Studies in Educational Evaluation 78 (2023) 101292

Contents lists available at ScienceDirect

Studies in Educational Evaluation

journal homepage: www.elsevier.com/locate/stueduc

Development and validation of the Self-Regulated Translation Learning Strategy Scale (SRTLSS)

Jianping Wen [a], Jumin Zhang [b], Yan Yang [a], Yuyang Cai [c,*]

[a] School of Languages, Shanghai University of International Business and Economics, China
[b] Nantong Zilang Lake Experimental School, China
[c] Centre for Language Education and Assessment Research (CLEAR) & School of Languages, Shanghai University of International Business and Economics, China

ARTICLE INFO

Keywords:
Measurement invariance
Multigroup confirmatory factor analysis
Scale development
Self-regulated learning
Translation learning strategy

ABSTRACT

Self-regulated learning (SRL) has been highlighted as a critical aspect of translation learning. However, past work in translation learning has rarely sought to synthesize translation learning strategies under a self-regulated learning paradigm. Further research would be confined by the paucity of a psychometrically sound instrument to measure learners' self-regulated translation learning strategies. This study aimed to develop a reliable and valid self-regulated translation learning strategy scale (SRTLSS). Based on relevant literature, we hypothesized a hierarchical model and generated items for the SRTLSS. Drawing on the response from 873 Chinese English majors, the validated SRTLSS had 25 items addressing five dimensions: *self-control*, *meaning fulfillment*, *value and interest*, *text processing*, and *retrieving strategies*. Results demonstrated the SRTLSS has good measurement validity and reliability with strong invariance across undergraduate and graduate students. The SRTLSS can be used as a complementary tool to diagnose learners' weaknesses and strengths in translation teaching and learning.

1. Introduction

Text translation is a multidimensional process involving problem-solving and strategy use (Albir & Alves, 2009). Successful translation learning heavily depends on the capability of orchestrating manifold strategies which can be efficiently navigated by self-regulated learning (SRL) (Alsahli, 2012; Pietrzak, 2018). Despite abundant discussions about translation strategies focusing on the text-centered perspective, recent studies in translation have seen a burgeoning interest in person-centered translation learning strategies. As a theory explaining how learners actively invest and manage efforts for accomplishing academic goals through strategies use (Cai et al., 2019; Pintrich, 2000; Winne & Hadwin, 1998; Zimmerman, 2000), SRL could be utilized as the overarching theoretical framework to study person-centered translation learning strategies. The impact of SRL on translation learning has been suggested and empirically investigated among translators and translation learners (e.g., Alsahli, 2012; Hashempour et al., 2015; Sarkeshikian et al., 2018).

To our knowledge, there is limited research on the use of self-regulated learning (SRL) strategies in translation, with most studies focusing on professional translators rather than translation learners. Furthermore, available measures for SRL have not been empirically validated and rely on general measures rather than those specific to translation, particularly in the context of English-Chinese translation. This absence of a valid instrument hinders efforts to study SRL in translation learning. To tackle this problem, the present study aimed to synthesize existing translation learning strategies and SRL theories and developed an instrument to measure EFL learners' self-regulated translation learning strategy use. This study would supplement the current knowledge of SRL in translation research and the newly developed instrument would provide useful insights for learners and teachers to aid translation learning and teaching.

2. Literature review

2.1. Translation learning strategies

Strategies for translation have been considered not only as one of the fundamental traits in the translation process (Albir & Alves, 2009) but also an essential subcomponent in constructing translation competence (Bell, 1991; PACTE, 2020; Piecychna, 2022). Due to the different scopes and purposes of research, varied labels, definitions, and typologies were

* Correspondence to: Shanghai University of International Business and Economics, 1900 Wenxiang Road, Songjiang District, Shanghai, China.
E-mail address: sailor_cai@hotmail.com (Y. Cai).

https://doi.org/10.1016/j.stueduc.2023.101292
Received 29 September 2022; Received in revised form 9 July 2023; Accepted 12 July 2023

proposed by different scholars and terminological confusion has long surrounded the discussion about translation strategies (Chesterman, 2016). Although there has been confusion in conceptualizing translation strategies, it is possible to identify two distinct areas of focus, which we label as translation strategies (i.e., practice-oriented) and translation learning strategies (i.e., learning-oriented).

Translation strategies are essential tools used by professional translators to produce quality target text. Stolze, (2011) translational hermeneutics theory identifies two main components of the translation process: translational reading and translational writing. This aligns with Chesterman, (2016) categorization of translation strategies, which can be divided into two broad categories: comprehension strategies and production strategies. Comprehension strategies are used by translators to understand the meaning conveyed by the source text, while production strategies are used during the process of creating the target text. Chesterman (2016) focused mainly on production strategies which he further categorizes into three subtypes, i.e., syntactic strategies, semantic strategies, and pragmatic strategies. In the same vein, Shreve and Lacruz (2017) viewed the translation process as a construction-integration process, where the translator must comprehend the source text before representing it in the target text.

Translation learning strategies differ from translation strategies in that they are more focused on the process of learning text translation. While previous studies have primarily focused on translation strategies, there is an increasing amount of research conducted on translation learning strategies due to their implications for translation education. For example, strategies such as plan-making, monitoring, and self-evaluating have been propounded as among the components determining translation competence (Kelly, 2014; PACTE et al., 2011; Piecychna, 2022). These strategies, to some extent, echo the metacognitive aspect of learning strategies in second language acquisition (e.g., Cai & Kunnan, 2020; Mokhtari & Reichard, 2002; Phakiti, 2006). Furthermore, scholars also maintained that the translation process also features psychological aspects, such as motivational beliefs and emotions (Hild, 2014; Kelly, 2014; PACTE, 2020). In terms of translation education, person-centered learning strategies undoubtedly carry constructive implications for learners and educators due to the multidimensionality of learners and the learning process.

2.2. Self-regulated learning (SRL)

SRL can be defined as a proactive and goal-oriented learning process where learners "monitor, regulate, and control their cognition, motivation, and behavior" (Pintrich, 2000, p. 453). Several influential theories and models have been proposed to explain SRL from different standpoints, such as Zimmerman, (2000) cyclical phases model, Pintrinch's (2004) four-phase by four-areas framework, and Winne and Hadwin's (1998) four-phase model, etc. Notwithstanding differences, they share considerable similarities (Panadero, 2017) in holding a process-oriented perspective and contend that SRL involves at least three phases: *preaction*, *action*, and *postaction* (Pintrich, 2004; Schmitz & Wiese, 2006; Winne & Hadwin, 1998; Zimmerman, 2000).

In line with these frameworks, the preaction phase involves the planning of the task and individual situation, including goal setting, motivational beliefs, task value, planning, content knowledge activation, and so forth. The actional phase points to the actual learning and volitional control, including task strategies, monitoring, and controlling time and effort. In the post-actional phase, learners reflect and evaluate their learning experience to modify previous motivation, cognition, or behaviors to improve the learning process. Important to note is that these SRL phases function in a recursive and intertwined way (Panadero, 2017), and is difficult to demarcate the SRL process in terms of these phases.

Meanwhile, from a structural-oriented perspective, the components of SRL can also be categorized into three other dimensions, i.e., motivation, cognition, and metacognition (Lehmann et al., 2014; Schraw et al., 2006; Wolters, 2003). The motivational dimension subsumes individual beliefs or mindsets that influence perceptions or behaviors toward learning tasks, such as self-efficacy, goal orientation, and perceived task value. The cognitive components refer to mental procedures that decrypt, retain, and retrieve information during knowledge acquisition and problem-solving, such as activating content knowledge, comprehending, and summarizing. The metacognitive components are deployed to oversee and adjust individual feelings, thoughts, and behaviors to the fulfillment of learning objectives (Cai et al., 2022; Cai et al., 2019). This dimension includes efforts in planning, monitoring, self-reflecting, strategy adaptation, etc. These three dimensions pervade all three phases in the process-oriented SRL models.

2.3. Measures of self-regulated translation learning strategies

The SRL necessarily features learners' strategy knowledge and selective and appropriate use of strategies (Pintrich, 2000; Winne & Perry, 2000; Zimmerman, 1989, 2002). SRL strategies refer to "actions and processes directed at acquiring information or skill that involve agency, purpose, and instrumentality perceptions by learners" (Zimmerman, 1989, p. 329).

In recent years, researchers in the field of translation have begun to examine translation strategy from an SRL perspective. Some studies have focused on investigating the profiles of SRL strategy use among translation learners, as well as the varying characteristics of SRL strategy use across learners of different levels (e.g., Alsahli, 2012; Hashempour et al., 2015; Hild, 2014). However, the most commonly-referred instruments of SRL in translation research are the Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich et al., 1993), the Learning and Study Strategies Inventory (LASSI; Weinstein et al., 1987), and the Inventory of Learning Styles (ILS) (Vermunt, 1998), even though they were designed to reflect SRL strategies in the general domain. Nonetheless, there has been relatively little focus on developing SRL strategies specific to translation. One exception is the Self-Regulatory Capacity in Translation Questionnaire (SRCTQ) developed by Sarkeshikian et al. (2018). Despite the potential benefits that the SRCTQ may offer, it lacks sufficient psychometric testing with a diverse and sizable sample population, which limits its validity as a measure of self-regulated translation strategies. Additionally, it should be noted that the SRCTQ primarily addresses translation strategies rather than translation learning strategies.

Based on the literature review conducted earlier, we propose a conceptual model for framing translation learning strategies within the context of SRL. Our model comprises five distinct dimensions that we have labeled as follows: *value and interest*, *retrieving strategies*, *meaning fulfillment*, *text processing*, and *self-control*. The dimension of *value and interest* corresponds to the motivational component, while *self-control* is related to the metacognitive component of SRL. In the following section, we will delve into each of these five dimensions with a more detailed explanation.

Value and interest are used by the learner intentionally to intervene in their motivation to achieve productive learning (Wolters, 2003). Following Pintrich et al. (1993), strategies related to perceived value and interest in individuals can be operationalized through the perspective of the expectancy-value model (e.g., Eccles & Wigfield, 2020) and goal-orientation (e.g., Pintrich, 2000; Urdan & Kaplan, 2020). In the context of translation studies, the expectancy aspect reflects the extent to which learners assume they can achieve successful translation learning and performance such as self-efficacy (Bandura, 1986), and control beliefs for learning (Pintrich et al., 1993). The value aspect represents the learner's self-awareness of the importance and utility attributed to translation learning, including goal orientation and task value (Pintrich et al., 1993). Particularly, extrinsic goal orientation is identified if learners learn translation in pursuit of external rewards, such as grades or performance, whereas intrinsic goal orientation is upheld by learners learning for inherent benefits, such as interest and

curiosity. Task value refers to the extent of utility that is credited to translation learning as perceived by the learner.

The cognitive aspects of SRL in translation learning can be broken down into three dimensions: *retrieving strategies*, *meaning fulfillment*, and *text processing*. These dimensions were developed based on cognitive strategies in language testing (e.g., Cai, 2020; Purpura, 1999), as well as "complete translation" methodology in the field of Chinese-English translation, which is widely accepted in higher education translation curricula in China (Yu, 2014). We packed these strategies into three dimensions. ***Retrieving strategies*** refer to the strategies used by learners to activate knowledge for a given translation task and to aid in understanding written information (Cai, 2013; Roediger & Karpicke, 2006). Strategies used to activate previous knowledge have been regarded as important in language learning and recognized as an important component of comprehension strategies in both translation research (e.g., Chesterman, 2016; Shreve & Lacruz, 2017) and EFL learning (e.g., Cai & Kunnan, 2020; Mokhtari & Reichard, 2002). ***Meaning fulfillment*** includes strategies that relate to constructing meaning to comprehend the text and deliver meaning when producing target texts. In other words, this dimension is related to building the mental representation of the source text, and then reconstructing the meaning in the target language. Translation learners use these strategies to facilitate the transfer of meaning between two languages. ***Text processing*** refers to the strategies that learners use to produce or improve the target text by manipulating linguistic components. In this dimension, translation learners pay more attention to the form of the target text and use relevant strategies to ensure that the linguistic form is appropriate and of high quality.

Self-control includes strategies related to the ability to think about the cognitive process and resources during learning or completing a learning task, which is commonly referred to as metacognitive strategies in the literature (Cai et al., 2019; Cai et al., 2022; Cai & Kunnan, 2020; O'Malley & Chamot, 1990; Winne, 2017). Shreve (2006) labeled "metacognition in translation" as "higher order thinking" that "involves active control over the component cognitive processes" (p. 39).

The metacognitive strategies were operationalized as the effortful deployment of certain strategies to facilitate the arrangement, supervision, and appraisal of the translation process and accomplish the translation task (Shreve, 2006). Drawing on research in second language learning (e.g., Cai, 2020; Cai et al., 2022; Mokhtari & Reichard, 2002; O'Malley & Chamot, 1990; Phakiti, 2006), the metacognitive strategies can be further classified into three components: planning (e.g., making a plan to allocate time for translation learning), monitoring (e.g., checking whether mistakes made before was avoided this time during translation), and evaluating/changing (e.g., using different translation skills flexibly).

Taken together, although SRL in translation learning has been investigated empirically, most of the studies drew on the existing domain-general SRL scales instead of a domain-specific instrument catering to translation learning. Moreover, the instruments measuring self-regulated translation learning strategies have rarely been validated with refined approaches, leaving the measurement validity largely undermined. It is thus necessary to develop a reliable and valid instrument of self-regulated strategies for translation learning to extend the scope of relevant studies. To address this gap, the current study aimed to develop and validate a scale measuring self-regulated translation learning strategies. Specifically, the current study aimed to answer the following questions:

1. What is the factorial structure of the Self-Regulated Translation Learning Strategy Scale (SRTLSS)?
2. Does the scale show measurement stability across undergraduate and graduate students?

3. Method

3.1. Scale construction

The scale construction comprised three steps. First, an initial list of translation learning strategies drawing on the first author's EFL translation instruction experience of over twenty years was used as the base. The item pool was further enriched by a comprehensive review of the literature in translation research (e.g., Yu, 2014). Finally, the strategies were mapped to the SRL paradigm (e.g., Cai, 2020; Mok et al., 2006; Pintrich et al., 1991; Sarkeshikian et al., 2018). This step resulted in a pool of 55 candidate items. Items of *meaning fulfillment* and *text processing* were initially written in Chinese, while the other items were in English. Two professors in translation education (including the first author) translated English items into Chinese and inspected the translated items using back translation.

Second, the candidate items were scrutinized by a panel including one professor in EFL education and translation (the first author), one professor in language assessment and educational psychology (the fourth author), and one graduate student studying translation education (the second author). The panel evaluated the readability, content relevance, and locations of the candidate items in the questionnaire. After several rounds of discussions, items identified as inappropriate were either discarded, re-edited, or revised iteratively. This process trimmed the number of candidate items to 38.

Third, five graduate students majoring in English language studies were recruited to read the items obtained from the foregoing process. Afterward, they were interviewed about the clarity and readability of the items. The students' comments were documented by the second author and then presented to the panel for another round of discussion where three items were dropped due to the possibility that they might go beyond the comprehension of the target population. After rounds of inspection, the final pool for the subsequent validation process retained 35 items that fell into three dimensions: motivation (5 items), cognition (15 items), and metacognition (15 Items). Sample items were "The progress in translation learning can give me a sense of achievement" (motivation), "I often adjust the word order according to the expression habits of the target language while translating" (cognition), and "I make a good plan for each subject so that I can have enough time to learn the translation." (metacognition). The scale was designed to be a six-point Likert scale (1 = "*Very Untrue of Me*" and 6 = "Very True of Me").

3.2. Participants and data collection

The method used for selecting the participants was convenience sampling, which involves selecting individuals who are easily accessible and willing to participate in the study (Johnson & Christensen, 2019). To obtain approval for data collection, the research team sent invitation emails to over 100 universities in China that offer translation courses. After receiving feedback, the researchers approached college English teachers at these universities and requested their assistance in data collection. Ultimately, teachers from 53 universities agreed to volunteer. An online meeting was then arranged by the research team to further elucidate the objectives of the study and provide a detailed explanation of the data collection procedures.

The SRTLSS was managed via the online platform Wenjuanxing (https://www.wjx.cn/) and the link was distributed to students by their teachers. On top of the questionnaire, a cover letter was enclosed, which informed participants of the research purpose and ensured data confidentiality. Before responding to the SRTLSS, participants were asked to provide demographic information through six items, which included gender, education level, school, student number, major, and grade. The participants received extra credit after completing the questionnaire.

We distributed the questionnaires to 1180 students and received a high retrieval rate of 97.8 % (N = 1154). After excluding 209 cases where the entire questionnaire had the same response and 72 cases from

students in other majors, we retained responses only from English major students who had completed at least one semester of a translation course and the questionnaire. This decision was based on the assumption that they possess a deeper understanding of translation learning strategies. Our final sample comprised 873 participants (544 undergraduates and 329 graduates) from 53 universities. The number of participants and the original items (n = 35) met the recommended 5:1 ratio of participants to the number of parameters for factor analysis (Bentler & Chou, 1987). After data cleaning, the final pool of 873 was retained for data analysis. Among them, there were 544 undergraduate students spanning from the first to the fourth year of studies (occupying 62.3 % of the total sample) and 329 graduate students spanning from the first to third year of studies (37.7 %). Please refer to Supplementary Table 1 for more demographic information regarding participants' specializations and regions of their universities.

3.3. Data analysis

Data analysis involved preliminary analysis and primary analysis. Preliminary analysis inspected data distribution, item discrimination, and item homogeneity. To examine data distribution, skewness and kurtosis of each item were computed. We used cut-off points recommended by Kline (2015) to determine data normality, i.e., $-3 <$ skewness $< +3$ and $-8 <$ kurtosis $< +8$. Item discrimination was evaluated with the critical ratio (CR) method using t-tests and the purpose was to examine whether a particular item can significantly differentiate the high-scoring group (the top 27 %) from the low-scoring group (the lowest 27 %). Items with non-significant or trivial CR (the absolute value of CR smaller than the suggested value of 3) were deemed to be incapable of discriminating participants on their self-regulated translation learning strategy use (Wu, 2010). Item homogeneity was assessed by computing the correlation between the single-item score and the total score of all items (ITC). Items with a non-significant ITC or an ITC less than 0.4 were considered to lack homogeneity with other items (Wu, 2010).

Primary data analysis is intended to evaluate the measurement quality of SRTLSS. We conducted a confirmatory factor analysis (CFA) to assess the factorial structure and examined the reliability, convergent validity, discriminant validity, and measurement invariance. First, CFA was performed using the five-factor structure, where items with severe cross-loadings and items with weak loading on home factors were inspected and dropped.

Second, the reliability of each subscale was assessed with Cronbach's alpha (α), McDonald's omega (ω), and Coefficient H. A reliability coefficient of.70 or higher for Cronbach's alpha and McDonald's omega is considered acceptable (Cortina, 1993; Dunn et al., 2014). Additionally, we use Coefficient H to indicate the maximal reliability of the subscales (Hancock et al., 2001; McNeish, 2018).

Convergent validity was evaluated using the average variance explained (AVE) and the composite reliability (CR) to ensure whether there is a substantial proportion of variance shared by indicators of a particular subscale (Hair et al., 2019). If the AVE is larger than 0.5 or the CR is above 0.7, convergent validity is considered to be established (Fornell & Larcker, 1981; Hair et al., 2019).

Discriminant validity concerns the extent to which related constructs exhibit appropriate distinctions or differences from one another (Hair et al., 2019). Our examination of discriminant validity followed a four-step approach proposed by Walker et al. (2015) and Cai and Yang (2023). To begin with, we compared the AVE of each subscale with its squared correlation with the other subscale, where an AVE higher than the squared correlations indicates adequate discriminant validity (Fornell & Larcker, 1981). Subscales having an AVE lower than the squared correlations were subject to additional steps of examination. In the second step, we ran an alternative model where the correlation between the pair of problematic subscales was forced to one. A chi-square difference test was conducted to determine whether the alternative model and the original five-factor model are significantly different from each other. A lack of significant distinction between the subscales under examination suggests insufficient discriminant validity. Third, another alternative model was constructed where problematic subscales were merged into one factor and underwent comparison with the original correlated-factor model. Since the two models were non-nested, the model comparison was conducted by evaluating the model fit indices rather than the chi-square difference test (Kenny, 2016). Finally, the confidence interval around the correlation of the problematic subscales (± two standard error) was inspected. The problematic subscales are considered distinct if the range does not cover the value of one, and sufficient discriminant validity is thus established (Anderson & Gerbing, 1988).

Measurement invariance is important as it demonstrates that the items or subscales of an instrument are interpreted by individuals across different subgroups in a consistent manner (Van de Schoot et al., 2012). To evaluate measurement invariance, we conducted multigroup CFA and tested three levels of invariance by constraining parameters to be equal in a stepwise manner: no constraints, factor loadings (weak invariance), and item intercepts (strong invariance) (Widaman & Reise, 1997). If the change in CFI and RMSEA between a more constrained model and a less constrained model is less than 0.01 and 0.015 respectively, an invariance level is considered established (Cheung & Rensvold, 2002).

CFA was performed on M*plus* version 8.5 (Muthén & Muthén, 1998–2020). Three widely recommended fit statistics were consulted to evaluate the CFA models: comparative fit index (CFI), Tucker-Lewis index (TLI), and root mean square error of approximation (RMSEA). Model-data fit is viewed as mediocre, with CFI and TLI higher than 0.90 and RMSEA lower than 0.10; model-data fit with CFI and TLI exceeding 0.92 and RMSEA less than 0.08 is considered a fair fit (Marcoulides & Yuan, 2017).

4. Results

4.1. Preliminary analysis: descriptive statistics and discrimination and homogeneity analysis

The mean score of 35 items ranged from 3.70 to 5.01 and the standard deviations ranged from 0.943 to 1.161. The skewness statistics ranged from −1.295–0.012, which is within the range of ± 3; the kurtosis statistics ranged from −0.382–2.268, falling within the range of ± 8 (Kline, 2015). We concluded that the normality assumption of the data distribution could not be rejected.

For item discrimination analysis, the CRs of all items were significant at $p < 0.01$, but the CR value for Item 11 ("I always pay attention to every word in the source text") was negative with a trivial absolute value of 0.855. This information suggested that all items except for Item 11 showed good quality in discriminating between higher and lower strategy users.

Regarding item homogeneity analysis, all items except for Item 11 had significant ITC values above 0.4 (from 0.645 to 0.875), indicating that only Item 11 had insufficient relevance to the SRTLSS. Item 11 was dropped for its lack of item discrimination and item homogeneity. Please refer to Supplementary Table 2 for the descriptive statistics and item analysis of each item.

4.2. Primary analysis

4.2.1. Confirmatory factor analysis (CFA)

CFA was conducted to test the five-factor model with the whole sample (N = 873). Each item was designated to load on its home factor and the rotation method is geomin. The model fit did not reach a mediocre level: CFI = 0.863, TLI = 0.852, RMSEA (90 % CI) = 0.077 (0.075–0.080), SRMR = 0.062. We examined the modification indices provided by Mplus and identified items that had correlated residuals,

indicating similar content. We then scrutinized them based on factors such as lower factor loadings and ambiguous item clarity, and iteratively dropped items until the model fit reached an acceptable level. Finally, 25 items were retained in the finalized SRTLSS. The model fit of the SRTLSS was found to be fair and close to a good fit.: CFI = 0.944, TLI = 0.936, RMSEA (90 % CI) = 0.059 (0.055–0.063), SRMR = 0.052. Fig. 1 presents the five-factor CFA model with standardized estimates. The items of the validated SRTLSS are presented in the Appendix.

4.2.2. *Reliability, convergent validity, and discriminant validity*

Table 1 presents the statistics for reliability, convergent validity, and discriminant validity. The reliability statistics demonstrated good internal consistency, with Cronbach's alpha ranging from 0.87 to 0.90 and omega ranging from 0.87 to 0.90, all surpassing the recommended threshold of 0.70. The maximum reliability is indicated by Coefficient H falling between 0.88 and 0.91. Convergent validity was supported, as CR and AVE values were all above the recommended threshold of 0.70 and 0.50 respectively, with CR values ranging from 0.87 to 0.90 and AVE values ranging from 0.52 to 0.71.

Discriminant validity was assessed using a four-step approach outlined in the Method section. First, comparisons were conducted between the AVE values of each subscale and the squared correlations between that subscale and other subscales. As displayed in Table 1, the squared correlation between *meaning fulfillment* and *text processing* ($r^2 = 0.67$) was found to exceed the AVE value of *meaning fulfillment* (AVE = 0.57), indicating that further investigation is necessary for the two subscales to establish discriminant validity.

Second, the original five-factor model (Model A) was compared with an alternative model (Model B) which fixed the correlation between *meaning fulfillment* and *text processing* to one. The model-fit indices are

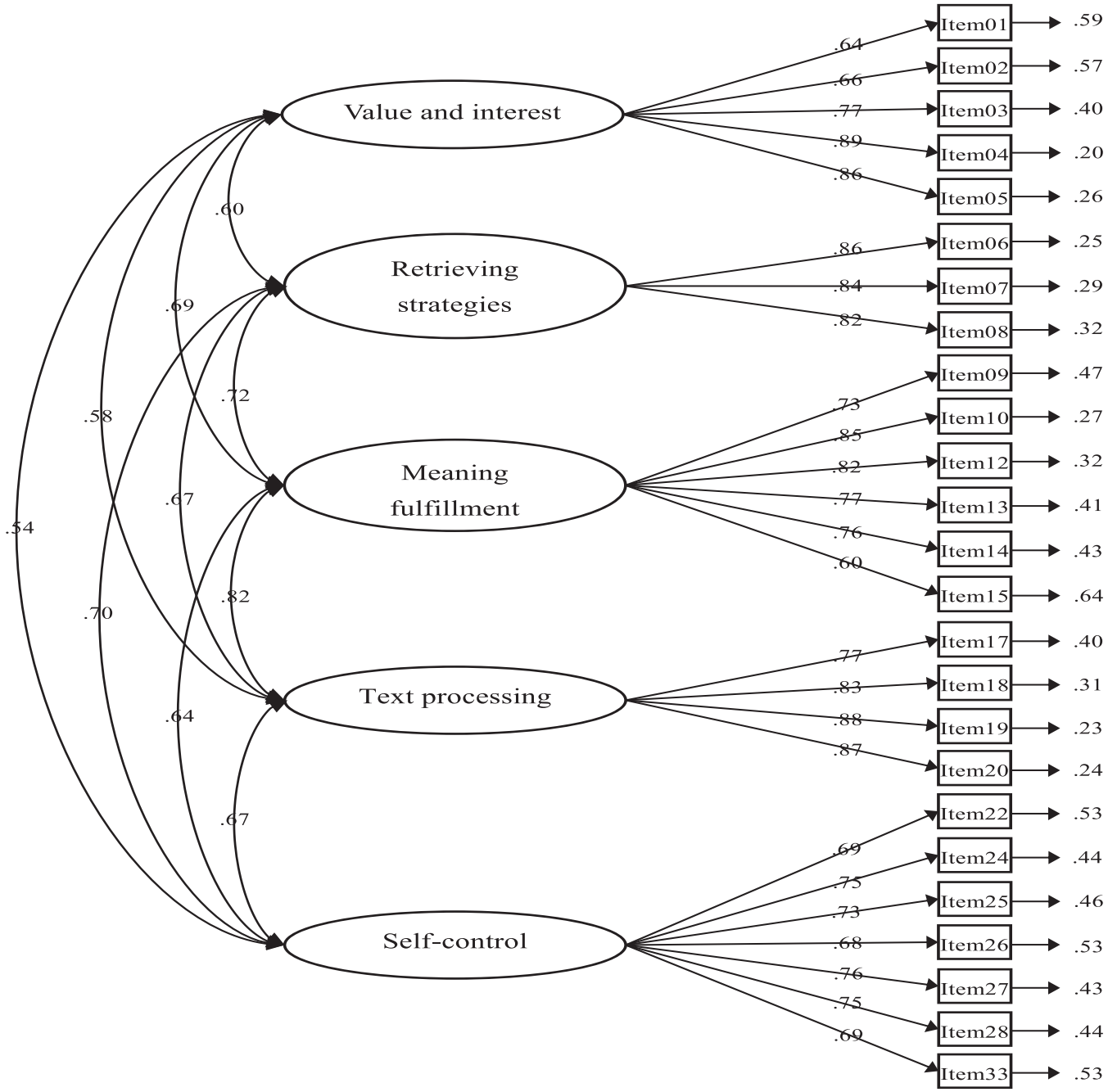

Fig. 1. CFA model with standardized estimates. *Note.* All the estimates are significant at $p < .001$.

Table 1
Statistics for reliability, convergent, and discriminant validity.

						Squared correlation (r^2)				
Factor	α	ω	H	CR	AVE	VI	RS	MF	TP	SC
VI	.87	.87	.91	0.87	0.59	–	0.36	0.49	0.34	0.29
RS	.88	.88	.88	0.88	0.71		–	0.52	0.45	0.49
MF	.88	.89	.90	0.89	0.57			–	0.67	0.41
TP	.90	.90	.91	0.90	0.70				–	0.45
SC	.88	.89	.89	0.88	0.52					–

Note. VI = Value and Interest, RS = Retrieving Strategy, MF = Meaning Fulfillment, TP = Text Processing, SC = Self-Concept; α = Cronbach's alpha; ω = omega; H = Coefficient H; CR = composite reliability; AVE = average variance explained.

shown in Table 2. The chi-square difference test rejected the null hypothesis that Model A and Model B were equal, suggesting the original five-factor model was significantly different from Model B ($\Delta\chi 2/df$ = 436.398/1, $p < .001$). Additionally, Model A fit better than Model B as a less-restricted model.

Third, a further comparison was made between Model A and another alternative model (Model C) where *meaning fulfillment* and *text processing* collapsed into one factor. The chi-square test showed that the two competing models differed significantly from the original model ($\Delta\chi 2/df$ = 474.43/4, $p < .001$).

Finally, we examined the confidence interval range of the correlation between the two factors under investigation. The confidence interval, which ranged from 0.79 to 0.88, did not include the value of one, suggesting that *meaning fulfillment* and *text processing* were two distinct factors. In sum, the results provided evidence for the adequate discriminant validity of the five-factor model.

4.2.3. Assessment of measurement invariance (MI)

Measurement invariance was assessed with the whole sample across cohorts of undergraduates (n_1 = 544) and graduates (n_2 = 329) using multigroup CFA. We did not consider gender groups to avoid possible biased results due to large gender imbalance in the sample data, with males (n = 93) accounting for only 10.7 % of the participants, a ratio commonly observed among foreign language majors in tertiary education. As shown in Table 3, the three models for configural invariance, weak invariance, and strong invariance yielded a fair model-data fit. Weak invariance was established across the two cohorts, as the increase in CFI and RMSEA from the weak invariance model to the configural invariance model (ΔCFI = 0, ΔRMSEA = 0.001) was less than the cut-off values of 0.01 and 0.015 respectively. Moreover, strong invariance was also determined with the change of CFI and RMSEA between the strong invariance model and weak invariance model (ΔCFI = 0.006, ΔRMSEA = 0.001) all below the cut-off values. The results indicated that the interpretation of SRTLSS is similar between undergraduate and graduate students, and the mean scores are comparable between the two cohorts.

Table 2
Model fit indices.

Model	χ^2	*df*	RMSEA (90 % CI)	SRMR	CFI	TLI
Model A (Original five-factor model)	1064.928 *	265	.059 (.055,.063)	.052	.944	.936
Model B	1501.326 *	266	.073 (.069,.077)	.054	.913	.902
Model C	1539.358 *	269	.074 (.070,.077)	.055	.910	.900

Note. Model 1.1 is the competing model where the correlation between *Meaning Fulfillment* and *Text Processing* is fixed to one; Model 1.2 is another competing model where *Meaning Fulfillment* and *Text Processing* were combined into one factor.
* $p < .001$; χ^2 = Satorra–Bentler chi-square; df = degrees of freedom; RMSEA=root mean square error of approximation; SRMR=standardized root mean square residual; TLI=Tucker–Lewis index; CFI=comparative fit index.

5. Discussion

The current study developed and validated the Self-regulated Translation Learning Strategy Scale (SRTLSS) to measure translation learning strategy use during translation learning. After validating the SRTLSS with a sample of 873 EFL translation learners in China, the SRTLSS ultimately contained 25 items falling into five factors: *self-control*, *meaning fulfillment*, *value and interest*, *text processing*, and *retrieving strategies*. The scale showed good reliability, measurement validity, and strong measurement invariance across undergraduate and graduate students.

Among the five SRTLSS factors, two factors, namely, *value and interest*, and *self-control,* correspond to the motivation and metacognition dimensions in the literature, respectively. The results suggested that motivational and metacognitive strategies should be treated separately as independent factors in describing self-regulated translation learning strategies use, corroborating the importance of the motivational aspect of SRL emphasized by Zimmerman (2000) and the metacognitive aspect highlighted by Winne (2017) in SRL literature. Items in *value and interest* were those initially written under the motivational dimension, which could be perceived as the engine that drives learners to acquire knowledge proactively as propounded and evidenced by studies in SRL (Zimmerman, 2000) and in translation (Hild, 2014; PACTE et al., 2011; Sarkeshikian et al., 2018).

Retrieving strategies focus on integrating and connecting new translation information with prior knowledge to achieve long-term memory and memory retrieval (Roediger & Karpicke, 2006). Techniques for retrieval could take the forms of writing or visual aids, such as making a memory map or conducting paired or individual elaborative interrogation. Items in *meaning fulfillment* focus on how to deliver meaning in producing target texts, while items in *text processing* tackle linguistic forms at the sentence level. These two factors tap into two commonly-discussed aspects in translation studies: lexical (form) and semantic representations (meaning) (Chesterman, 2016). The relatively high inter-factor correlation reflected a close link between knowledge about the source language and the receptor language, as well as between the knowledge of forms and meaning. This close connection is in line with preceding studies indicating lexical and semantic connections between L1 and L2 word representations (Guasch et al., 2008). The difference between the resulting factorial structure and the hypothesized model was that three factors (retrieving strategies, meaning fulfillment, and text processing) initially constructed under the cognitive dimension ultimately presented as first-order factors. This endorsed the scholarly interests in translation strategies (Chesterman, 2016), and also evinced the need to examine the domain-specificity of SRL as suggested in the literature (Poitras & Lajoie, 2013).

Self-control retained items originally generated as metacognitive strategies, relating to the superordinate ability that orchestrates or manages cognitive processes and resources in translation learning (Pietrzak, 2018). This factor involves planning, monitoring, and changing. Planning can be long-term or short-term, but it needs to be measurable and realistic, such as a timesheet or daily task checklist, so that learners could achieve specific goals one step at a time (Ushioda,

Table 3
Model fit statistics for multigroup CFA by participants' educational levels.

Model	χ^2	*df*	SRMR	RMSEA (90 % CI)	Δ RMSEA	TLI	CFI	ΔCFI
Configural invariance	1394.151 *	530	.056	.061 (.057,.065)	–	.931	.939	–
Weak invariance	1422.730 *	550	.059	.060 (.056,.064)	.001	.933	.939	0
Strong invariance	1522.213 *	570	.062	.062 (.058,.066)	.001	.930	.933	.006

Note. *p < .001; χ^2 = Chi-square; *df* = degrees of freedom; RMSEA=root mean square error of approximation; SRMR=standardized root mean square residual; TLI=Tucker–Lewis index; CFI=comparative fit index.

2014). Monitoring provides learners with an opportunity to self-evaluate their translation performance and strategies about changing pertain to replacing prior strategies with more suitable ones to better support translation learning (Cai & Kunnan, 2020; Mokhtari & Sheorey, 2002).

Concerning the results of measurement invariance tests, SRTLSS held strong invariance across undergraduate and graduate students. This demonstrated that regardless of students' levels of learning, translation learners not only interpreted the SRTLSS as the same in meaning but also endorsed items with the same degree on the five subscales of the SRTLSS. This robustness across cohorts of undergraduate and graduate students further substantiated the reliability and validity of the SRTLSS.

6. Conclusion

This study developed and validated an instrument measuring EFL learners' competence in using self-regulated translation learning strategies. Drawing on a theoretical model for self-regulated translation learning strategies and existing instruments measuring SRL strategies, we developed an initial pool of 35 candidate items. We validated the SRTLSS with responses from 873 students studying at the undergraduate and graduate levels and decided on a scale with 25 items subsumed under five subscales, i.e., *self-control*, *meaning fulfillment*, *value and interest*, *text processing*, and *retrieving strategies*. The SRTLSS showed good reliability, measurement validity, and stable measurement invariance across undergraduate and graduate students. The scale can be applied to practice and research in translation education to help teachers and students to diagnose and evaluate strengths and weaknesses in translation learning.

Our study bears a few limitations. The first issue is generalizability. The SRTLSS was developed specifically for the English-Chinese translation context and was only validated among English majors in higher education in China. Therefore, caution should be taken when applying this instrument in other contexts. It is recommended that future studies further validate it by expanding the sample to include learners with different characteristics, such as varying mother tongues, educational levels, and academic disciplines. Second, the cross-sectional data collected in this study was unable to assess the test-retest reliability. Longitudinal data collection is suggested to examine the stability and reliability of the SRTLSS across time. Third, due to logistic issues, the translation outcomes of the participating students were not obtained. Therefore, the predictive validity of the SRTLSS for translation outcomes was not examined. It would be informative for future studies to investigate the effect of the SRTLSS factors in predicting translation learning outcome. Fourth, as one of the anonymous reviewers pointed out, the item review process during the scale construction did not include participation from undergraduate students, which could potentially compromise the clarity of the scale at that level.

Notwithstanding these limitations, the present study contributed to the understanding of translation learning and SRL in at least two ways. Theoretically, this study took the lens of SRL to inspect the translation learning strategies and synthesized a hypothetical model of self-regulated translation learning strategies. While the discussions on translation learning strategies seem to put more emphasis on the perspective considering translation as an activity that shifts between two languages, our study resonated with the call for maximizing learners' agency by integrating text-centered and person-centered strategies in translation learning with SRL as the overarching theoretical framework.

Practically, the newly developed SRTLSS is valid and reliable with adequate measurement invariance across students both at the undergraduate and graduate levels. The SRTLSS can be applied in translation training and teaching to measure learners' self-regulated translation learning strategy use. For instructors, the SRTLSS can serve as a vital resource to ascertain students' learning profiles, locate where the student needs to improve, optimize curriculum design, and modify the instructional practice to cater to individual differences in translation learning. For learners, the SRTLSS can be used not only to secure insightful information to introspect their translation learning but also to purvey a list of strategies to navigate their learning process when they encounter challenges in learning or task performance.

Conflict of Interest

The authors declare no conflict of interest related to the publication of this article.

Consent to publication

All the authors consent to publish this article in *Studies in Educational Evaluation*.

Appendix.

The Self-Regulated Translation Learning Strategy Scale (SRTLSS)

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 6-point scale: 1 = very untrue of me, 2 = untrue of me, 3 = somewhat untrue of me, 4 = somewhat true of me, 5 = true of me, 6 = very true of me.

Dimension	Item No.	Items
Value and interest	1	I have a positive attitude and a keen interest in translation learning.
	2	For me, the most important aspect of translation learning is to improve translation ability.
	3	I think translation lessons are very helpful to my other subjects.
	4	Learning translation can develop my thinking ability.
	5	The progress in translation learning can give me a sense of achievement.
Retrieving strategy	6	I often combine the translation content with what I have learned.
	7	I often combine the translation content with my own experience.
	8	I often relate the translation content to other subject knowledge.
Meaning fulfillment	9	I read through the original text to understand the ideas and style of the text before translating.
	10	I understand and translate specific words and sentences according to the meaning of the whole passage while translating.
	12	I pay more attention to conveying the overall meaning of the passage while translating.

(*continued on next page*)

(*continued*)

Dimension	Item No.	Items
	13	When encountering new words or the words I cannot understand, I will look up the dictionary and extend the meanings flexibly according to the context.
	14	If I cannot think of exact word expressions while translating, I will use the words or phrases that has the closest meaning instead.
	15	I often cut out some unnecessary information and language forms while translating.
Text processing	17	I often adjust the word order according to the expression habits of the target language while translating.
	18	I consider active and passive structure conversion while translating.
	19	While translating, I often integrate sentence groups, clauses or phrases to avoid redundancy and highlight the main points of the translated text.
	20	When translating English to Chinese, I often take apart and reconstruct sentences to accurately and completely convey the meanings.
Self-control	22	I skim the key words and consider the translated texts before translating.
	24	I make a good plan for each subject so that I can have enough time to learn translation.
	25	I always search for parallel texts to gain translation inspiration and language expressions before translating.
	26	I often go through my classmates' translated texts to find out their highlights and reflect on the problems I encountered in translating.
	27	I often write down the problems and solutions that I encountered during the translation process.
	28	I subconsciously think about whether I have avoided the problems that occurred before while translating.
	33	I can flexibly use different translation skills.

Funding

This work was supported by The Program for Professor of Special Appointment (Eastern Scholar) at Shanghai Institutions of Higher Learning [Code: TP2018068] given to the fourth author.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.stueduc.2023.101292.

References

Albir, A. H., & Alves, F. (2009). Translation as a cognitive activity. In J. Munday (Ed.), *The Routledge Companion to Translation Studies* (pp. 54–73). Routledge.

Alsahli, F.S. (2012). Learning and self-regulation in translation studies: the experience of students' in three contrasting undergraduate courses in Saudi Arabia. (Doctoral dissertation, University of Edinburgh), Retrieved from ⟨https://era.ed.ac.uk/handle/1842/6663⟩.

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin, 103*(3), 411. https://doi.org/10.1037/0033-2909.103.3.411

Bandura, A. (1986). The explanatory and predictive scope of self-efficacy theory. *Journal of Social and Clinical Psychology, 4*(3), 359–373. https://doi.org/10.1521/jscp.1986.4.3.359

Bell, R. T. (1991). *Translation and Translating: Theory and Practice*. Longman,.

Bentler, P. M., & Chou, C.-P. (1987). Practical issues in structural modeling. *Sociological Methods & Research, 16*(1), 78–117. https://doi.org/10.1177/0049124187016001004

Cai, Y. (2020). *Examining the interaction among components of English for Specific Purposes Ability in reading: The Triple-Decker Model*. Peter Lang,. https://doi.org/10.3726/b17063

Cai, Y., King, R., & McInerney, D. M. (2022). The concurrent trajectories of utility value, metacognitive strategy use, and English achievement: A multivariate growth modeling analysis. *The Journal of Experimental Education*. https://doi.org/10.1080/00220973.2022.2053496

Cai, Y., King, R., Wu, W., & McInerney, D. M. (2019). Which comes first? Modeling the relationships among intrinsic-extrinsic goals, metacognitive strategies and English achievement using multilevel cross-lagged structural equation modeling. *Learning and Individual Differences, 74*, Article 101750. https://doi.org/10.1016/j.lindif.2019.06.004

Cai, Y., & Kunnan, A. J. (2020). Mapping the fluctuating effect of strategy use ability on English reading performance for nursing students: A multi-layered moderation analysis approach. *Language Testing, 37*(2), 280–304. https://doi.org/10.1177/0265532219893384

Cai, Y., & Yang, Y. (2023). The development and validation of the Scale of Design Thinking for Teaching (SDTT) (Article) *Thinking Skills and Creativity*. , Article 101255. https://doi.org/10.1016/j.tsc.2023.101255.

Chesterman, A. (2016). Memes of translation. John Benjamins B.V. https://doi.org/10.1075/btl.123.

Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling, 9*(2), 233–255. https://doi.org/10.1207/S15328007SEM0902_5

Cortina, J. M. (1993). What is coefficient alpha? An examination of theory and applications. *Journal of Applied Psychology, 78*(1), 98–104. https://doi.org/10.1037/0021-9010.78.1.98

Dunn, T. J., Baguley, T., & Brunsden, V. (2014). From alpha to omega: A practical solution to the pervasive problem of internal consistency estimation. *British Journal of Psychology, 105*(3), 399–412. https://doi.org/10.1111/bjop.12046

Eccles, J. S., & Wigfield, A. (2020). From expectancy-value theory to situated expectancy-value theory: A developmental, social cognitive, and sociocultural perspective on motivation. *Contemporary Educational Psychology, 61*. https://doi.org/10.1016/j.cedpsych.2020.101859

Guasch, M., Sánchez-Casas, R., Ferré, P., & García-Albea, J. E. (2008). Translation performance of beginning, intermediate and proficient Spanish-Catalan bilinguals: Effects of form and semantic relations. *The Mental Lexicon, 3*(3), 289–308. https://doi.org/10.1075/ml.3.3.03gua

Hancock, G. R., & Mueller, R. O. (2001). Rethinking construct reliability within latent variable systems. In R. Cudeck, S. d Toit, & D. Sörbom (Eds.), *Structural Equation Modeling: Present and Future—A Festschrift in Honor of Karl Jöreskog*. IL: Scientific Software International.

Hashempour, M., Ghonsooly, B., & Ghanizadeh, A. (2015). A study of translation students' self-regulation and metacognitive awareness in association with their gender and educational level. *International Journal of Comparative Literature and Translation Studies, 3*(3), 60–69. https://doi.org/10.7575/aiac.ijclts.v.3n.3p.60

Hild, A. (2014). The role of self-regulatory processes in the development of interpreting expertise. Translation and Interpreting Studies. *The Journal of the American Translation and Interpreting Studies Association, 9*(1), 128–149.

Johnson, R. B., & Christensen, L. B. (2019). *Educational Research: Quantitative, Qualitative, and Mixed Approaches*. SAGE Publications,.

Kelly, D. (2014). *A Handbook for Translator Trainers*. Routledge,. https://doi.org/10.4324/9781315760292

Kenny, D.A. (2016). Multiple factor models: Confirmatory factor analysis. Retrieved June 16, 2022, from ⟨http://davidakenny.net/cm/mfactor.htm#DV⟩.

Kline, R. B. (2015). *Principles and Practice of Structural Equation Modeling*. Guilford Press,.

Lehmann, T., Hähnlein, I., & Ifenthaler, D. (2014). Cognitive, metacognitive and motivational perspectives on reflection in self-regulated online learning. *Computers in Human Behavior, 32*, 313–323. https://doi.org/10.1016/j.chb.2013.07.051

Marcoulides, K. M., & Yuan, K.-H. (2017). New ways to evaluate goodness of fit: A note on using equivalence testing to assess structural equation models. *Structural Equation Modeling: A Multidisciplinary Journal, 24*(1), 148–153. https://doi.org/10.1080/10705511.2016.1225260

McNeish, D. (2018). Thanks coefficient alpha, we'll take it from here. *Psychological Methods, 23*, 412–433. https://doi.org/10.1037/met0000144

Mok, M. M. C., Lung, C. L., Cheng, D. P. W., Cheung, R. H. P., & Ng, M. L. (2006). Self-assessment in higher education: Experience in using a metacognitive approach in five case studies. *Assessment & Evaluation in Higher Education, 31*(4), 415–433. https://doi.org/10.1080/02602930600679100

Mokhtari, K., & Reichard, C. A. (2002). Assessing students' metacognitive awareness of reading strategies. *Journal of Educational Psychology, 94*(2), 249–259. https://doi.org/10.1037//0022-0663.9

Mokhtari, K., & Sheorey, R. (2002). Measuring ESL students' awareness of reading strategies. *Journal of Developmental Education, 25*(3), 2–11.

Muthén, L.K., & Muthén, B.Q. (1998–2020). Mplus 8.5 [Computer software]. Muthén & Muthén.

O'Malley, M. J., & Chamot, A. U. (1990). *Learning Strategies in Second Language Acquisition*. Cambridge university press,.

PACTE. (2011). Results of the validation of the PACTE translation competence model: Translation problems and translation competence. In C. Alvstad, A. Hild, & E. Tiselius (Eds.), *Methods and strategies of process research: Integrative approaches in translation studies* (pp. 317–343).

PACTE. (2020). Translation competence acquisition. Design and results of the PACTE group's experimental research. *The Interpreter and Translator Trainer, 14*(2), 95–233. https://doi.org/10.1080/1750399X.2020.1732601

Panadero, E. (2017). A review of self-regulated learning: Six models and four directions for research. *Frontiers in Psychology, 8*, 422. https://doi.org/10.3389/fpsyg.2017.00422

Phakiti, A. (2006). Modeling cognitive and metacognitive strategies and their relationships to EFL reading test performance. *Melbourne Papers in Language Testing, 11*(1), 53–94. https://doi.org/10.3316/aeipt.165763

Piecychna, B. (2022). Hans-Georg Gadamer's philosophy of understanding and its implications for a model of hermeneutical translation competence. *Perspectives, 31*(1), 74–87. https://doi.org/10.1080/0907676x.2022.2145909

Pietrzak, P. (2018). The effects of students' self-regulation on translation quality. *Babel, 64*(5–6), 819–839. https://doi.org/10.1075/babel.00064.pie

Pintrich, P. R. (2000). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of Self-regulation* (pp. 451–502). Academic Press.

Pintrich, P. R. (2004). A conceptual framework for assessing motivation and self-regulated learning in college students. *Educational Psychology Review, 16*(4), 385–407. https://doi.org/10.1007/s10648-004-0006-x

Pintrich, P. R., Smith, D. A., Garcia, T., & McKeachie, W. J. (1993). Reliability and predictive validity of the Motivated Strategies for Learning Questionnaire (MSLQ). *Educational and Psychological Measurement, 53*(3), 801–813. https://doi.org/10.1177/0013164493053003024

Pintrich, P.R., Smith, D.A.F., Garcia, T., & McKeachie, W.J. (1991). A manual for the use of the Motivated Strategies for Learning Questionnaire (MSLQ). The University of Michigan.

Poitras, E. G., & Lajoie, S. P. (2013). A domain-specific account of self-regulated learning: the cognitive and metacognitive activities involved in learning through historical inquiry. *Metacognition and Learning, 8*(3), 213–234. https://doi.org/10.1007/s11409-013-9104-9

Purpura, J. E. (1999). *Learner Strategy Use and Performance on Language Tests: A Structural Equation Modeling Approach*. Cambridge University Press,.

Roediger, H. L., & Karpicke, J. D. (2006). The power of testing memory: Basic research and implications for educational practice. *Perspectives on Psychological Science, 1*(3), 181–210. https://doi.org/10.1111/j.1745-6916.2006.00012.x

Sarkeshikian, S. A. H., Tabatabaee, S. A.-M., & Asghari, M. (2018). An analysis of the self-regulatory strategies used by Iranian English-Persian translators in translation process: A mixed method study. *Translation Studies Quarterly, 16*(63), 55–70. ⟨https://journal.translationstudies.ir/ts/article/view/586⟩.

Schmitz, B., & Wiese, B. S. (2006). New perspectives for the evaluation of training sessions in self-regulated learning: Time-series analyses of diary data. *Contemporary Educational Psychology, 31*(1), 64–96. https://doi.org/10.1016/j.cedpsych.2005.02.002

Schraw, G., Crippen, K. J., & Hartley, K. (2006). Promoting self-regulation in science education: Metacognition as part of a broader perspective on learning. *Research in Science Education, 36*(1–2), 111–139. https://doi.org/10.1007/s11165-005-3917-8

Shreve, G.M. (2006). The deliberate practice: Translation and expertise. Journal of Translation Studies, 9(1), 27–42. Retrieved from ⟨https://cup.cuhk.edu.hk/chinesepress/journal/JTS9.1/JTS9.1_27–42.pdf⟩.

Shreve, G. M., & Lacruz, I. (2017). Aspects of a cognitive model of translation. In J. W. Schwieter, & A. Ferreira (Eds.), *The Handbook of Translation and Cognition* (pp. 127–143). John Wiley & Sons.

Stolze, R. (2011). *The Translator's Approach: Introduction to Translational Hermeneutics*. Frank & Timme,.

Urdan, T., & Kaplan, A. (2020). The origins, evolution, and future directions of achievement goal theory. *Contemporary Educational Psychology*, *61*. https://doi.org/10.1016/j.cedpsych.2020.101862

Ushioda, E. (2014). Motivation, autonomy and metacognition: Exploring their interactions. In D. Lasagabaster, J. M. Sierra, & A. Doiz (Eds.), *Motivation and Foreign Language Learning* (pp. 31–49). John Benjamins Publishing Company.

Van de Schoot, R., Lugtig, P., & Hox, J. (2012). A checklist for testing measurement invariance. *European Journal of Developmental Psychology, 9*(4), 486–492. https://doi.org/10.1080/17405629.2012.686740

Vermunt, J. D. (1998). The regulation of constructive learning processes. *British Journal of Educational Psychology, 68*(2), 149–171. https://doi.org/10.1111/j.2044-8279.1998.tb01281.x

Walker, A., Lee, M., & Bryant, D. A. (2015). Development and validation of the International Baccalaureate Learner Profile Questionnaire (IBLPQ). *Educational Psychology, 36*(10), 1845–1867. https://doi.org/10.1080/01443410.2015.1045837

Weinstein, C. E., Palmer, D. R., & Schulte, A. C. (1987). *Learning and Study Strategies Inventory (LASSI)*. H & H Publishing,.

Widaman, K. F., & Reise, S. P. (1997). Exploring the measurement invariance of psychological instruments: Applications in the substance use domain. In K. J. Bryant, M. Windle, & S. G. West (Eds.), *The Science of Prevention: Methodological Advances from Alcohol and Substance Abuse Research* (pp. 281–324). American Psychological Association.

Winne, P. H. (2017). A cognitive and metacognitive analysis of self-regulated learning. In D. H. Schunk, & J. A. Greene (Eds.), *Handbook of Self-regulation of Learning and Performance* (2nd ed..,, pp. 36–48). Routledge/Taylor & Francis Group.

Winne, P. H., & Hadwin, A. F. (1998). Studying as self-regulated learning. In D. J. Hacker, J. Dunlosky, & A. C. Graesser (Eds.), *Metacognition in Educational Theory and Practice* (pp. 277–304). Lawrence Erlbaum Associates Publishers.

Winne, P. H., & Perry, N. E. (2000). Measuring self-regulated learning. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of Self-regulation* (pp. 531–566). Academic Press.

Wolters, C. A. (2003). Regulation of motivation: Evaluating an underemphasized aspect of self-regulated learning. *Educational Psychologist, 38*(4), 189–205. https://doi.org/10.1207/S15326985EP3804_1

Wu, M. (2010). *Practice of Questionnaire Statistical Analysis: SPSS Operation and Application*. Chongqing University Press,.

Yu, C. (2014). *Quan yi fang fa lun [Methodology of Complete Translation]*. China Social Sciences Press,.

Zimmerman, B. J. (1989). A social cognitive view of self-regulated academic learning. *Journal of Educational Psychology, 81*(3), 329–339. https://doi.org/10.1037/0022-0663.81.3.329

Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of Self-regulation* (pp. 13–39). Academic Press. https://doi.org/10.1016/B978-012109890-2/50031-7.

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory Into Practice, 41*(2), 64–70. https://doi.org/10.1207/s15430421tip4102_2