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Exploring the psychometric properties of the Grammar Learning Strategy Inventory *in the Chinese EFL context*

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Abstract

Learning a second language is a life-long process requiring acquaintance with a repertoire of language learning strategies (LLS). Despite copious research on LLS and their role in fostering autonomous learning, few studies have examined strategies employed when trying to master specific subsystems of the target language, especially grammar. Meaningful communication in a second

language hinges on implicit or highly automatized grammar knowledge, which, given the limitations of classroom-based grammar instruction, must for the most part be developed by learners themselves outside the classroom and this can best be achieved through adept use of grammar learning strategies (GLS). Our knowledge of the GLS, however, is scant, an issue that can be addressed either by designing reliable GLS measurement instruments or revalidating the few existing ones. This study adopts the latter approach by investigating the psychometric properties of Pawlak's (2018) *Grammar Learning Strategy Inventory* (GLSI) in the Chinese context. The tool was administered to 923 English majors, and the responses were subjected to exploratory and confirmatory factor analyses. We found that all seven strategy categories included in the original instrument showed acceptable composite reliability and discriminant validity. The paper concludes by suggesting further revalidation of the GLSI and proposing avenues of research that employ methodological innovations to shed further light on GLS.

Keywords: language learning strategies; autonomous learners; grammar learning strategies; instrument revalidation; Grammar Learning Strategy Inventory

1. Introduction

Language learning strategies (LLSs), defined as active, purposeful, and goal-oriented actions and thoughts that learners engage in to learn and use a second or foreign language (L2; Griffiths, 2018), have come a long way since their conceptualization in the 1970s as a result of a series of studies focusing on "the good language learner" (e.g., Rubin, 1975). Although they came under attack at the turn of the twenty-first century (Dörnyei, 2005) and were even accused of being "elusive" and theoretically ungrounded (Wenden, 1991, p. 7), they were brought under the spotlight again in recent studies focusing on the factors mediating the use of LLSs and their relationships with target language (TL) attainment (e.g., Chamot & Harris, 2019; Griffiths, 2018; Oxford & Amerstorfer, 2019; Pawlak, 2021a, 2021b; Pawlak & Oxford, 2018; Pawlak et al., 2023).

Among the strategies employed to learn the different TL skills and subsystems, those for learning and using L2 grammar, or *grammar learning strategies* (henceforth GLS), have been subject to empirical investigation in only a handful of studies that have been limited in scope. Given the fact that grammar is one of the most challenging aspects of the TL and it is also highly language-specific (Lin et al., 2020; Pawlak, 2018), and that many learners have a tendency to learn grammar by rote (Chu et al., 2019), which hardly translates into its accurate, meaningful and appropriate use in authentic, real-life communication, more research is needed to fully grasp how grammar is learned and what strategies are used to master this important TL subsystem. To achieve this goal, however, we

need to develop data-collection instruments that manifest sound psychometric properties after being repetitively used and fine-tuned in various contexts (Pawlak, 2020). In this spirit, the present study set out to investigate the psychometric properties of the *Grammar Learning Strategy Inventory* (GLSI; Pawlak, 2013, 2018), a data-collection instrument initially designed for Polish students majoring in English, in the context of China. While this tool has recently been revalidated in Iran (Pawlak et al., 2023), since China has a huge population of English language learners with potentially diverse grammar learning strategy preferences, it makes sense to scrutinize the psychometric properties of the GLS in this context as well. Furthermore, as China is playing an increasingly active role in world politics and economy, being able to successfully communicate in English has become an indispensable life skill for its citizens (Kang & Lin, 2019), which necessitates the availability of valid and reliable instruments that would provide an accurate picture of how the Chinese approach the task of learning different areas of this TL, including grammar. This study, therefore, examines the construct validity and composite reliability of the GLSI in the Chinese context in order to provide researchers, instructors, and students in this educational setting with a valid and reliable tool that can help them better investigate, teach, and learn strategies that can make the process of learning L2 grammar more effective.

2. Literature review

2.1. Grammar knowledge, learning, and teaching

For many years, grammar knowledge was simply conceived of as mastery of a certain number of morphosyntactic features and being able to put them to use in isolated sentences. This myth was later debunked when L2 grammar researchers demonstrated that syntax and morphology are just resources used for expressing meaning in particular contexts – a means to an end, which is meaningful communication (Nassaji, 2017). From this fresh perspective, according to Larsen-Freeman (2003), the knowledge of any grammatical feature entails the three mutually dependent aspects of *form* (how it is constructed), *meaning* (what meaning it conveys), and *use* (how it functions in context).

Another important issue is the crucial distinction between *explicit* and *implicit* dimensions of L2 grammar knowledge. While the former is conscious and declarative relying on controlled processing mechanisms, the latter is tacit and procedural, accessible in spontaneous, unplanned interactions (Pawlak, 2021c; Tian et al., 2022; Weinberger & Green, 2022). In studies of L2 grammar, implicit knowledge is measured, among others, through tasks requiring the use of a specific feature under

time pressure or oral elicited imitation tasks, while explicit knowledge is tapped into with untimed grammaticality judgment tests and tests of metalinguistic knowledge (Ellis & Roever, 2021; Roehr-Brackin, 2022). These studies have revealed that it is really difficult – if not impossible – for learners past the critical period and with limited access to the TL in foreign language settings to develop implicit knowledge (DeKeyser, 2017; DeKeyser & Juffs, 2005; see Kinsella & Singleton, 2014, for a counterargument). They also suggest that even advanced L2 learners with seemingly native-like command of the TL do not have to rely on implicit knowledge and may instead deploy their automatized explicit knowledge, which is functionally unrecognizable from implicit knowledge and can be quickly activated in spontaneous interactions (DeKeyser, 2017; DeKeyser & Juffs, 2005; Pawlak, 2019, 2021c).

In instructed L2 education, there has always been a lot of debate over the mechanisms behind implicit vs. explicit learning. Whereas it can be arguably claimed that explicit and implicit instruction will lead to explicit and implicit knowledge, respectively, skill-learning theory (DeKeyser, 2015, 2017) posits that the knowledge acquired explicitly can be proceduralized and automatized only if sufficient communicative practice is provided. Other instructional options that can be used to develop implicit knowledge or to automatize explicit knowledge include *focus-on-form techniques,* where learners' attention is more or less overtly directed at particular grammar features in the course of meaning and message conveyance. These techniques include, among others, *recasts*, in which case the correct version of an erroneous utterance is provided without changing the intended message (Kamiya, 2021; Nassaji & Fotos, 2011; Rassaei, 2022), or *input enhancement*, where a specific grammar feature is made more salient by, for example, highlighting or underlining its instances in written texts and using exaggerated stress in spoken discourse (Van Vu & Peters, 2022).

2.2. What are GLS and how are they measured?

One of the earliest definitions of strategies for learning grammar was proposed by Oxford et al. (2007) who, based on Oxford's (1990) classical characterization of LLS, described GLS as "actions and thoughts that learners consciously employ to make language learning and/or language use easier, more effective, more efficient, and more enjoyable" (p. 117). More recently Oxford (2017, p. 244) described L2 GLS as "*teachable*, dynamic thoughts and behaviors that learners *consciously* select and employ in specific contexts to improve their self-regulated, *autonomous* L2 grammar development for effective task performance and *long-term* efficiency" (emphasis added). This is a comprehensive definition that highlights several key aspects of GLS and suggests a roadmap for future empirical studies.

First, GLS are *teachable*, that is, they can be taught, like grammar itself, with varying levels of success, and, more crucially, teacher education programs can inform pre- and in-service teachers on how and when to effectively teach such strategic devices in their classes. The next two words emphasized in the definition provided above dovetail well with the notions of learner autonomy and self-regulation (Little, 2022). In other words, learners' *conscious* use of GLS allows them not only to learn grammar better but also to feel on top of their learning, which makes them *autonomous*, *self-regulated* learners (Zare et al., 2024). The autonomy brought to learners through familiarity with GLS and their adept use not only helps them tackle learning tasks more efficiently, but it also empowers them to become *lifelong* (the last emphasized word in the definition above) learners, exercise agency in successfully confronting future grammar problems, and "gradually develop a proficiency that is reflective as well as communicative, and the target language becomes a fully integrated part of their plurilingual repertoire and identity" (Little, 2022, p. 64).

Notwithstanding the comprehensiveness of Oxford's (2017) most recent definition, its multifaceted features can hardly be investigated in a single study. For this reason, the present empirical investigation is guided by the definition proposed by Cohen and Pinilla-Herrera (2010, p. 64), who view GLS as "deliberate thoughts and actions that students consciously [employ] for learning and getting better control over the use of grammar structures." This definition stresses the fact that GLS can, on the one hand, help learners come to grips with the nuances of grammar and remember requisite rules, thus contributing to the development of explicit knowledge, and, on the other, that they can also facilitate the use of grammar features in real-time processing under time pressure constraints during spontaneous conversation, which can drive the development of implicit or highly automatized knowledge (Pawlak, 2021c).

As research into GLS has not been particularly robust in the past decades and it could easily be argued that it is still in its infancy, very few comprehensive classifications of these strategies are available. One of these classifications is the one developed by Cohen and Pinilla-Herrera (2010) in the format of a website designed to help learners of Spanish grammar. There are other classifications of GLS, however, that are universal in nature in the sense that they can be applied to a wide range of target languages. One such classification, or, rather, a descriptive scheme, is the one developed by Oxford et al. (2007), who categorized GLS on the basis of four modes of teaching/learning grammar derived from research into form-focused instruction (see Doughty & Williams, 1998). These include: (1) *implicit, meaning-focused learning* (no focus on TL structure incorporated into lessons), (2) *implicit learning with a focus on form* (shifting attention to grammar in entirely meaning-focused communication tasks), (3) *explicit inductive learning*

(implementation of activities stimulating rule discovery), and (4) *explicit deductive learning* (providing learners with rules through teacher explanations, textbooks, etc.).

A few years later, Pawlak (2013, 2018) presented the most comprehensive classification of GLS to date, which includes *metacognitive* (employed to plan, monitor and evaluate grammar learning), *affective* (deployed for emotional regulation), *social* (based on cooperation with the teacher, peers, etc.), and *cognitive* (directly relating to understanding and using grammar structures in different contexts) strategies. In this classification, cognitive strategies are considered to constitute the core of grammar learning and are further divided into four subcategories: (1) *GLS used to aid production and comprehension of grammar in communicative tasks or to facilitate focus on form* (e.g., comparing one's own output with that of more proficient TL users in order to improve), (2) *GLS used to develop explicit knowledge of grammar* through deduction (e.g., remembering grammar information by location on a page) or induction (e.g., figuring out rules by analyzing examples), (3) *GLS used to develop implicit (highly automatized) knowledge of grammar*, whether this involves controlled practice (e.g., applying rules in exercises, such as paraphrasing) or communicative practice (e.g., deliberately using specific grammar features when speaking or writing) in both production or comprehension, and (4) *GLS used to deal with corrective feedback* concerning errors in the use of grammar in different contexts (e.g., trying to notice and self-correct mistakes when practicing grammar). While this classification takes into account the specificity of learning and using L2 grammar and makes a crucial distinction between explicit and implicit knowledge of this TL subsystem, it is mainly intended for (highly) advanced university-level students, especially those majoring in a given L2.

Because Pawlak's (2013, 2018) classification has only recently emerged, most GLS studies reviewed in the following section have employed general classifications of LLSs, such as those developed by Oxford (1990) and O'Malley and Chamot (1990), with minor modifications being made. The problem with these classifications is that they are too general and fail to address the specificity of learning and using L2 grammar as well as the intricacies that these processes involve. Given these shortcomings, Pawlak (2013, 2018) used his classification of GLS as a foundation for the development of a dedicated data-collection instrument named the *Grammar Learning Strategy Inventory* (GLSI). This tool includes 70 five-point Likert-scale statements divided into the categories and subcategories specified in the classification described above. The GLSI was initially validated with Polish university students majoring in English (Pawlak, 2018). Even though a specific factor structure failed to be uncovered, satisfactory internal consistency reliability was reported for the entire research instrument (Cronbach alpha value of .89) as well as for most of the specific groups of GLS (Cronbach alpha values in the range of .54-.85). The instrument has also been utilized in several studies,

some of which have already been published, while others are currently under review (e.g., Alnufaie & Alzahrani, 2024; Pawlak, 2021b; Pawlak & Csizér, 2023; Pawlak et al., 2023). The study reported in this paper aimed to validate the GLSI in a new context, that is, with Chinese university students majoring in English.

2.3. Previous GLS studies

As it was not until the first decade of the new millennium that GLS began to be studied in their own right, studies focusing on the various strategies used by learners to facilitate the process of learning and using grammar are still few and far between. Among the GLS studies available, just a handful have embraced a micro-perspective by investigating GLS among a limited number of learners working on particular activities and tasks, while the vast majority have adopted a macro-perspective by striving to determine general patterns of GLS use based on data obtained from large numbers of participants (Pawlak, 2013, 2020). As the current study also attempts to present a general picture of GLS used by a large number of L2 learners in one specific educational context, only the studies representing the latter perspective are reviewed here.

Still under the influence of general LLS studies, early GLS studies attempted to identify and describe GLS in different learner groups. Sarıçoban (2005), for example, administered a questionnaire inspired by O'Malley and Chamot's (1990) taxonomy of LLS to 100 English major English as a foreign language (EFL) learners. Quantitative analyses revealed that the most go-to strategies in this cohort were cognitive strategies, whereas metacognitive and socio-affective strategies were to a large extent neglected. In a later study also conducted in the Turkish context, Gürata (2008) investigated GLS use among 176 students learning English in a preparatory program using an instrument constructed on the basis of both Oxford's (1990) and O'Malley and Chamot's (1990) taxonomy of LLSs. Also in this case the findings revealed that the most frequently used strategies were cognitive in nature, followed by metacognitive and socio-affective strategies. The findings of these two studies indicate that cognitive strategies, that is, those directly involved in learning grammar, come somewhat naturally to learners and require little instruction in educational contexts that espouse the traditional pedagogical paradigm where students are regarded as passive recipients of knowledge. More modern, progressive educational milieus that place a premium on values such as cooperative learning and whole-person education are more likely to encourage learners to make more use of metacognitive and socio-affective strategies. Some new light was shed on GLS use in a study conducted by Kemp (2007), who examined these strategies in the case of multilingual language learners. Using

a questionnaire comprising 40 five-point Likert-type items and follow-up open-ended queries, Kemp (2007) found that participants knowing a higher number of languages not only tended to use GLS more frequently, but they also reported resorting to a wider array of such strategies.

In the past decade, the Polish context has become the major testing ground for GLS researchers, who have investigated the issue in a series of studies focusing mainly on students in degree programs in English. Using diaries, Pawlak (2008) analyzed patterns of GLS use of 29 English majors, concluding that most of the strategies reported by the participants were cognitive in nature and mainly involved different types of formal practice. In a later study, Pawlak (2012) tapped into the use of GLS among 142 English major students in Poland through a questionnaire comprising 36 Likert-scale items designed on the basis of Oxford et al.'s (2007) classification, followed by open-ended queries. While the questionnaire data revealed the participants' predilection for reliance on GLS intended to facilitate communicative interaction, qualitative findings once again showed a strong tendency towards reliance upon cognitive strategies involved in various types of formal practice. Wach (2016) also investigated GLS use of 85 Polish university students learning L2 English and Russian as a third language (L3). The findings revealed that the participants resorted to significantly different GLS in L2 and L3, which could be attributed to their TL proficiency and psychotypology. Worth mentioning at this juncture is also the recent empirical investigation by Pawlak and Csizér (2023), who examined the patterns of GLS use among English majors in Hungary and Poland. Even though some differences were revealed, in both contexts, GLS for dealing with corrective feedback were reported the most frequently, followed by GLS used to facilitate production and comprehension of grammar features in spontaneous communication, whereas GLS used for the development of explicit knowledge through induction were reported the least often.

Only a handful of studies have set out to illuminate the link between strategy use and TL attainment. In her investigation of the GLS use of 425 university-level Turkish learners of English, Tilfarlioğlu (2005) did not observe any differences between successful and unsuccessful students, either in terms of the overall frequency of reported GLS use or specific groups of such strategies. In a similar vein, Pawlak (2009) explored GLS use among 142 English majors in Poland using a questionnaire, drawing on the descriptive scheme for grammar strategies developed by Oxford et al. (2007). Correlational analysis showed little relationship between GLS use and attainment for most GLS categories. One exception was the positive link between reported use of GLS for explicit deductive learning and the final grades in a grammar course but the correlation was also weak in this case. In a more recent study drawing on more nuanced measures of L2 attainment, Pawlak (2021b) examined the mediating effect of GLS on students' L2 grammar attainment measured through productive and

receptive dimensions of both explicit and implicit (or highly automatized) knowledge of the English passive voice. The regression analyses conducted on the data collected from 193 Polish students majoring in English demonstrated that, except for certain cognitive strategies used in communicative interaction, GLS had little contribution to the participants' mastery of the English passive voice. In a so-much-needed attempt to gauge the effectiveness of pedagogic interventions in GLS use, Trendak (2015) explored the effects of instruction in metacognitive and cognitive GLS on the mastery of stylistic inversion in English. Among the 40 Polish students participating in the study, those who had received instruction in the use of GLS showed gains in the accurate use of this grammar feature in the short and long run.

Finally, Iran was recently added to the contexts where GLS use has been studied. Pawlak et al. (2023) set out to validate the 70-item GLSI, originally developed in the Polish context, in the Iranian EFL setting. The results of exploratory and confirmatory factor analyses of the data obtained from 605 Iranian EFL university students yielded a seven-factor model that best described GLS use in the Iranian context. Although the identified factors mirrored those originally included in the GLSI, a large number of items had to be eliminated, which led to a truncated 30-item version of the GLSI. The authors concluded that the basic four-prong framework underlying the GLSI, that is, metacognitive, social, affective, and cognitive GLS, was also conceptually valid in the Iranian context, as was the division of cognitive GLS into four groups (i.e., focus on form, explicit knowledge, implicit knowledge and corrective feedback GLS).

Whereas the Iranian setting is a welcome addition to the list of contexts in which GLS have been explored, we still need reliable data collected through theoretically sound and validated tools to get better insight into how GLS are used in other, less investigated milieus. In this spirit, the present study attempts to revalidate Pawlak's (2013, 2018) GLSI in the context of China, whose vast geographical, educational, and sociopolitical landscape makes it a perfect petri dish for investigating the strategies used for learning grammar. To this aim, the following research question was addressed in this study:

> *Is the GLSI characterized by good psychometric properties of validity and reliability in the Chinese EFL university context?*

3. Method

3.1. Participants

The participants were 923 university students majoring in English (97 males and 826 females), who were enrolled in Translation Studies, EFL Education, English

Literature Studies, Business English, and Technology English programs. The age of the participants ranged from 17 to 22 and at the time of the study they had been learning English for 10 years on average. The students came from universities located in 13 provinces (i.e., Anhui, Henan, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Hubei, Hunan, Jiangsu, Shandong, Shaanxi), three municipalities directly administered by the Central Government of China (Tianjin, Beijing and Chongqing), one Special Administrative District (Hongkong) as well as two autonomous regions involving Xinjiang and Inner Mongolia.

3.2. Context

All the participants involved in the current study were university students majoring in English who were enrolled in an English as a foreign language course and, upon graduation, the English Language Bachelor's degree would be conferred on them. In the Chinese education context, the undergraduate English education strand in the first two years normally comprises general English courses intended to build up students' fundamental TL skills and subsystems, such as listening, speaking, reading (intensive reading and extensive reading), grammar, and writing. Only then do students move on to their specialized courses, such as general English linguistics, American and British literature, translation studies, second and foreign language and other courses related to English language teaching. After successfully completing the aforementioned courses in the first two years in the program, the students are required to take the Test for English Majors-Band 4 (intermediate English level) issued by the Teaching Guiding Committee for College Foreign Language Majors under the Department of Higher Education, Ministry of Education of China. Importantly, it is compulsory for all students majoring in English to receive extensive English grammar instruction, which involves extensive activities dealing with diverse receptive and productive dimensions of English grammar. For this reason, the Chinese educational context is a fertile ground for probing into the use of GLS.

3.3. Instrument

As explained in the section devoted to the literature review, the GLSI, an instrument designed by Pawlak (2013, 2018, 2020), on the basis of his classification of strategies for learning L2 grammar, was used to collect requisite data. The 70 five-point Likert-scale items which comprise this questionnaire were designed to tap the use of the four principal categories of GLS included in the classification: (1)

metacognitive (e.g., "I preview the grammar structures to be covered in a lesson"), (2) *affective* (e.g., "Learning English after classes rarely excites me"), (3) *social* (e.g., "I am willing to initiate communication with a foreigner met in the street"), and (4) *cognitive*. The last category comprises four groups of strategies directly involved in learning and using grammar structures in an L2: (1) *GLS used to aid the production and comprehension of grammar during communicative interaction* (e.g., "I notice [or remember] structures that are emphasized orally through pitch, repetition, etc."), (2) *GLS used to develop explicit knowledge of grammar*, which can happen either deductively (e.g., "I pay attention to rules provided by the teacher or coursebook") or inductively (e.g., "I create my own hypotheses about how structures work and check these hypotheses"), (3) *GLS used to develop implicit (highly automatized) knowledge of grammar* either in controlled practice (e.g., "I try to apply new rules carefully and accurately in specific sentences") or communicative practice (e.g., "I try to use grammar rules as soon as possible in a meaningful context"), and (4) *GLS used to process corrective feedback on errors in the use of L2 grammar structures* (e.g., "I pay attention to teacher correction when I do grammar exercises and try to repeat the correct version").

The questionnaire started with a consent form, intended to give those not interested in participating in the study an opportunity to immediately indicate their withdrawal. The next section comprised items designed to elicit the participants' background information, including their gender, English learning experience, and self-assessment of their TL proficiency. A decision was made to administer the questionnaire in English because the participants were all English major students and it was warranted to assume that they possessed the required level of TL proficiency. Importantly, a pilot administration of the tool to 12 students resembling the target participants showed that they could comprehend the items included in the GLSI with ease.

3.4. Data collection and analysis

The questionnaires were distributed online through WeChat, one of the most popular social networking applications in China. We opted for this mode of data collection for two reasons: (1) the social distancing restrictions imposed to curb the spread of COVID-19, and (2) the vast geographical dispersion of universities in China, which would have made our desire to use maximum variation sampling impossible had we relied solely on participants in our geographical proximity. The link to the questionnaire was shared with students through WeChat. Thanks to the assistance of colleagues teaching at various universities in all the four corners of China, the authors were able to reach out to a large and diverse sample of English majors.

The participants' responses to the questionnaire reflected their general GLS use rather than in relation to specific grammar learning tasks. It should be pointed out at this juncture that the consent form included at the beginning of the GLSI stated that participation in the study was voluntary. By agreeing to participate, the students authorized the researchers to use their responses and personal information as long as their demographic information remained anonymous. All of this was done to resolve ethical issues connected with the collection of the data.

The collected responses were double-checked for any possible outliers before being processed by SPSS software for further statistical analyses. These analyses were carried out with the following seven components of the GLSI: (1) metacognitive GLS; (2) affective GLS; (3) social GLS; (4) focus-on-form GLS; (5) explicit knowledge GLS; (6) implicit knowledge GLS; and (7) corrective feedback GLS, the last four of which being subcategories of cognitive GLS. Exploratory factor analysis was run using the answers of the initial group (initial *N* = 350; *N* after removal of unengaged responses = 271) to see if the items load on the same components in the context of this study. A number of items with low loadings were excluded in this phase and the modified questionnaire (37-items) was administered to a second group (initial *N* = 573; *N* after removal of unengaged responses = 433). Confirmatory factor analyses were then run to determine the reliability of the instrument and the seven underlying factors. The former was done using SPSS (Version 24), and the latter was conducted through IBM AMOS (Version 24).

4. Results

4.1. Pre-processing of the data

Before commencing the main analyses, the data went through pre-processing to exclude the potentially problematic cases. Initially, 923 (350 from the first administration and 573 from the second administration) solid answers were obtained from the administration of the questionnaire. No missing answers were found in the data and thus the data were first inspected for patterns showing possible participant disengagement. Consequently, 123 cases with a constant pattern (i.e., when only one response is selected for all items), 76 cases with a decreasing pattern (i.e., when one selects the highest point on the Likert scale and then chooses successively lower ones), and 24 cases with an increasing pattern (i.e., the reverse of what has been mentioned before) were identified and excluded. Then, the standard deviation of respondents' answers was calculated and those with values below 0.5 were inspected for unengagement. No such cases were found. As a result of data screening, 704 respondents were kept for the main analysis.

4.2. Exploratory factor analysis (EFA)

As discussed above, GLSI was previously validated in two contexts of Poland and Iran, and the factor structure from the Polish context was also matched against a Hungarian sample, with all of these studies supporting the existence of seven underlying factors. One may rightly argue that if the existence of seven factors has already been corroborated, there is no need for running an EFA. However, we decided to use EFA as the Iranian study showed that a considerable number of items had low loadings and this might potentially also be the case for the Chinese sample. In this EFA, the principle component analysis (PCA) extraction method was accompanied with Promax rotation, which is an oblique method of rotation, as our factors were proved to have strong correlations and this method is robust when such correlations exist. EFA was run on the first sample (N = 271) and the second sample was later used to perform CFA to make sure that the results obtained from EFA are generalizable in the context under investigation. Before running the factor analysis, the sample adequacy was checked through Kaiser-Meyer-Olkin (KMO) and Bartlett's tests. The results of the sample adequacy test (KMO = .951 > .6) suggested adequacy for the sample size and Bartlett's tests of sphericity was statistically significant at $p < .01$, thereby providing a basis for rejecting the null hypothesis that the factors in the matrix are not independent of each other (an identity matrix).

The initial results of factor analysis demonstrated the extraction of ten factors with 68.12% of the total variance explained. Employing parallel analysis, the extraction was reduced to seven fixed factors. The eigenvalues for the sixth and seventh factors were 1.45 and 1.39, respectively, while the value dropped to 1.13 for the eighth factor. The screeplot is available in Appendix A. The explained variance for the seven fixed factors turned out to be 63.42%. Table 1 indicates the pattern matrix resulting from this extraction.

Table 1 EFA pattern matrix

	Factor						
	1	2	3	4	5	6	7
VAR00001		.724					
VAR00002		.819					
VAR00003		.849					
VAR00004		.732					
VAR00005		.543					
VAR00006		.738					
VAR00007		.727					
VAR00008							
VAR00009							
VAR00010							
VAR00011							
VAR00012					.720		
VAR00013					.832		
VAR00014					.817		

VAR00015				.653		
VAR00016						
VAR00017						
VAR00018						
VAR00019						
VAR00020	.646					
VAR00021	.749					
VAR00022	.871					
VAR00023	.745					
VAR00024						
VAR00025						
VAR00026						
VAR00027						
VAR00028						
VAR00029	.592					
VAR00030	.614					
VAR00031	.643					
VAR00032	.683					
VAR00033	.766					
VAR00034	.740					
VAR00035						
VAR00036						
VAR00037						
VAR00038						
VAR00039						
VAR00040						
VAR00041						
VAR00042						
VAR00043						
VAR00044						
VAR00045						
VAR00046		.707				
VAR00047		.808				
VAR00048		.757				
VAR00049		.690				
VAR00050		.785				
VAR00051						
VAR00052						
VAR00053			.582			
VAR00054			.629			
VAR00055			.649			
VAR00056			.624			
VAR00057						
VAR00058			.607			
VAR00059						
VAR00060						
VAR00061						
VAR00062						.588
VAR00063						
VAR00064						.546
VAR00065						.610
VAR00066					.709	
VAR00067					.760	
VAR00068					.798	
VAR00069						
VAR00070						

Note. Extraction method: Maximum likelihood. Rotation method: Promax with Kaiser normalization. Rotation converged in 8 iterations

Items with loadings below 0.45 in Table 1 were suppressed. Based on the content of the questionnaire, the factors were labeled as follows: Factor 1: *Cognitive GLS – explicit knowledge*, Factor 2: *Metacognitive GLS*, Factor 3: *Cognitive GLS – implicit knowledge*, Factor 4: *Cognitive GLS – corrective feedback*, Factor 5: *Cognitive GLS – focus on form*, Factor 6: *Affective GLS,* and Factor 7: *Social GLS*. The items representing the seven factors were as follows:

1. Cognitive GLS – explicit knowledge: items 20, 21, 22, 23, 29, 30, 31, 32, 33, and 34.
2. Metacognitive GLS: items 1, 2, 3, 4, 5, 6, and 7.
3. Cognitive GLS – implicit knowledge: items 46, 47, 48, 49, and 50.
4. Cognitive GLS – corrective feedback: items 53, 54, 55, 56, and 58.
5. Cognitive GLS – focus on form: items 12, 13, 14, and 15.
6. Affective GLS: items 62, 64, and 65.
7. Social GLS: items 66, 67, and 68.

4.3. Confirmatory factor analysis (CFA)

Using the pattern obtained from EFA, a moderated 37-item questionnaire was administered to the second group of participants. The reason we used two distinct groups for EFA and CFA was to make sure that the pattern extracted from the EFA is generalizable and works for other participants. After removal of the unengaged answers, CFA was run through IBM AMOS (version 24). Initial inspection of the results showed that there were high correlations among four factors, namely Factors 1, 3, 4, and 5. Therefore, we put the items in these categories in the second order and the four factors were put together under a larger factor called cognitive GLS. Then the model was examined for convergent and discriminant validity.

First, items with non-significant loadings in unstandardized estimation were excluded. Table 2 illustrates the results for standardized and unstandardized estimates. As reported, none of the items had a non-significant unstandardized estimate, nor did any item have a standardized estimate below 0.45. Therefore, all of the 37 items were kept in the model. It should be noted that item loadings above 0.6 are considered desirable and our report shows that all items except for Q65 reached this threshold.

Subsequently, the reliability and validity of the model was checked. Before conducting the analyses, modifications with the threshold of 10, which were not contradictory to the literature (they were from the same components and their errors could be correlated based on the content overlap), were applied (Kline, 2016). Overall, 17 modifications were proposed while only 8 were applicable. Figure 1 delineates the final modified CFA model.

Table 2 Unstandardized and standardized estimates of the initial CFA model

			Unstandardized				Standardized
			Estimate	S.E.	C.R.	*p*	Estimate
Explicit	<---	Cognitive	1.000				.900
Feedback	<---	Cognitive	1.142	.082	13.857	.000	.909
Implicit	<---	Cognitive	1.119	.082	13.671	.000	.889
Form	<---	Cognitive	1.001	.077	13.070	.000	.845
Q01	<---	Metacognitive	1.000				.746
Q02	<---	Metacognitive	.991	.066	14.998	.000	.744
Q03	<---	Metacognitive	1.078	.066	16.428	.000	.807
Q04	<---	Metacognitive	.916	.060	15.281	.000	.749
Q05	<---	Metacognitive	.797	.064	12.352	.000	.613
Q06	<---	Metacognitive	.901	.065	13.890	.000	.687
Q07	<---	Metacognitive	.989	.067	14.651	.000	.720
Q12	<---	Form	1.000				.777
Q13	<---	Form	1.089	.057	19.135	.000	.844
Q14	<---	Form	1.134	.055	20.758	.000	.902
Q15	<---	Form	1.098	.058	19.093	.000	.843
Q20	<---	Explicit	1.000				.718
Q21	<---	Explicit	1.059	.068	15.602	.000	.771
Q22	<---	Explicit	1.057	.066	16.018	.000	.792
Q23	<---	Explicit	1.117	.073	15.312	.000	.757
Q29	<---	Explicit	.999	.073	13.714	.000	.679
Q30	<---	Explicit	1.066	.072	14.712	.000	.727
Q31	<---	Explicit	.905	.069	13.036	.000	.647
Q32	<---	Explicit	1.071	.067	15.908	.000	.785
Q33	<---	Explicit	.953	.065	14.600	.000	.721
Q34	<---	Explicit	1.060	.066	16.146	.000	.796
Q46	<---	Implicit	1.000				.789
Q47	<---	Implicit	1.056	.052	20.110	.000	.857
Q48	<---	Implicit	1.060	.052	20.195	.000	.860
Q49	<---	Implicit	.969	.053	18.360	.000	.800
Q50	<---	Implicit	1.039	.053	19.585	.000	.840
Q53	<---	Feedback	1.000				.792
Q54	<---	Feedback	1.040	.044	23.879	.000	.836
Q55	<---	Feedback	1.027	.050	20.517	.000	.875
Q56	<---	Feedback	.999	.059	16.855	.000	.751
Q58	<---	Feedback	1.035	.054	19.024	.000	.825
Q62	<---	Affective	1.000				.659
Q64	<---	Affective	1.180	.099	11.941	.000	.756
Q65	<---	Affective	.789	.099	8.006	.000	.452
Q66	<---	Social	1.000				.805
Q67	<---	Social	1.025	.053	19.251	.000	.860
Q68	<---	Social	.875	.053	16.409	.000	.747

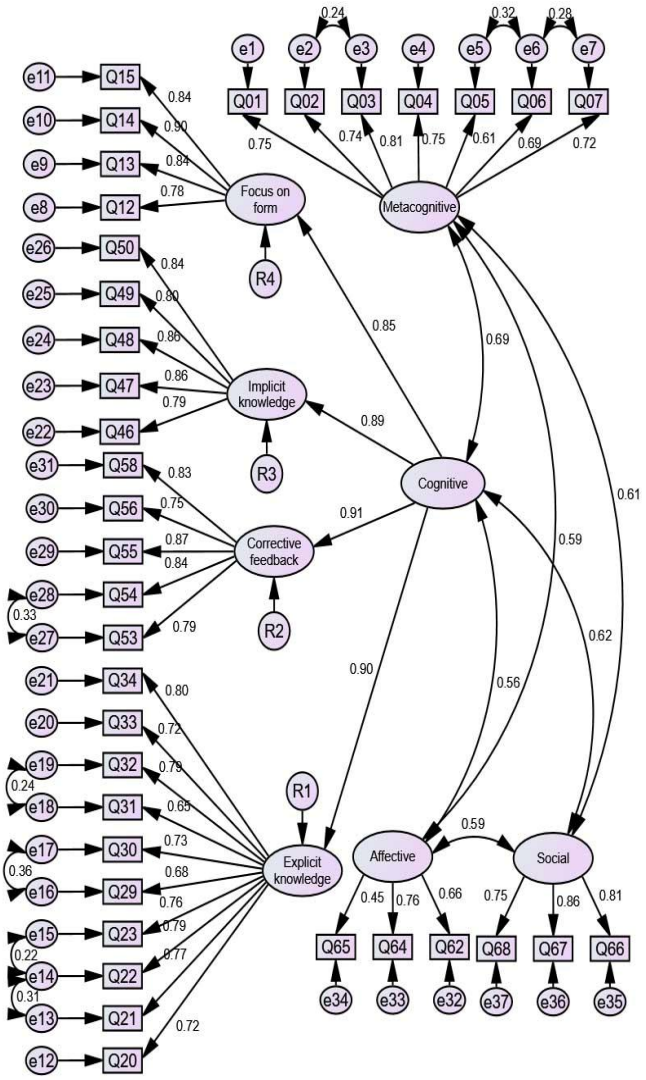

Figure 1 The final modified CFA model with standardized estimates (the GLSI encompasses four principal categories: *metacognitive*, *affective*, *social*, and *cognitive*; cognitive GLS comprise four groups: *focus on form*, *implicit knowledge*, *corrective feedback*, and *explicit knowledge*)

After applying the modifications, the model's goodness of fit was examined. According to Hu and Bentler (1999), in order for the model to have a goodness of fit, a number of criteria have to be met. These criteria, alongside the values obtained from the data, are reported in Table 3. The results reported in the table indicate acceptable to excellent goodness of fit.

Table 3 *Evaluation of the CFA goodness of fit*

Criteria		Threshold			Evaluation
		Poor	Acceptable	Excellent	
CMIN	1535.141				
Df	600				
CMIN/df	2.559	> 5	> 3	> 1	Excellent
RMSEA	.047	> 0.08	< 0.08	< 0.06	Excellent
CFI	.949	< 0.9	> 0.9	> 0.95	Acceptable
TLI	.945	< 0.9	> 0.9	> 0.95	Acceptable
SRMR	.035	> 0.1	> 0.08	< 0.08	Excellent
PClose	.950	< .01	< .05	> .05	Excellent

Next, the composite reliability (CR) and discriminant validity for each factor were examined. As can be seen from Table 4, all of the variables had CR values above 0.7, which provides evidence for acceptable reliability. Moreover, the square root of average variance extracted (AVE) (the bold values in the table) was above inter-correlations of the factors, indicating discriminant validity (see Fornell & Larcker, 1981).

Table 4 *Composite reliability and discriminant validity of the factors*

	CR	AVE	Fornell-Larcker criterion			
			Metacognitive	Affective	Social	Cognitive
Metacognitive	.886	.527	.726			
Affective	.761	.403	.592**	.635		
Social	.847	.649	.613**	.588**	.805	
Cognitive	.936	.785	.688**	.560**	.619**	.886

** Correlation is significant at $p < .001$

The items that were retained in the GLSI following the analyses in the Chinese context were matched to the ones obtained from the Iranian context (see Appendix B; Pawlak et al., 2023). Most of the items were shared in both settings. Based on the results we propose a reduced version of GLSI with 37 items (see Appendix B), which is hopefully applicable to different contexts or can at least represent a starting point for future empirical investigations.

5. Discussion

This study set out to examine to what extent the GLSI is characterized by good psychometric properties of validity and reliability in the Chinese EFL university context. The EFA and CFA results pointed to a seven-factor model with sound goodness-of-fit criteria stipulated in the literature (Hu & Bentler, 1999). This

model largely mirrors the GLS classification forming the basis of Pawlak's (2013, 2018) GLSI in the Polish context. Therefore, as was the case in Pawlak et al. (2023), the division of the GLS into metacognitive, social, affective, focus-on-form, explicit knowledge, implicit knowledge, and corrective feedback GLS is conceptually valid in the context of Chinese university students majoring in English. The obtained levels of internal reliability consistency (composite reliability values ranging from .761 to .936) and discriminant validity also point to the reliability and validity of the instrument in the Chinese context.

The findings summarized above indicate that the GLSI enjoys as high a reliability and validity in the Chinese context as it does in the Polish setting, for which it was originally developed. In other words, the reduced instrument with 37 items retained the pattern proposed for the Polish context, with four main, first-order factors and seven components (including four components loading onto cognitive strategies).[1] Such findings are not overly surprising in view of the fact that, in both contexts, the Chinese and Polish one, English majors study the TL in an EFL setting where they receive mostly explicit grammar instruction, typically through the so-called presentation – practice – production (PPP) model. In the different parts of this model, certain GLS representing the cognitive category are likely to be more applicable and useful. For instance, in the "presentation" phase, where teachers introduce grammar rules, students tend to rely on strategies aimed at facilitating the development of explicit knowledge. Similarly, the "practice" and "production" components encourage students to fall back on various focus-on-form and corrective feedback strategies, respectively, which might aid the development of implicit knowledge or automatization of existing explicit knowledge. At the same time, metacognitive, affective and social GLS can be viewed as more universal in nature, being applied in different educational contexts with respect to learning not only grammar but also other TL skills and subsystems.

Obviously, the fact that the overall factor structure of the GLSI obtained for the Chinese context mirrors the categories proposed for the Polish setting does not mean that GLS comprising the different groups are used with the same frequency. It shows, however, that these strategies are adjusted to the task in hand or that they form chains or clusters that are the most beneficial to more effective learning of grammar features and their accurate, meaningful and appropriate use in different contexts. There are bound to be considerable differences in this respect between different instructional settings and within them, an issue that was not the focus of the present empirical investigation. Based on the findings of the present investigation, it might be tempting to conclude that the GLSI developed in Poland can be used in its full form in most, if not all, EFL

[1] It should be noted, however, that no specific factor structure was identified in Pawlak (2018).

contexts. However, there were also clear differences between the two contexts, as best evidenced by the fact that many of the items originally designed for the Polish context were eliminated as a result of the current analyses. While a detailed discussion of this issue cannot be undertaken at this juncture due to limitations of space, it is instructive to highlight the most conspicuous instances of this kind. For example, in the focus-on-form category, only four out of the original ten items were retained and, interestingly, all of them pertained to understanding form-meaning mappings represented by specific grammar features (e.g., noticing structures that are often repeated in a text) rather than actually trying to produce those features in relatively spontaneous interactions (e.g., comparing one's own output with that of more proficient TL users and then trying to employ grammar features in the right way). A similar observation can be offered with respect to GLS employed to aid the development of explicit knowledge of TL grammar, where only ten out of the original 24 items were retained. Importantly, most of these items were related to understanding and processing grammar rules provided by the teacher or the coursebook rather than discovering such rules on one's own, which testifies to the importance of the deductive approach. Such preferences can perhaps be reflective of the predominant modes of instruction in the Chinese context since, as Pawlak (2012) pointed out, the way in which grammar is learned by English majors is likely to be conditioned to a large extent by the way in which this subsystem is taught and subsequently tested. Admittedly, though, there were also categories where almost all the items originally included in the GLSI were kept after the analyses, the best examples being metacognitive GLS and corrective feedback GLS. It could thus be argued that strategies for learning grammar in these two categories are more universal and largely context-independent.

In a similar revalidation study conducted in the Iranian context (Pawlak et al., 2023), almost half of the GLSI items failed to meet acceptable levels of discriminant validity and had to be discarded, although the underlying seven-factor structure was confirmed. In another study mentioned in the literature review, Pawlak and Csizér (2023) found that the overall patterns of GLS use were closely similar among Hungarian and Polish university students in degree programs in English but some differences were also revealed in these contexts. The Hungarian students, for example, showed more interest in focus-on-form GLS and corrective feedback GLS, whereas the Polish students reported higher use of metacognitive GLS and induction GLS. Taken together, the present investigation and other similar studies show that, while the GLSI can be a useful research tool and can also be used to improve grammar instruction, it should be employed in specific contexts only after undergoing rigorous and methodologically sound revalidation processes.

The results of the present study should also be viewed with some circumspection due to several limitations. For one thing, this empirical investigation relied solely on quantitative data gleaned from the participants' responses to the GLSI. Although the number of participants was high, more insights into GLS use could potentially have been generated if some qualitative data in the form of, say, semi-structured interviews or open-ended queries had been collected as well. Such data could have bolstered the credence of the numerical calculations made and generated evidence of other strategic devices used by the participants. Another problem is that the study was cross-sectional in nature, with the GLSI being administered only once, which made it impossible to shed light on how the use of grammar strategies fluctuates over time (Cohen & Wang, 2018; Oxford, 2017). Finally, the present study is based on the assumption that strategies, including GLS, can be neatly squeezed into specific categories, a stance that has been criticized by some researchers, including Oxford (2017) herself, who points to the dynamicity of the use of strategic devices and the fact that their functions might be subject to change depending on the task being performed, individual learner profiles or specific instructional contexts. While there is surely merit to this position, we believe that adopting a macro-perspective is warranted as it allows identification of general patterns of GLS use which can then be related to other individual difference factors or attainment. At the same time, we agree that the puzzle of GLS use will inch closer to completion only when the studies adopting the macro-perspective, like the present one, are complemented with insights gained from research projects grounded in the micro-perspective, where GLS use is examined with limited numbers of participants performing different grammar learning tasks in specific contexts. This will surely allow invaluable insights into how GLS are constantly being adjusted to the demands imposed by specific grammar activities as they are performed in specific settings (see Pawlak, 2020).

6. Conclusion

The present study sought to revalidate the GLSI (Pawlak, 2013, 2018), originally designed to tap into English major students' use of GLS in Poland, in the Chinese context. Even though the original questionnaire had to be truncated to comprise only 37 items, the results of EFA and CFA run with these items corroborated the validity of the seven-factor model underlying the tool. Such results corroborate the validity of the division into the four categories of metacognitive, affective, social and cognitive GLS at the first-order as well as four factors of focus-on-form, explicit knowledge, implicit knowledge, and corrective feedback GLS at the second order, comprising the larger category of cognitive strategies. These findings

demonstrate that the overall underlying structure of GLS in the Chinese context is akin to that identified among English majors in Poland, a setting in which the tool was initially developed.

This having been said, it should be emphasized that we still need research that would further examine the GLSI in the Chinese context with the help of a combination of quantitative and qualitative methodologies. For example, in addition to administering the GLSI, researchers could collect qualitatively rich data from stimulated recall interviews upon the completion of specific grammar learning tasks. Such studies might reveal that students resort to strategies other than those included in questionnaires, such as the GLSI. Nevertheless, the findings of quantitatively oriented studies, such as the present one, can help researchers develop tools that would capture the specificity of the grammar learning processes in the Chinese context. Such data collection instruments are invaluable because they can help us better understand factors mediating GLS use, its relationship to TL proficiency or the usefulness of GLS instruction (Pawlak, 2020). Following such a research agenda, as daunting a challenge as it might be, can shed further light on L2 grammar learning and teaching not only in the Chinese setting but also in other contexts around the globe with respect to both English and a wide range of other languages.

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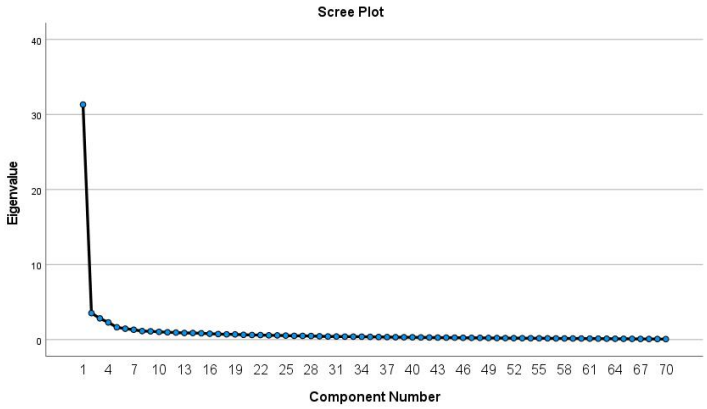
APPENDIX A

Screeplot for EFA



APPENDIX B

Matching the results from Chinese and Iranian contexts

Items		Factors	Loadings	
			Chinese	Iranian
Q01. I preview the grammar structures to be covered in a lesson.	<---	Metacognitive	.746	.624
Q02. I pay attention to grammar structures when reading and listening.	<---	Metacognitive	.744	.674
Q03. I look for opportunities to practice grammar structures in many different ways.	<---	Metacognitive	.807	.771
Q04. I try to find more effective ways of learning grammar.	<---	Metacognitive	.749	.714
Q05. I know my strengths and weaknesses when it comes to grammar.	<---	Metacognitive	.613	L
Q06. I have specific goals and objectives in learning grammar.	<---	Metacognitive	.687	.728
Q07. I schedule grammar reviews in advance.	<---	Metacognitive	.720	.625
Q12. I notice (or remember) structures that are repeated often in the text.	<---	Focus on form	.777	.728
Q13. I notice (or remember) structures that are highlighted in a text by italics, boldface, underlining, etc..	<---	Focus on form	.844	.795
Q14. I notice (or remember) structures that are emphasized orally through pitch, repetition, etc.	<---	Focus on form	.902	.754
Q15. I notice structures that are repeated extremely frequently in a short period of time (e.g., the past tense in a series of stories over the course of a few lessons).	<---	Focus on form	.843	.741
Q16. I pay attention to how more proficient people say things and then imitate.	<---	Focus on form	L	.646
Q20. I try to understand every grammar rule.	<---	Explicit	.718	L
Q21. I memorize rules about frequently used linguistic forms/structures (e.g., formation and use of the passive).	<---	Explicit	.771	L
Q22. I memorize rules about how structures change their form (e.g., from an adjective to an adverb).	<---	Explicit	.792	.613
Q23. I mark new grammar structures graphically (e.g., colors, underlining).	<---	Explicit	.757	.734
Q24. I paraphrase the rules I am given because I understand them better in my own words.	<---	Explicit	L	.639
Q25. I make charts, diagrams or drawings to illustrate grammar rules.	<---	Explicit	L	.652
Q29. I use a notebook/note cards for new rules and examples.	<---	Explicit	.679	.620
Q30. I group grammar structures to remember them better (verbs followed by gerund and infinitive).	<---	Explicit	.727	.713
Q31. I review grammar lessons to remember the rules better.	<---	Explicit	.647	.666
Q32. I use grammar reference books, grammar sections of coursebooks or grammatical information in dictionaries.	<---	Explicit	.785	.562
Q33. I use my mother tongue or other languages I know to understand and remember grammar rules.	<---	Explicit	.721	L
Q34. I try to discover grammar rules by analyzing examples.	<---	Explicit	.796	L
Q38. I analyze diagrams, graphs and tables to understand grammar.	<---	Explicit	L	.600
Q46. I use newly learnt rules to create new sentences (to write about my plans).	<---	Implicit	.789	.788
Q47. I try to use grammar rules as soon as possible in a meaningful context (e.g., use them in my speech and writing).	<---	Implicit	.857	.812
Q48. I try to use whole phrases containing specific structures in my speech.	<---	Implicit	.860	.760
Q49. I notice (or remember) a structure which, when I encounter it, causes me to do something, like check a box, choose a drawing or underline a structure.	<---	Implicit	.800	L
Q50. I try to adjust the way I process spoken and written language in accordance with L2 spoken and written rules (e.g., in the case of some passive voice sentences).	<---	Implicit	.840	.545
Q53. I listen carefully for any feedback the teacher gives me about the structures I use.	<---	Feedback	.792	.764
Q54. I pay attention to teacher correction when I do grammar exercises and try to repeat the correct version.	<---	Feedback	.836	.800
Q55. I try to notice and self-correct my mistakes when practicing grammar.	<---	Feedback	.875	.740
Q56. I try to negotiate grammar forms with the teacher when given a clue (e.g., a comment about the rule).	<---	Feedback	.751	.623
Q57. I notice when I am corrected on grammar in spontaneous communication (e.g., when giving opinions).	<---	Feedback	L	.684
Q58. I try to notice how the correct version differs from my own and improve what I said.	<---	Feedback	.825	.766
Q62. I give myself a reward when I do well on a grammar test.	<---	Affective	.659	.582

Q64. I talk to other people about how I feel when learning grammar.	<---	Affective	.756	.650
Q65. I keep a language learning diary where I include comments about language learning.	<---	Affective	.452	.716
Q66. I ask the teacher to repeat or explain a grammar point if I do not understand.	<---	Social	.805	.787
Q67. I ask the teacher or more proficient learners to help me with grammar structures.	<---	Social	.860	.760
Q68. I like to be corrected when I make mistakes using grammar structures.	<---	Social	.747	.584

Note: L = Low Loading