efficacy in the long term to become lifelong and successful learners.

2.2 Learning Strategy

According to Wenden (1987, p.7-8), "Learning strategies are the various operations that learners use to make sense of their learning." This elucidation underscores the notion that learning strategies constitute a repertoire of

cognitive tools leveraged by learners to navigate particular learning endeavours and attain educational objectives (Fleck & Zhu, 2024)). Cenka et al. (2023) bifurcates language learning strategies into three tiers: cognitive, metacognitive, and socio-affective. Within the realm of the second language classroom, cognitive language learning strategies, exemplified by feedback mechanisms, analytical approaches, and grammar examinations, among others (Oxford, 1989), are predominantly harnessed to tackle specific tasks. Metacognitive language learning strategies are perceived as sophisticated methodologies adopted by advanced language learners (Kuzyk et al., 2019). Amid the metacognitive learning phase, learners assume a pivotal role in the language acquisition journey by meticulously overseeing their learning trajectory, encompassing self-evaluation, scrutiny of their linguistic learning efficacy, and strategizing subsequent phases of language learning predicated on their recent performance metrics (Zhu et al., 2024). On the other hand, socio-affective language learning strategies, situated at the confluence of social and emotional dimensions, principally revolve around the mechanisms by which learners in the second language classroom milieu interact and synergize effectively with educators and cohorts to foster optimized learning results (Rincon-Flores et al., 2024).

The burgeoning interest in Language learning across the globe has ushered in an era of refined focus among scholars in the domain of Second Language Acquisition (SLA) on the pivotal role of learning strategies (Hardan, 2013). Primarily, the employment of learning strategies has been substantiated as a robust means to ameliorate anxiety among second language learners (Chow et al., 2021). Through a meticulously administered survey involving 35 Chinese and 37 Spanish university students, Chen et al. (2022) unearthed that learning strategies notably mitigate language learning anxiety, particularly within the realm of English reading courses. Nonetheless, a comparative analysis revealed that Chinese learners exhibited a diminished aptitude for leveraging learning strategies to assuage their learning anxiety compared to their Spanish counterparts. The underlying catalyst for this discrepancy was identified as the linguistic affinity between English and Spanish, which culminates in a reduced anxiety quotient for Spanish learners whilst engaging with English naturally.

2.3 Self-regulated Learning Strategy

In the realm of metacognitive approaches, self-regulation strategies stand as a notable learning strategy, attracting the attention of educational practitioners globally (Zare et al., 2024; Teich et al., 2024)). Zimmerman (1989) delineates self-regulation strategies as the application of diverse techniques and resources to steer learners toward the successful completion of learning tasks. These strategies extend beyond merely aiding learners in navigating through the learning process and overcoming challenges; they encompass assisting learners in accessing resources within a broader social milieu to fulfil their learning objectives (Shunk & Zimmerman, 1994).

In the prevailing domain of CSL research, the extant literature has navigated the interplay of learning strategies and learners' self-efficacy, embodying both empirical and non-empirical paradigms. Zhou & Li (2016) pioneered in probing the interconnections between language learning beliefs and language learning strategies. Their bipartite survey unveiled that self-efficacy markedly sways learners' language learning beliefs and motivation. Although Zhou & Li's (2016) inquiry displayed a modicum of prescience, it merely skimmed the superficial impacts of self-efficacy, failing to traverse the operational depth of self-efficacy within the Chinese educational milieu. Venturing into this exploratory realm, Zhang (2017) and Cui & Hu (2022) have made noteworthy strides. Stationed at Shanghai Jiao Tong University, Zhang honed in on undergraduate Chinese learners, dissecting the impact mechanisms intertwining self-efficacy and learning strategies among this cohort. With a flair for innovation, Zhang forged a bespoke scale for Chinese language learners, mirroring the distinctiveness of CSL. The findings underscored heightened employment of metacognitive learning strategies among undergraduate learners, attributing this trend to their transition into adulthood, entailing an augmented predilection for autonomous learning and self-regulation. Eager to either assimilate swiftly into Chinese society or enhance their language prowess, these undergraduates meticulously craft learning strategies to keep tabs on their learning trajectory.

2.4 Research Questions

In contemporary scholarly discourse, there is a pronounced emphasis on delineating the concepts of self-efficacy and self-regulated learning strategies

(Zhao et al., 2023). Many assert that learners utilize self-regulated learning strategies as tools during their academic journey to amplify both their motivation and confidence (Su et al., 2023). However, there is a discernible gap in literature addressing the dynamics of using these strategies at both cognitive and sociocultural levels and their influence on learners' self-efficacy. Existing empirical studies that investigate the mechanics of self-regulated learning strategies tend to be centred on disciplines such as STEM and are often anchored in North American and European paradigms (Wen et al., 2023). However, research on Chinese language learners in universities is relatively scarce. Besides, A predominant challenge in conducting a quantitative analysis in this inquiry emanates from the fact that antecedent studies have hitherto explored the impact of learning strategies on learners' self-efficacy and the influence of self-regulation strategies on learners' self-efficacy in isolation. Given this backdrop, this study endeavours to explore the interplay between self-regulation strategies and self-efficacy among undergraduate learners in the context of CSL, shedding light on the intricate relationship that binds them. The trio of universities chosen for this study epitomize a uniform academic standing, reflected in their university rankings, student enrollment figures, and faculty prowess, thereby presenting a balanced backdrop for evaluating the pragmatic deployment of self-regulation strategies across diverse learner cohorts. This dichotomy has led to the identification of a myriad of factors influencing learners' self-efficacy. Thus, the exigency arises for this paper to distil the regulatory factors pertinent to how self-regulation strategies impact learners' self-efficacy within a singular study. Founding its inquiry on this premise, the study initially broadens its research scope to encompass emotional factors. Extant literature underscores that learning strategies can ameliorate learners' learning anxiety and bolster their learning motivation, delineating emotional variables from learning strategies and self-regulation strategies.

Grounded on Bandura's (1999) quartet of theoretical sources of self-efficacy, four influential variables in self-regulation on self-efficacy are selected. These variables have been justified to have effects on self-efficacy in previous research and applied to ESL (Wen et al., 2023). To be specific, by scrutinizing these variables across three dimensions, this paper zeroes in on three facets of the impact of self-regulation strategies on learners' self-efficacy in Chinese

language acquisition: learners' experiences in mastering Chinese, technical and resource backing throughout the Chinese learning trajectory, and social and emotional sustenance during the Chinese learning phase. Specifically, this paper endeavours to address the ensuing three questions:

1. In what aspects do self-regulation exert influences on self-efficacy?
2. How is self-regulation affected by students' academic performance, the ability to utilize external resources and affection in language learning?

3. Method

3.1 Participants

This investigation engaged 187 undergraduate CSL learners hailing from three distinct educational institutions in Beijing and Tianjin. The selection of Beijing and Tianjin as the focal points for this study springs from its well-established reputation in Chinese language pedagogy. The rationale behind the selection of undergraduate learners stems from the conspicuous gap in the scholarly discourse regarding the ramifications of self-regulated learning strategies on learners' self-efficacy, particularly within the Chinese as a Second Language framework. This inquiry predominantly zeroes in on the university educational arena, which currently stands as the foremost target demographic for CSL instruction, given its well-rounded Chinese language curriculum. As a part of the survey dissemination, all international students majoring in Chinese Language during their sophomore year at these universities were enlisted to participate. With a year of immersive learning experience in China under their belt, these learners are poised to offer insightful reflections on their engagement with self-regulated learning strategies and their interplay with self-efficacy in their learning journey. The choice of second-year undergraduate participants also serves to mitigate the transient effects of cultural shock, a byproduct of cross-cultural assimilation. In terms of linguistic competency, the participants embody an average proficiency benchmark of HSK (Hanyu Shuiping Kaoshi) Level 4, which augments the validity of their responses in the context of this study.

3.2 Instrument and Procedure

3.2.1 Instrument

The present study primarily investigates the impact of self-regulated learning strategies and their constituent elements on self-efficacy among CSL learners. A self-report questionnaire comprising a self-regulated learning strategies scale and a self-efficacy scale was developed for analysis. The survey instrument employed in this study encompasses a total of 55 items, of which 49 are derived from a 5-point Likert scale. The principal objective of this scale is to scrutinize the facets of self-regulation strategies potentially impacting learners' self-efficacy. Within this scale, the variables encompass self-monitoring and evaluation, individual achievement and fulfilment, the capacity to harness external resources, and an affective attitude. Extant literature has robustly corroborated that these four facets are pivotal sources of learners' self-efficacy throughout the learning trajectory and exert a significant influence on learners' self-efficacy. By quantifying these four variables, a nuanced analysis can be undertaken to ascertain whether learners employ self-regulatory learning strategies to attain self-efficacy during the learning process.

The self-efficacy scale was adapted from the scale developed by Zhang Meng (2017) at Shanghai Jiao Tong University. Zhang Meng's scale was chosen because it was adapted from the academic self-efficacy scale developed by Oxford (1989) to suit Chinese learners. Additionally, the main participants in Zhang Meng's scale were individuals at HSK Level 4 and above, which is consistent with the participants selected for this study. The scale divides academic self-efficacy into self-efficacy for learning ability and self-efficacy for academic behaviour. Each dimension consists of 15 items, totalling 30 questions. The overall scale's Cronbach's α coefficient is 0.74, indicating good reliability and validity.

The self-regulated learning strategies scale was adapted from the scale developed by Wen et al. (2023). Wen et al. (2023) divided the scale into five parts: Value and Interest (5 Questions), Retrieving Strategy (3 Questions), Meaning Fulfillment (6 Questions), Text Processing (4 Questions), and Self-control (7 Questions), totalling 25 questions.

3.2.2 Measures

Before sending our questionnaire, we made both Chinese and English versions to maximize and guarantee comprehension (See Appendix A). Next, The initial phase of the study entailed the dissemination of a questionnaire to a cohort of

5 undergraduate students engaged in the department of Chinese Language. Following the accumulation of responses, a rigorous examination concerning the reliability and validity of the questionnaire was conducted. Oxford (1989) posits that in the context of a learning strategy survey, Cronbach's α coefficient exceeding 0.7 is indicative of satisfactory reliability and validity of the questionnaire. After inspection, Cronbach's α coefficient in the research is 0.92. Therefore, the questionnaire was then distributed to faculty members instructing Chinese language courses across three distinguished universities located in Beijing and Tianjin, alongside the relevant departmental administrators. The departmental channels facilitated the distribution and subsequent completion of the questionnaires. Upon retrieval, the completed questionnaires were subjected to a comprehensive statistical analysis employing R software (version 4.2.3).

3.3 Data Analysis

3.3.1 *Statistical Tools and Methods*

This study utilized R language (version 4.2.3) for preprocessing, descriptive statistics, T-tests, Bootstrap confidence intervals, correlation analysis, and polynomial regression. R language is used to calculate parameters for the response surface curves based on polynomial regression (Shanock et al., 2010) and to generate corresponding response surface graphs.

3.3.2 *Common Method Bias*

Since the self-regulated learning strategies in this study were all reported by the learners, there may be a common method bias. The Harman single-factor test was used to check for common method bias. If the factor explains less than 40% of the variance, there is no significant common method bias in this study.

3.3.3 *Polynomial Regression-Based Response Surface Analysis Method*

In this study, to explore the impact of self-regulation strategies on learners' self-efficacy, a response surface analysis method based on polynomial regression was used. Following the recommendations of Shanock et al. (2010) and Ju et al. (2023), the study proceeded with the following steps:

(1) Independent sample T-tests were used to examine whether differences in scores for self-monitoring and evaluation, individual achievement and fulfilment, the capacity to harness external resources, and affective attitude affect self-efficacy. According to Oxford (1989), in research using the Likert 5-

point scale as a benchmark, an average score ranging from 1.0 to 2.4 signifies low frequency of strategy usage, a score within 2.5 to 3.4 denotes moderate frequency, and a score ranging from 3.5 to 5.0 implies high frequency of strategy usage.

(2) Constructing a polynomial regression equation: building squared and interaction terms of the four-centred independent variables, which are then entered into the regression equation along with the centred independent variables to obtain the corresponding unstandardized regression coefficients.

(3) Calculating Marginal Effects for regression models: The research first categorized students into two groups: high self-monitor and evaluation and low self-monitor and evaluation. It is evidenced that self-monitoring and evaluation is the first step in self-regulation. With self-monitoring and evaluation comes further adaptation in self-regulation. Secondly, the research compares self-monitoring and evaluation with the other three variables to predict how self-regulation is associated with different factors, which is especially true for polynomial regression, a complex model.

(4) Using the confidence interval methods of Bias-corrected and Percentile proposed by McKinnon (2008), with Bootstrap set to 5000 iterations and the confidence interval set at 95%. The Bootstrap confidence interval estimation method can determine whether the polynomial regression model is robust.

4. Results

4.1 Findings regarding the first research question

In the analysis of the questionnaire results on the relationship between self-regulation and self-efficacy, Table 1 reveals that the average self-efficacy level of Chinese language learners in utilizing self-regulation in this study is 3.524, indicating a relatively high level of self-efficacy among the participants. To specifically illustrate the in-depth impact of self-regulation on self-efficacy, the study, following previous research recommendations, used Self-Monitoring and Evaluation (SME) as the primary observed variable and controlled for its influence while exploring the interaction of the other three types of factors. The study found that the mean score for learners' use of SME was 3.51. According to the strategy use index criteria proposed by Oxford (1989), learners' use of

SME in this study is at a relatively high level. The higher use of SME positively indicates a generally higher level of self-regulation ability among Chinese language learners in this study, which also positively predicts the role of SME in enhancing self-efficacy. Further analysis revealed that Item 14 had the highest average score at 3.76, while Item 7 had the lowest score at 3.15. There were a total of six items (Items 2, 3, 6, 7, 10, 11) with scores below 3.51 (see Appendix A).

However, after preliminary data analysis, the study was unable to determine whether different levels of SME had an impact on other aspects of self-regulation. To explore whether different levels of SME affect the other three indicators of learners, we divided the learners into two groups: high self-monitoring and evaluation (n=97) and low self-monitoring and evaluation (n=90).

Table 1. Descriptive statistical analysis of Chinese language learners' self-efficacy under the use of self-regulated learning strategies

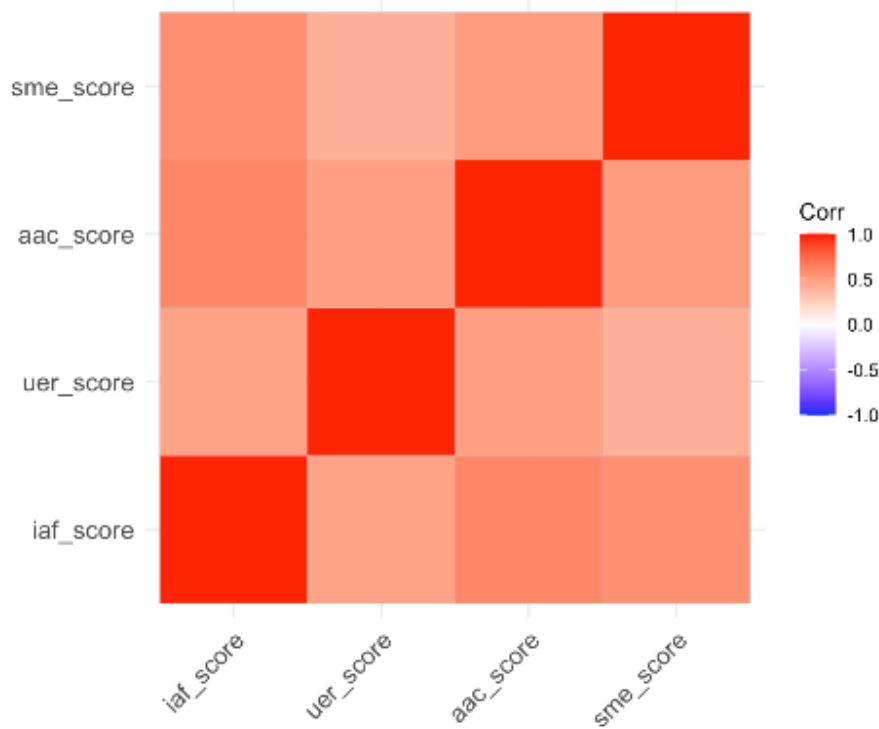
	N	Minimum	Maximum	Mean	SD
Self-efficacy	187	2.93	4.88	3.524	.1758

4.2 Findings regarding the second and third research questions

In this study, Independent sample T-tests were first employed to identify significant statistical differences in Individual Achievement and Fulfillment (IAF), the Ability to Utilize External Resources (UER), and Affective Attitude Towards Chinese (AAC) between learners with stronger self-regulation abilities and those with slightly weaker self-regulation abilities (df=48.8, $p < 0.00$; df=49, $p < 0.00$; and df=46.8, $p < 0.00$, respectively). Additionally, the same method was applied to the UER and AAC aspects, yielding similar results. The study presented a heat map to illustrate whether there were issues of multicollinearity among the variables. Figure 1 indicates that the colour blocks representing different variables are not predominantly purple, suggesting the absence of significant multicollinearity among the variables. However, it is worth noting that the lack of clear boundaries or lines in the grid may imply a more complex

relationship among the variables, necessitating further investigation through modelling to determine the impact of each variable on self-regulation.

Figure 1. Heat map of multicollinearity among different variables under the use of self-regulated learning strategies



A polynomial regression model is used to capture the potential non-linear relationship between AAC, UER, and IAF. The following presents the fitted polynomial regression model equation, and Table 2 is the result of this question.

Quation:

Self-

$$\text{regulation} = 11.103 - 0.660 \times \text{iaf} - 4.019 \times \text{uer} - 2.916 \times \text{aac} + \text{sme} = 11.103 - 0.660 \times \text{iaf} - 4.019 \times \text{uer} - 2.916 \times \text{aac} + 0.093 \times \text{iaf}^2 + 0.616 \times \text{uer}^2 + 0.206 \times \text{aac}^2 + 0.093 \times \text{iaf} \times \text{uer}^2 + 0.206 \times \text{aac}^2 + 0.186 \times \text{iaf} \times \text{uer} + 0.569 \times \text{iaf} \times \text{aac} + 0.591 \times \text{uer} \times \text{aac} - 0.204 \times \text{iaf} \times \text{uer} \times \text{aac}$$

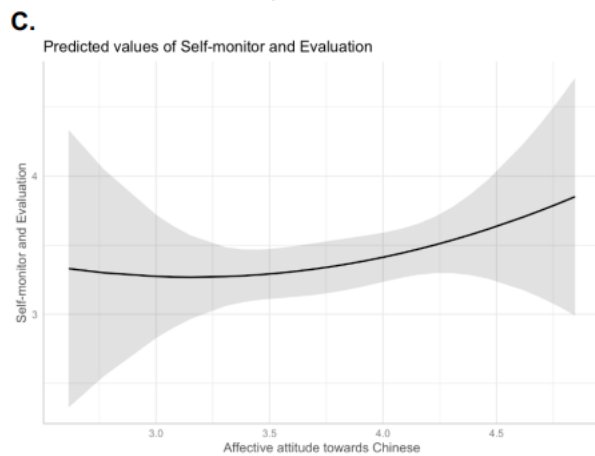
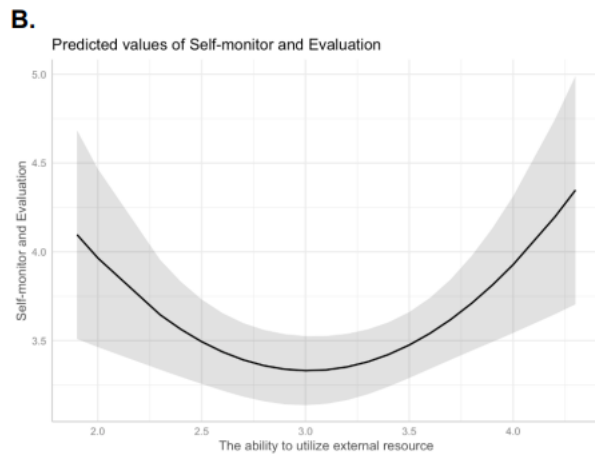
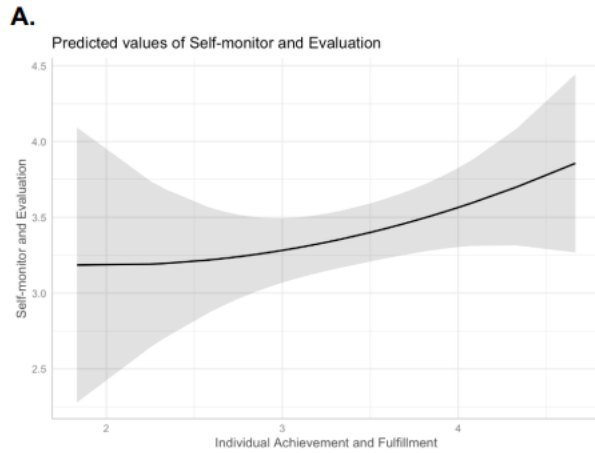
Table 2. Polymial regression analysis for the if, user and aac

Coefficients:

Estimate		Std. Error	t-value	p-value
(Intercept)	11.1	15.0	0.741	0.463
iaf_score	-0.7	4.1	-0.160	0.874
uer_score	-4.0	5.0	-0.798	0.429
aac_score	-2.9	4.7	-0.619	0.539
l(iaf_score^2)	0.1	0.2	0.597	0.553
l(uer_score^2)	0.6	0.2	2.966	0.0049 **
l(aac_score^2)	0.2	0.4	0.531	0.598
iaf_score:uer_score	0.2	1.5	0.124	0.902
iaf_score:aac_score	0.6	1.2	0.470	0.641
uer_score:aac_score	0.6	1.3	0.471	0.640
iaf_score:uer_score:aac_score	-0.2	0.4	-0.509	0.613

The adjusted R-squared value of 0.39 indicates a relatively good fit in the social sciences, especially in SLA. The main reason for the lower adjusted R-squared value compared to other model parameters is rooted in the study's focus on addressing practical issues. However, this does not imply poor model fit quality. On the contrary, the study's sig value of 0.01 and p-value of 0.00 both indicate a high model fit quality. Furthermore, residuals appear to be randomly distributed around zero (0.37). After controlling for SME, the study found a significant relationship between learners' self-regulation abilities and UER. The stronger the UER ability, the stronger the self-regulation ability. However, no significant linear relationships were observed with the other two factors, AAC and IAF. Additionally, employing a 95% confidence interval approach, the study found the confidence interval for UER to be [0.039, 1.186], indicating a strong predictive accuracy. In contrast, the confidence intervals for the other factors showed lower accuracy, suggesting that their predictions may not be significantly related to self-regulation.

Fig 2. Self-regulation strategies and Individual Achievement and Fulfillment, the ability to utilize external resources, and the Affective Attitude Towards Chinese (AAC) Relationships Affect Plot



5. Discussion

5.1 Relationship between Self-efficacy and Self-regulation Strategies among College Students

The university stage is the first microcosm of society that individuals enter after stepping into adulthood and choosing to continue their education (Zhao et al., 2023). During this period, college students gradually undergo the transition from

youth to adulthood. Therefore, most young people who choose to pursue higher education at this stage hope to quickly accumulate foundational knowledge and learn how to apply that knowledge in practice to address societal issues (Ng et al., 2021). CSL college students' autonomous capabilities are cultivated during their primary and secondary education. Consequently, they place greater emphasis on "how language works in use" and "how language is learnt through use (Trappes-Lomax, p.8, 2002)."

In other words, college students during this period place more value on the transformation from receiving knowledge to developing independent learning identities. This transformation reflects the learners' emphasis on and pursuit of their self-efficacy (Papi & Khajavy, 2021). As they seek self-identification and self-transcendence, learners need to seek ways to cultivate their self-efficacy actively. In comparison to adolescents, the majority of college students have received at least ten years of academic training (Shengyao et al., 2024). Therefore, during the university stage, they place greater emphasis on self-guidance rather than relying entirely on teachers. Driven by self-perception, learners use self-regulation strategies to guide their learning. Regarding self-regulation abilities, learners first need to achieve self-monitoring and evaluation, which are fundamental elements of self-regulation (Tahmouresi & Papi, 2021).

In this study, all learners demonstrated the ability to implement self-monitoring and evaluation. However, there was no significant tendency in terms of the strength of this ability. Learners with high self-monitoring and evaluation abilities were only seven more than those with low self-monitoring and evaluation abilities (Lee, 2020). There are two possible reasons for this: some learners have not fully mastered the methods of self-monitoring and evaluation, and some learners do not accurately grasp how to use self-monitoring and evaluation methods. The second reason will be discussed in detail in section 5.2, while this section will focus on the first reason. In the survey, learners demonstrated proficiency in monitoring and evaluating their language learning activities both inside and outside the classroom (Zhao et al., 2020). Both prior language learning experiences and language teachers may influence this phenomenon. Regardless of the influence, modern SLA teaching emphasizes that language proficiency development occurs through interaction. Since

interaction is emphasized, learners need to construct Language learning cognitive abilities in authentic social contexts (Bailey & Almusharraf, 2022).

Therefore, most learners actively record their learning experiences and note down learning issues in the classroom. Due to the frequent opportunities for interaction with Chinese people in China, learners can also actively regulate their emotions related to their academic studies after class. However, it is important to note that in the study, the majority of learners lack self-monitoring and evaluation in pre-Chinese language learning. Firstly, most learners indicated that they had never sought advice from Chinese language learners from their own country before learning Chinese (Alhelaly et al., 2024). As a direct consequence, learners may not have a clear understanding of their own learning needs. Davies (1999) summarized simplified language learning needs as follows: the foreign language learner, the standard dialect learner, and the learner of advanced writing. Different learning needs directly correspond to how learners select suitable Chinese language courses and engage in classroom tasks. Learners with unclear learning needs are likely to choose courses arbitrarily and gradually seek their language learning preferences and styles within the course (MacIntyre & Khajavy, 2021).

Due to the need for prolonged adaptation and adjustment, these learners spend a significant amount of time on self-awareness rather than self-monitoring and evaluation. Furthermore, some learners lack the ability and habit of independent pre-class study (Fan & Cui, 2024). The reasons for this phenomenon can be attributed to the teachers' lack of reflective teaching. Reflection is an important part of teaching activities, as it helps teachers to regularly evaluate learners' language output skills and provide teaching feedback. Only when teachers recognize the existing learning abilities of the learners can they actively take measures to guide the learners in the next stage of learning (Khajavy et al., 2021). The lack of reflection can lead to teachers neglecting the learners' autonomy and relationship with Language, thereby placing learners in a passive learning position. The ability to preview before class is particularly important in the university student population, as it allows students to focus more on their weak learning areas (Khan, 2023). The lack of pre-class previewing ability can easily lead to students not understanding the

key and difficult points of the course, and they may not be able to seek help from the teacher based on their situation. The two situations mentioned above result in weaker self-monitoring and evaluation abilities among learners, which affects their practical actions in using these monitoring and evaluation abilities (Resnik et al., 2021).

5.2 Factors Influencing Self-regulation Strategies and Self-efficacy

Previous studies have confirmed that learners with strong self-regulation abilities are able to predict self-efficacy positively. Among these, academic performance and the use of external resources have been shown by previous research to have a good predictive effect on self-regulation abilities. According to Kormos & Csizér (2014), this study incorporates language learning attitudes into the model of self-regulation abilities. Consistent with previous research, this study found that the use of external resources has a significant moderating effect on self-regulation abilities. Unlike previous research, academic performance did not show a significant moderating effect on self-regulation abilities in this study.

Similarly, language learning attitudes did not show a significant predictive effect on self-regulation abilities (Bowden & Barrett, 2022). The study attributes the main cause of this particular phenomenon to the language value judgment of adult learners. The cognition of the value of a language arises from the learner's sense of belonging to the language-learning community. The sense of belonging to the language learning community mainly depends on the learner's identity in a specific language context and the recognition of the values hidden behind a language culture of another ethnic group (Bai & Wang, 2023). The former determines how they use resources within the language learning community, while the latter determines their intrinsic attitude towards language learning. Adult learners have formed their personal academic and career values after decades of education in their home country. This condition is especially true for CSL learners, as many of them come from third-world countries, and their academic performance may have a limited impact on their self-efficacy (Meng & Zhang, 2023).

Given that adults are more deeply influenced by their native culture compared to adolescent learners and can adapt more quickly to unfamiliar situations, their affective attitudes toward learning Chinese are not as

prominently reflected in their self-regulation abilities and self-efficacy. Instead, adult learners are more inclined to leverage their cognitive and physical advantages to quickly adapt to the intensive learning pace (Poluektova et al., 2023). Additionally, they are more adept at utilizing external resources to integrate into Chinese society, thereby seeking greater support for their future career development.

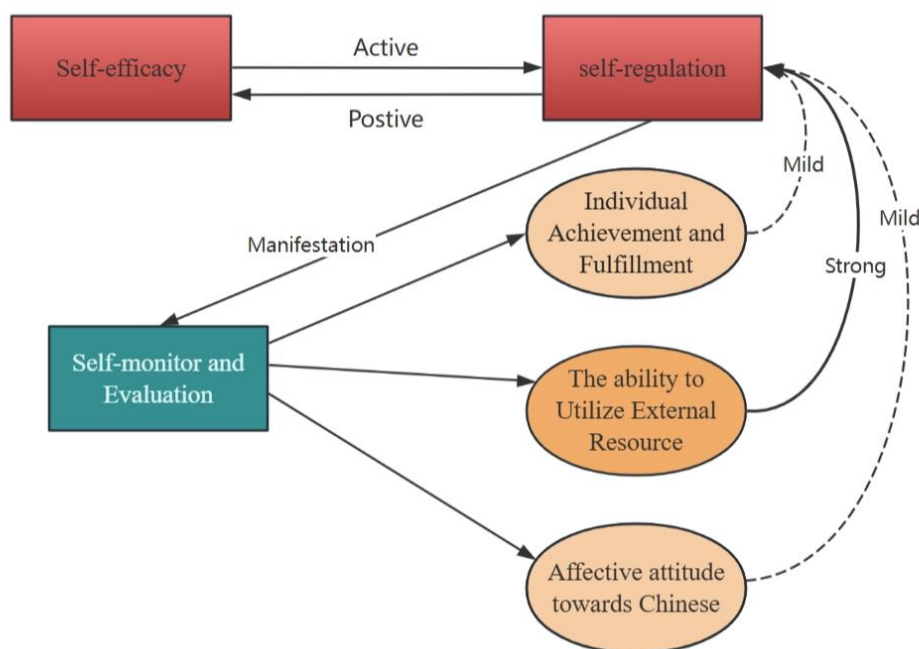
In this study, learners enhance their sensitivity to Chinese learning by engaging with Chinese online media while simultaneously seeking assistance from offline teachers and online resources. For adult learners, the appeal of online media may surpass that of traditional classroom language learning (Affuso et al., 2023). Online media provides adult learners with a wealth of news coverage about China, including reports on social development and economic trends. These news sources offer adult learners more opportunities to experience the real China while also providing potential job opportunities. Movies, TV shows, and online short videos better meet adult learners' needs for authentic language materials (Teng, 2024).

The vocabulary and texts in Chinese textbooks used domestically are generally subject to strict review by the Chinese Ministry of Education, with content often being relatively formal and serious (Zhang et al., 2023). Due to the time-consuming process of textbook writing, revision, and publication, the content may sometimes fall out of sync with contemporary popular culture. However, popular culture is precisely what adult learners are eager to understand and engage with as they enter adulthood. Therefore, entertainment resources can offer adult learners more authentic language materials, helping them communicate with Chinese people in a similarly native manner and thus integrate into the society in which they reside (Huang et al., 2023).

Based on this, Figure 3 illustrates the relationship between self-efficacy and self-regulation strategies. In the figure, self-efficacy promotes self-regulation abilities, and when learners have higher self-regulation abilities, they exhibit stronger self-monitoring and evaluation capabilities. Similarly, the use of self-regulation strategies has a positive feedback effect on self-efficacy. During the process of self-monitoring and evaluation, "Individual Achievement and Fulfillment," "The Ability to Utilize External Resources," and "Affective Attitude towards Chinese" are commonly employed strategies by university-level

Chinese learners. Notably, "The Ability to Utilize External Resources" has a more significant impact on self-regulation abilities, which is represented in the study by stronger colours and thicker solid lines. "Individual Achievement and Fulfillment" and "Affective Attitude towards Chinese" have a certain influence, though slightly weaker, and are therefore depicted with a lower brightness in the same colour scheme as "The Ability to Utilize External Resources," along with dashed lines to illustrate this process. After the above processes, self-regulation strategies exert a feedback effect on self-efficacy.

Fig 3. Self-efficacy in relation to self-regulation strategies map



6. Conclusion

This study is the first to explore the relationship between self-efficacy and self-regulation strategies in the context of CSL. It further investigates which factors within self-regulation strategies positively influence both the use of these strategies and self-efficacy. Based on a survey of 187 undergraduate students in China, the study reveals that learners currently exhibit a high capability for using self-regulation strategies, which positively predicts their high levels of self-efficacy. It suggests that Chinese language instruction generally meets

learners' needs and provides adequate academic support. A deeper analysis indicates that the ability to use external resources significantly enhances learners' self-regulation strategy usage and positively impacts self-efficacy. Academic performance and language learning attitudes also demonstrate a certain degree of self-regulation ability among adult learners, though their effects are relatively limited. Notably, while learners show good mastery of self-regulation abilities during and after class, their self-regulation is slightly lower during pre-class independent study.

For future teaching practices, the study recommends the following:

1. **Emphasize the Activation of Pre-Class Independent Learning:** Unlike younger learners, adult learners possess stronger independent learning abilities and a more proactive desire for self-improvement. Helping learners regulate their learning process before class can assist them in identifying key points of the course content, enabling more targeted and active interaction with instructors during class. Teaching courses must include a degree of individualized support to provide appropriate feedback and guidance throughout the learning process.

2. **Provide Emotional Support for Independent Learning Using External Resources:** Beyond essential knowledge transmission, teachers should allocate some attention to offering emotional support for adult learners as they seek external resources for independent study. Given that learners are exposed to far more external information daily than what is provided in the classroom, an imbalance in the use of external and internal resources may lead to academic burnout. To mitigate this, teachers should provide learners with suitable external learning resources and instruct them on how to use these resources effectively. Teachers can inform learners about potential challenges in utilizing artificial intelligence tools and guide them on how to seek higher-level support if issues arise. Additionally, teachers should clarify how to convert external resources into internal knowledge efficiently.

This study acknowledges several limitations. First, despite the relatively large sample size, the data were collected from only three schools, all of which are renowned for Chinese language instruction. The students admitted to these schools already demonstrated a high level of Chinese proficiency at the time of admission. Therefore, future research should broaden its scope to examine

whether learners with varying initial proficiency levels differ in their ability to use self-regulation strategies after a period of study. Second, the study focused on undergraduates to increase the sample size. However, other adult learners of Chinese include pre-college students, professional development students, short-term intensive learners, and graduate students. Neglecting these groups may weaken the explanatory power of the model, so future research should consider expanding the study population. Third, this study relied solely on quantitative methods, which may limit the depth of explanation for certain issues. Although academic performance and attitudes did not significantly impact self-regulation strategies and self-efficacy in this study, statistical insignificance does not imply a complete lack of influence in real-world teaching contexts. Future research could benefit from using qualitative or mixed-method approaches to explore further the impact of these factors on self-regulation strategies and self-efficacy.

Credit authorship contribution statement

Chenrui Miao: Conceptualization, Methodology, Data curation, Writing.

Jingyao Shi: Data curation, writing

Declaration of competing interest

The authors declare no competing interests.

Ethical statement

The Medical Ethics Committee of Tianjin University, Tianjin Normal University and Minzu University of China approved the study. We obtained written consent from all participants.

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Appendix A

Please carefully read each statement below and reflect on your learning experience in text translation. Then, indicate the extent to which each statement reflects your learning experience using a 5-point scale: 1 = very untrue of me, 2 = untrue of me, 3 = somewhat true of me, 4 = true of me, 5 = very true of me.

Dimension	Item No.	Items
Self-monitor and Evaluation	1.	At the beginning of learning Chinese, I will turn to websites to search for information about how to learn Chinese effectively.
	2.	As a Second Language Learner, before learning Chinese, I asked other Chinese learners from my place about the difference between our mother tongue and Chinese and analyzed the difficulty of learning Chinese.
	3.	After learning Chinese in the classroom, I made an initial plan to ensure I had enough time to study Chinese.
	4.	I once communicated with the Chinese teacher about how to improve Chinese.
	5.	I tend to preview the new course before the next formal class.
	6.	In advance, I list some unresolved problems via previewing and ask for the teacher's explanation in class.
	7.	I usually think about what knowledge I should master after a new class.
	8.	During the classroom, if I can not understand the teacher's or other speakers' Chinese, I always ask the person to say it again to ensure I can follow the class.
	9.	I record notes in class even if this is not a compulsory part.
	10.	I will write down the problems I do not understand and find a proper chance to ask the teacher or other classmates in class.
	11.	I will check my notes in class and turn to roommates or classmates for help if I find that I miss some key notes.
	12.	I will reflect on whether I have mastered all the knowledge that the teacher has taught.
	13.	I will award myself as binge-watching sometimes, such as at the weekend, to relieve learning pressure.
	14.	I will adjust my next learning according to my current learning.

Individual Achievement and Fulfillment	15.	After reviewing the next day's lesson, I will feel a sense of achievement.	
	16.	I think that I will have efficient learning if I preview the next day's course.	
	17.	Through preview, I can do better than most classmates in class.	
	18.	Teachers always praise my performance in class.	
	19.	My classmates always envy my proficient language ability.	
	20.	I boost my confidence via language learning classes because I can realize more of my self-value in them.	
	21.	My Chinese teachers can assign homework since it will let me show my language skills.	
	22.	When teachers require someone to respond to a question, I always am the first to answer.	
	23.	If my classmates have some queries about Chinese, they will think of me first and ask for assistance.	
	24.	I feel a sense of self-value when other Chinese learners ask me for some questions or skills in learning Chinese.	
	25.	Until now, I have been satisfied with almost all of my examinations.	
	26.	I can find a job in China.	
	The ability to utilize external resource	27.	I always imitate the news reporters' tone to correct my pronunciation.
		28.	I always search for information concerning how to improve my Chinese more quickly via all kinds of channels such as Facebook, Twitter, WeChat, etc.
29.		I once specifically found other Chinese tutors to guide my Chinese one-on-one.	
30.		I followed some Chinese Teaching vloggers and always studied some effective tips for learning Chinese.	
31.		I have the habit of listening to some Chinese songs to practice my listening skills.	
32.		I read some extra-curricular articles or news to improve my reading.	
33.		I once specifically found Chinese friends to be language-learning partners.	
34.		When I need to relax myself, I tend to watch Chinese movies and TV shows.	

	35.	I can use AI robots such as Chat Gpt to help me learn Chinese.
	36.	I always communicate with other Chinese learners regarding Chinese learning.
Affective attitude towards Chinese	37.	Compared to my previous learning, I now have more confidence in learning Chinese and using it to communicate.
	38.	I have a stronger willingness to talk with Chinese natives.
	39.	I always specifically go to some Chinese restaurants for a meal since it is a chance to utilize Chinese.
	40.	I want to make more Chinese friends who are my contemporaries.
	41.	I want to use Chinese as much as possible in daily life compared to English or my mother tongue when I live in China.
	42.	Now, I do not feel afraid of speaking Chinese, whether in class, in public, or on private occasions.
	43.	Now, during the process of learning Chinese, I will take the initiative to refuse other people to communicate with me in English or my mother tongue.
	44.	I am more intrigued by Chinese culture.
	45.	I want to learn about the Chinese culture.
	46.	I gradually became more interested in joining some Chinese traditional festivals and celebrations.
	47.	I can use Chinese in my future work.
	48.	I can achieve more honors by learning Chinese in the coming days.
	49.	Generally speaking, learning Chinese brings me more joy than anxiety.

Your name:

Gender:

Native Language:

Working Language:

Time for learning Chinese:

Your HSK Level: