# By Enhancing Students' Ability to Solve Problems Improving L2 Students' Writing Performance: A Quasi-Experimental Study

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## Abstract

This quasi-experimental study investigated the effectiveness of the Attribute Listing Approach (ALA) in improving second language (L2) writing performance and writing self-efficacy. A total of 41 international learners of Chinese as a second language were assigned to either an experimental group (n = 22), which received ALA-based instruction, or a control group (n = 19), which received traditional writing instruction over an eight-week period. ALA consisted of four stages: attribute listing, sentence expansion, peer feedback, and iterative revision. Data were collected through pre- and post-intervention writing tests, a validated writing self-efficacy questionnaire, and post-intervention interviews. Quantitative results revealed statistically significant improvements in the experimental group's writing structure and content (p < 0.05), as well as increased self-efficacy in ideation and self-regulation, though language accuracy showed no significant gains. Qualitative findings further illustrated that ALA fostered deeper thinking, collaborative engagement, and enhanced problem-solving strategies. These findings suggest that ALA offers a promising pedagogy that fosters cognitive engagement and supports learners in tackling complex writing tasks. However, its limited impact on linguistic accuracy indicates a need for supplementary grammar-focused instruction.

## 1. Introduction

As a vital component of language learning, writing plays a crucial role in second language (L2) acquisition. Both in academic and everyday contexts, writing serves as a key means of communication and expression (Javadi-Safa, 2018). In the past, L2 writing instruction primarily employed methods such as product-based, process-based, genre-based, and task-based approaches, which have achieved remarkable accomplishments but also exhibit certain limitations. For instance, the product-based approach emphasises writing outcomes (Furneaux, 1999) but neglects the cognitive processes and creativity involved in writing, thus depriving students of opportunities to further enhance their expressive abilities and creativity (Prodromou, 1995; Yan, 2005). The process-based approach focuses on the writing process, yet students may get trapped in a cycle of free expression (Hyland, 2003), overlooking the quality of writing outcomes. The task-based approach emphasises real-life tasks (Long, 2016), but it has limitations in enhancing students' language expression abilities (Widdowson, 2003). The genre-based approach emphasises the writing norms of different genres but lacks teaching methods tailored to the differences among individual students (Hyland, 2004). With the advent of the post-method era proposed by scholars, composition instruction no longer advocates specific teaching methods but instead promotes the comprehensive use of multiple methods, prioritising writing outcomes over teaching methods (Pennycook, 1989; Prabhu, 1990). Nevertheless, L2 writing remains a daunting challenge for both teachers and students (Damavandi et al., 2018; Hyland, 2019; Moses & Mohamad, 2019; Shah et al., 2023; Siddiqui et al., 2023).

As a writing teacher for students with Chinese as an L2, I frequently encounter situations such as this in the classroom: 'I can't think of anything to write about'. However, when I extend the writing topics to areas that interest the students, surprisingly, their compositions can be quite rich. This situation prompted me to reflect on whether we can consider an approach that goes beyond merely teaching the conventions of specific genres of writing. Instead, we could focus on imparting the underlying logic of writing to students and nurturing their ability to tackle complex problems, thereby equipping them to address situations where writing becomes challenging or produces limited output. After a period of teaching exploration, I developed a method called the Attribute Listing Approach (ALA). This creative thinking

approach breaks down complex tasks into specific attributes or features, helping students clarify their thinking and solve problems.While some studies have examined the role of creative thinking in second language writing, few have explicitly included problem-solving skills as a core component of writing instruction. This study provides a unique perspective on improving second language writing proficiency and fills the research gap.

To examine the practical effectiveness of this teaching method, I initiated an eight-week teaching experiment in September 2023. By comparing the performance of students in the experimental group with those in the control group, and conducting in-depth interviews with students, the impact of this teaching method on L2 learners was explored.

## 2. Literature Review

This section begins by elucidating the mainstream approaches to L2 writing instruction, tracing their theoretical origins, summarising their relevant characteristics, and exploring their strengths and limitations. These traditional pedagogical methods offer valuable insights for the development of novel instructional approaches. Subsequently, we introduce ALA, delineating its historical development and elucidating its theoretical underpinnings rooted in the theories of 'decomposition', which lay the groundwork for the successful implementation of this instructional method. Lastly, we delve into research on writing self-efficacy, as it is recognised as a significant factor influencing writing performance. Thus, we contend that examining changes in student's writing self-efficacy is reasonable, when evaluating the potential benefits of an innovative instructional approach on students' writing performance.

*2.1 L2 Writing Instruction*

2.1.1 Product-based Approach

The product-based approach, which emerged in the 1960s, stems from Western pedagogical traditions such as the formalist approach and the current-traditional approach to writing instruction. The former emphasises the intrinsic form of texts, particularly grammar, asserting that the fundamental elements of excellent writing lie in the correctness of sentence structure. Conversely, the latter focuses on the 'products' generated by writing behaviours, with particular attention to vocabulary, sentence, and paragraph levels of discourse. Thus, the product-based approach regards writing as the 'product' of writing behaviour closely intertwined with language knowledge, emphasising the correct application of vocabulary, syntax, and cohesive devices.

Guided by the product-based approach, writing instruction emphasises teaching content such as vocabulary, grammar, sentence structure, and discourse. Teachers prioritise developing students' abilities regarding word choice and sentence construction, focusing on grammar knowledge and sentence composition exercises, while imparting knowledge of discourse structures and engaging in text production (Nunan, 2003). The entire writing instruction process is teacher-centred, with teachers leading classroom activities including providing explanations, selecting supplementary materials, and organising writing tasks (Hyland, 2003). The transmission of teaching information is unidirectional and closed, with minimal active responses from students to instructional information; writing feedback is primarily based on teachers' evaluations, with relatively limited student-to-student interaction (Palpanadan et al., 2014). Additionally, the product-based approach emphasises imitation exercises, particularly highlighting substitution exercises, to help students imitate correctly . This monitored imitation facilitates smoother practise for students.

As evident from the above discussion, writing instruction under the guidance of the product-based approach exhibits a characteristic of complete teacher dominance, with students engaging in exercises and drills on vocabulary, sentence structure, grammar, and discourse, independently completing the exercise in one sitting, and ultimately receiving language-based feedback from the teacher. Silva (1990) pointed out that this approach views L2 writing as a habitual exercise in which students merely practise language structures, while the teacher's focus primarily lies in the formal features of language. Consequently, scholars have criticised this approach. For instance, Donovan and McClelland (1980) argued that student writing under this approach amounts to a mechanical replication of specific discourse structures and styles, while Prodromou (1995) suggested that it underestimates students' linguistic and personal potential. Additionally, some scholars have noted that the feedback in this approach overly emphasises grammatical errors while neglecting to inspire and improve students' thinking, content, and structural aspects of writing (Badger & White, 2000; Furneaux, 1999; Yan, 2005).

However, the product-based approach has its merits. Arndt (1987) argued that the explanation of model texts and imitation of these texts can benefit students' writing. Badger and White (2000) pointed out that the emphasis on inputting and imitating the language required for writing helps improve students' language proficiency and writing skills. Furthermore, Myles (2002) suggested that learning from model texts can help reduce writing errors. Although, in terms of the writing perspective, the product-based approach is not aligned with the requirements of modern writing instruction, its emphasis on inputting language knowledge and learning from model texts for imitation still holds some value for L2 writing instruction.

### 2.1.2 Process-based Approach

The process-based approach, proposed in the late 1970s to early 1980s, emerged under the influence of cognitive psychology and communication theory as a method for writing instruction. Its theoretical foundation lies in cognitive psychology and socio-cultural theory, emphasising that writing is a complex, iterative process rather than a simple linear act (Arndt, 1987). At the core of this approach is the idea of enhancing students' writing abilities by helping them better understand and comprehend the writing process.

Guided by the process-based approach, the instructional process prioritises the development of students' writing processes and skills, rather than solely focusing on the importation and application of language knowledge. Teachers are dedicated to guiding students through the entire writing process, from prewriting and planning to drafting, revising, and ultimately producing a final draft, progressively enhancing their writing abilities (Raimes, 1983; Zamel, 1983). In the instructional process, students are regarded as independent writers, with emphasis on discovering and nurturing their inherent writing thoughts and skills. Teaching activities emphasise interactive communication between teachers and students, as well as among students, to facilitate the improvement of writing abilities (Myles, 2002). Additionally, the process-based approach emphasises the positive role of feedback and revision in writing, encouraging students to revise their drafts multiple times to continually refine their manuscripts. Through feedback and revision, students can better develop their ideas and language expression abilities, thereby improving their writing proficiency (Badger & White, 2000; Cumming, 1989).

However, the process-based approach is criticised for not adequately emphasising the language knowledge required for writing, focusing excessively on the fluency of idea expression while neglecting the accuracy of language expression. In instructional practise, this approach often lacks emphasis on learning from model texts, which may result in students encountering difficulties in organising their writing structures. Furthermore, it tends to apply the same writing process to different genres of writing, overlooking the distinct characteristics and requirements of various genres. Additionally, Hyland (2003) stated that this approach overemphasises the free expression of writers' individual thoughts while neglecting social, cultural, and other factors that constitute the meaning of writing. Overall, compared with the product-based approach, the process-based approach has identified the essence and purpose of writing, correcting the developmental direction of writing instruction and exerting a profound influence on subsequent writing pedagogy.

### 2.1.3 Genre-based Approach

The genre-based approach, originating in the 1990s, stems from the Western writing theory of discipline-centred pedagogy, which emphasises rhetoric, logic, and language. Under this approach, various model texts are utilised in the classroom to enhance students' accuracy and expressive abilities regarding logic, grammar, sentence structure, vocabulary, usage, and style. The genre-based approach refers to a pedagogical method in writing instruction based on genre and genre analysis theories. Teachers instruct students in specific genre writing by focusing on the schematic structure of particular genres (Hyon, 1996). This approach aims to enable students to understand the communicative purposes and discourse structures of different genres (Miller, 1994), acquire the methods and techniques necessary for writing these genre discourses, and recognise that discourse construction involves not only linguistic but also social meaning construction. Mastering genre schematic structures and understanding the discourse construction process aid students in writing discourse specific to particular genres.

The genre-based approach emphasises a thorough understanding of the social functions and discourse structures of target genres, highlighting the purposiveness of writing. This method prioritises the interpretation of schematic structures and writing techniques of different genre discourses, integrating relevant language knowledge to provide students with clear writing guidance and examples, thus aiding in improving students' writing proficiency. However, it may restrict students' creativity by excessively relying on imitating model texts, leading to a trend towards homogeneity in their work. Additionally, the emphasis on mimicking discourse structures and practising language knowledge may render teaching activities mechanical and rigid, limiting students' imagination and creative expression. Simultaneously, similar to the task-based approach, the genre-based approach also faces challenges in fully encompassing the diverse array of genres present in real-life situations, thus making it difficult to cover all possible writing tasks comprehensively in the classroom (Badger & White, 2000; Derewianka, 2003; Hyland, 2004).

### 2.2 Attribute Listing Approach

#### 2.2.1 Attribute Listing Technique

The key to ALA lies in the attribute listing technique (ALT), which originates from the field of creative thinking. It was initially proposed by Professor Robert Crawford of the University of Nebraska in 1954 and is a well-known creative thinking strategy. This technique emphasises the observation and analysis of various features or attributes of objects or problems during the creative process. It involves systematically listing these features and proposing concepts for

improving or modifying each feature. For example, when developing a new candy product, key elements such as shape, colour, filling, and packaging could be considered, leading to improvements in each aspect. This creative thinking strategy is widely applied in the business field, such as in clothing design (Liu & Suh, 2021) and business operation strategies (Rao & Das, 2002; Voehl, 2016).

To the best of our knowledge, no study has empirically explored this technique in the field of language. However, Rimm et al. (2018) argued that ALT is simple and effective in addressing and solving attribute-related problems. This technique provides students with concrete ideas, helping to narrow down broad topics to manageable scopes, focusing on specific attributes, and guiding them in selecting meaningful writing directions (Chambless & Bass, 1995). Additionally, it provides a unique thinking approach for generating concepts and sources of information, thus promoting further reflection, exploration, and speculation. This helps learners organise their thoughts and trains them to use mental frameworks to construct their knowledge (Minsky, 1974), thereby facilitating the creation of content-rich articles. Therefore, we believe that this technique as a teaching method will enhance learners' writing abilities

2.2.2 Decomposition Theory

In the field of cognitive science, decomposition theory is regarded as a weak method for addressing the complexity of partially structured problems (Simon, 1969), classified as a problem simplification technique (Volkema, 1983). The task decomposition approach describes the system under study as a series of interacting tasks or processes. When a task is too complex to be directly described, this method allows it to be broken down into two or more subtask sequences, facilitating the description of these subtasks (Sloof & Everest, 2001). Thus, 'decomposition' is a method of breaking down complex tasks or problems into manageable parts. This decomposition can occur at different levels, such as breaking a problem down into multiple sub-problems or breaking a solution down into a series of simple operations or steps. This method primarily aims to enhance the understanding of complex problems, improve problem-solving efficiency, and reduce the difficulty of problems by breaking them down into manageable components.

This theory aligns with the core concept of 'divide and conquer' in ALTs (Cramond, 2005; Starko, 2021). In writing, this means breaking down the composition topic or problem into a series of attributes or aspects and then considering and analysing each of these attributes separately. Through this approach, we can consider problems more comprehensively, fostering deeper and more organised thinking among students. Moreover, this decomposition strategy helps reduce cognitive load during student writing, allowing one to think more clearly about each component and gradually determine a complete solution after addressing each small problem.

*2.3 Writing Self-Efficacy*

Self-efficacy is considered a critical concept in the social cognitive theory of learning, referring to an individual's confidence and belief in organising and executing necessary actions to achieve specific performance outcomes (Bandura, 1986). Writing self-efficacy pertains to students' confidence and beliefs in their writing abilities (Pajares et al., 2001). Existing research has shown that writing self-efficacy is closely related to the writing performance of L2 learners (Chen & Zhang, 2019; Sun & Wang, 2020; Teng et al., 2018; Xu et al., 2023; Zabihi, 2018). The level of confidence and self-assurance students exhibit during the writing process directly impacts their writing motivation, persistence, and eventual writing outcomes. Students with positive writing self-efficacy are better able to adapt to the demands of writing tasks, employ various strategies to sustain their learning process, and emotionally prepare themselves for learning, resulting in better writing performance (Bruning et al., 2013; Teng et al., 2018).

Furthermore, writing self-efficacy mediates writing outcomes through mechanisms such as reducing anxiety levels (Woodrow, 2011), enhancing interest (Hidi et al., 2002), eliciting more self-regulatory strategies (Zhang & Zhang, 2024), and increasing writing time. Overall, a substantial body of research consistently confirms the positive impact of writing self-efficacy on improving students' writing performance (Han & Hiver, 2018; Sun & Wang, 2020; Zabihi, 2018). Therefore, while exploring innovative teaching methods to enhance the writing performance of L2 learners, it is also necessary to pay attention to changes in students' writing self-efficacy.

We conducted a pedagogical experiment employing ALA as an intervention measure, aiming to investigate its effects on the writing quality and self-efficacy among Chinese as a second language (CSL) learners. The specific research inquiries are delineated as follows:

1. What impact does ALA exert on the writing performance (regarding language usage, structure, and content) of CSL learners?

2. Does ALA enhance the writing self-efficacy of CSL learners?

3. What impact does ALA have on students?

## 3. Method

### 3.1 Participants

The teaching experiment was conducted at a university in eastern China, where two third-year classes majoring in Chinese language were selected using a whole-class sampling method. These two classes were selected because the students' overall Chinese proficiency levels were similar and they all had to improve their writing skills. To obtain more experimental data, we designated the larger class as the experimental group (n=22), while the control group comprised 19 students, totalling 41 participants. Their average age was 25 years (MD=24.63, SD=3.77), with 30 women and 11 men, indicating an imbalance in the gender ratio. This disparity may be attributed to the tendency of disciplines falling under the purview of education or humanities, such as language studies, attracting more female students in China. These participants came from diverse international backgrounds, including Korea, Vietnam, Poland, Japan, and Russia, resulting in significant differences in their language backgrounds.

Before beginning the experiment, we provided all students with an overview of the experiment's procedures and objectives and sought their feedback. All participants signed informed consent forms, and none withdrew from the experiment throughout its duration. Owing to reasons related to COVID-19, one student from the control group was absent during the post-test. However, this student later completed a makeup examination remotely, ensuring the completeness of the data.

### 3.2 Evaluation Rubrics and Rater

We developed a scoring rubric for assessing the quality of students' Chinese writing. This rubric was adapted from the Chinese Proficiency Test essay scoring guidelines (see Appendix A1) and the commonly used complexity, accuracy, and fluency analysis framework in L2 acquisition (Housen & Kuiken, 2009; Liao, 2021; Vercellotti, 2017). It primarily comprises three components:

- Language Usage: This aspect examines the textual output, focusing on assessing the richness and diversity of vocabulary usage, evaluating language accuracy based on grammatical and lexical errors, and applying scoring principles to language form errors.

- Structure: Within the essay, this aspect assesses learners' clarity of internal-level reasoning, hierarchical paragraphing, and other cognitive activities related to essay organisation, with corresponding evaluation and scoring.

- Content: This aspect evaluates learners' cognitive activities related to essay content, including clear and accurate articulation of the topic, adherence to the requirements of the topic, richness of content, and depth of perspective.

This scoring rubric aims to provide a comprehensive evaluation framework that encompasses language proficiency, structural coherence, and thematic development in students' writing, thereby facilitating a more nuanced assessment of their Chinese writing abilities.

Two unrelated Chinese language instructors participated in the scoring process. They underwent proficient rater training (Wolfe et al., 1998) and utilised the newly developed essay scoring criteria. To minimise potential time discrepancies' influence on pre-test and post-test scores, all scoring procedures were uniformly conducted after the experiment's conclusion. Test papers from both testing occasions were mixed and randomly distributed. Evaluators rated the papers across three dimensions—language usage, structure, and content—using a Likert 5-point scale, where 1 denoted very poor performance and 5 indicated excellent performance, with a total score of 15. To assess inter-rater reliability, we utilised the kappa coefficient and interpreted the values according to the standards outlined by Rigby (2000) and Fleiss and Cohen (1973). The kappa values for the two evaluators ranged between 0.752 and 0.896 (Table 1), indicating the rater's ratings were trustworthy.

Table 1. Kappa value between raters

| | Pre-test scores | | | Post-test scores | | |
|---|---|---|---|---|---|---|
| | Language Usage | Structure | Content | Language Usage | Structure | Content Kappa |
| value | 0.785 | 0.779 | 0.896 | 0.815 | 0.752 | 0.766 |

### 3.3 Data Collection and Analysis

The study employed a triangulation approach for data collection and analysis, encompassing both quantitative and qualitative data (Archibald, 2016). Quantitative data consisted of writing test papers and survey questionnaires administered to participants before and after the intervention. Qualitative data comprised post-intervention interviews conducted with students at the end of the experiment.

The writing test papers were meticulously crafted based on the instructional materials, with input sought from subject-matter experts to ensure the appropriateness of question selection and formulation. This design approach ensured that the test questions had a suitable difficulty level and aligned with the content of the instructional materials, thus making them apt for assessing students' proficiency in Chinese writing.

The Writing Self-Efficacy Questionnaire (WSEQ), adapted from Bruning et al. (2013), comprises 15 items organised into three key dimensions (see Appendix A2): ideation (Q1–Q5), conventions (Q6–Q10), and self-regulation (Q11–Q15). These dimensions serve as critical criteria for assessing writing behaviour. 'Ideation' pertains to generating innovative ideas; 'conventions' focuses on proficiently expressing viewpoints using language; and 'self-regulation' evaluates how effectively students adjust themselves during the writing process, making cognitive and linguistic judgments. Participants utilised a 5-point Likert scale to respond to the 15 survey items, with 1 indicating 'strongly disagree' and 5 indicating 'strongly agree'. To ensure participants' easy comprehension of the questionnaire content, all items were presented in both Chinese and English. Overall, the questionnaire demonstrated good reliability, with a Cronbach's alpha coefficient of 0.961. The reliability coefficients for the three dimensions were 0.956, 0.871, and 0.919, respectively, indicating sufficient reliability of the questionnaire in measuring students' writing self-efficacy (McNeish, 2018).

After the experiment concluded, semi-structured interviews were conducted with nine students who volunteered to participate.. The interviews were conducted online via WeChat, a commonly used communication tool in China, with each session lasting approximately 20 minutes. Subsequently, the textual and voice messages from the interviews were transcribed into text format for further analysis.

For the quantitative data collected, we utilised SPSS Statistics 28 software to conduct independent $t$-tests (Ruxton, 2006), comparing the experimental group with the control group regarding both test score performance and survey results. Homogeneity among participants was confirmed by analysing differences between pre-test scores, while the impact of ALA on students' writing performance and self-efficacy was assessed by comparing post-test differences. Subsequently, the relationship between the WSEQ and writing performance was examined through Pearson correlation coefficient analysis (Hauke & Kossowski, 2011). Finally, Cohen's $d$ value was computed to gauge the magnitude of ALA's effect, thereby addressing the first and second research questions (Goulet-Pelletier & Cousineau, 2018). Furthermore, regarding the qualitative textual data collected, initial open and inductive coding was conducted using NVivo software (Miles & Huberman, 1994). Relevant keywords/phrases pertaining to the influence of ALA on students' writing were identified within the interview transcripts. By employing the constant comparison method (Strauss & Corbin, 1990), data analysis was conducted iteratively and holistically, facilitating comparisons among students and enabling us to address the third research question.

### 3.4 Procedures

The experiment lasted eight weeks, with participants attending two 90-minute Chinese writing classes per week. Both groups of students used the same instructional materials. The schedules for the control group and the experimental group were identical; however, the design of their instructional activities differed. The control group did not receive any experimental treatment during writing tasks. Students in this group received outcome-oriented guidance in a relatively traditional manner, with teachers assigning writing tasks and requirements and learners completing tasks independently. By contrast, the experimental group participated in ALA instructional activities designed by researchers. Typically, ALA instruction includes the following four activities:

a.  Listing the key attributes of the topic: Students list the key attributes related to the topic in their minds, which could be anything of interest to them. The more attributes listed, the better the outcome. At this stage, students only need to write down single words. Below is an example of attributes listed during a composition class:

  - Topic: My hometown
  - Listed attributes: Scenery, climate, tourism, food, emotions, special festivals. (S1)

b.  Students further elaborate on attributes selected from the listed terms by constructing simple sentences. Subsequently, they revisit the existing sentences to enumerate additional attributes and provide detailed descriptions, gradually forming paragraphs. This iterative process aids them in progressively refining and enriching their writing content. At this stage, students are expected to produce lengthy sentences. Below are attributes and descriptions provided by a student.

  - Attribute: Climate
  - Description: Bandung falls within the tropical climate zone. (S2)
  - Listed Attributes + Description: Bandung is situated on a plateau, characterised by a tropical climate,

resulting in distinct wet and dry seasons. Surrounded by mountains, the city enjoys a pleasant temperature, neither too cold nor too hot. (S2)

c.  Prompt feedback, whether from teachers or peers, is essential. It highlights the strengths of a student's work and areas for improvement. This feedback fosters a culture of continuous improvement, making students aware that writing is an iterative process. It encourages them to exchange ideas, thereby making the writing process more engaging and enriching. Below is an example of the listed attributes and description provided by a student, followed by the feedback they received and the subsequent modification to the composition.

- Listed Attributes + Description: Jakarta, Indonesia, experiences a tropical monsoon climate characterised by two distinct seasons: the rainy season and the dry season. During the rainy season, frequent rainfall brings a cooler sensation, whereas the dry season is marked by minimal precipitation, resulting in dry atmospheric conditions. (S3)

- Peer Feedback: Your description of the climate is quite precise. You could further enhance it by describing the physical sensations experienced under this climate. This would allow readers to empathise and feel as if they are experiencing it themselves.

- After Modification: However, for those who have lived in Jakarta for many years, the climate can feel persistently hot, akin to an eternal summer, becoming uncomfortable. (S3)

d.  To provide ample practise opportunities for students to gradually master ALA through practical exercises, students are required to provide lists and descriptions of multiple attributes. They are then guided through the gradual integration of these attributes, organising them into a cohesive paragraph. This process helps students understand the logical relationships between various attributes, including causal relationships, comparisons, and sequential relationships. This aids them in better organising content in their writing, ensuring logical coherence. Figure 1 illustrates the entire process of constructing an article.
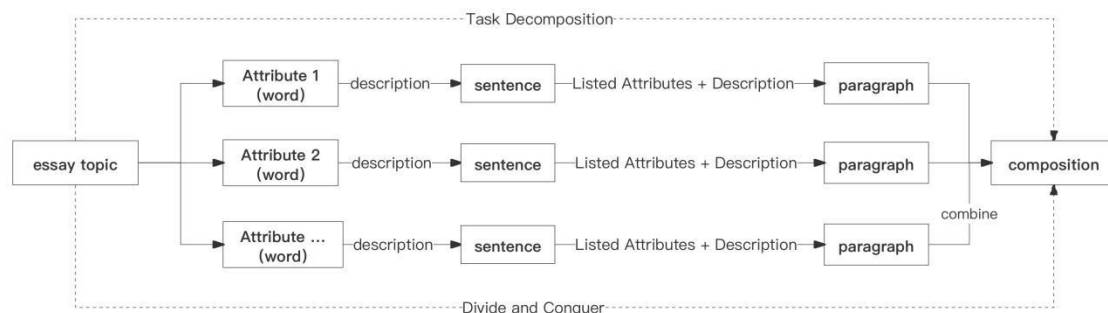


Figure 1. Schematic diagram of the attribute listing technique

The four activities primarily revolve around two core concepts of ALA: 1) listing and describing and 2) sharing and revising. The former significantly reduces the difficulty of student writing by progressively providing a learning pathway. Students complete different levels of writing tasks step by step, enabling them to experience the joy of success at each stage, thus enhancing their confidence in writing. The second concept makes students realise that writing is not an instantaneous process (Zamel, 1983); through sharing, they continuously broaden their perspectives, increase their acceptance and understanding of others' opinions, and simultaneously improve based on feedback. Revising is a continuous process of refinement, making the work more concise and clearer through repeated deliberation and correction (Brown & Lee, 2015). Throughout the sharing and revising process, students also develop critical thinking and teamwork skills, which are crucial for their future learning and career development.

## 4. Results

### 4.1 Results of the Quantitative Data

According to the results of an independent *t*-test (Table 2), there was no significant difference between the pre-test scores of the writing performance and self-efficacy questionnaire. This finding further confirms the validity of our sample selection, indicating that students from the two classes have similar Chinese proficiency levels, which serves as the foundation of the experiment's homogeneity.

Table 2. Results of the pre-test *t*-test

|  | | EG (n=22) | CG (n=19) | | |
|---|---|---|---|---|---|
|  | Dimensions | MD±SD | MD±SD | *t* | *p* |
| Writing Performance | Language usage | 3.70±0.91 | 3.61±0.79 | 0.370 | 0.713 |
|  | Structure | 3.59±0.61 | 3.50±0.58 | 0.488 | 0.629 |
|  | Content | 3.57±0.98 | 3.58±0.82 | -0.038 | 0.970 |
| WSEQ | Ideation | 3.75±0.60 | 3.63±0.57 | 0.670 | 0.507 |
|  | Conventions | 3.69±0.44 | 3.75±0.40 | -0.423 | 0.675 |
|  | Self-regulation | 3.70±0.36 | 3.58±0.45 | 0.962 | 0.342 |

*$p < 0.05$;EG=Experimental Group,CG=control group

The post-test scores for writing performance (Table 3) indicated that the experimental group outperformed the control group significantly across all dimensions. This suggests an improvement in the writing proficiency of the experimental group following the ALA intervention. Further *t*-test results also supported the statistical significance of differences in both the structure and content dimensions (Structure: $t$=2.050, Content: $t$=2.496; $p < 0.05$). However, no significant improvement was observed in the language usage dimension. We speculate that ALA, through the enumeration of topic-relevant attributes, stimulates a broader and deeper level of student reflection, guiding students to clarify the logical relationships between various attributes, thus benefiting their structure and content. Although the teaching materials also include model essays, their primary function is to assist students in intuitively grasping the method of attribute enumeration, with limited guidance on language and grammar accuracy. This result is consistent with the convention dimension involving accuracy in the questionnaire test (e.g. Q7. I can write complete sentences, Q9. I can write grammatically correct sentences), which also showed no significant difference (Conventions: $t$=0.319, $p > 0.05$). Meanwhile, a significant improvement was observed in the dimensions of ideation (e.g. Q3. I can think of many words to describe my ideas) and self-regulation (e.g. Q13. I can start writing assignments quickly) (Ideation: $t$=2.303, Self-regulation: $t$=2.291; $p < 0.05$). This indicates that under ALA guidance, students' creative thinking abilities and self-regulation capabilities are strengthened, thereby promoting more creative thinking and the application of learning strategies and skills, thus enhancing their confidence in writing.

Table 3. Results of post-test *t*-test

|  | Dimensions | MD±SD | MD±SD | *t* | *p* |
|---|---|---|---|---|---|
| Writing Performance | Language usage | 3.75±0.75 | 3.58±0.84 | 0.689 | 0.495 |
|  | Structure | 4.05±0.51 | 3.71±0.54 | 2.050 | 0.047* |
|  | Content | 4.16±0.50 | 3.74±0.59 | 2.496 | 0.017* |
| WSEQ | Ideation | 4.19±0.77 | 3.67±0.65 | 2.303 | 0.027* |
|  | Conventions | 3.77±0.52 | 3.73±0.40 | 0.319 | 0.752 |
|  | Self-regulation | 3.96±0.49 | 3.61±0.49 | 2.291 | 0.027* |

*$p < 0.05$;EG=Experimental Group,CG=control group

Additionally, Pearson correlation data revealed a significant positive correlation (correlation coefficient value of 0.730, $p < 0.01$; see Table 4) between the average scores of the WSEQ post-intervention and writing performance. This finding further corroborates that ALA enhances both students' writing performance and their writing self-efficacy.

Table 4. Results of the Pearson correlation coefficient

|  | Questionnaire mean values |
|---|---|
| Total Writing Score | 0.730** |

**$p < 0.01$

To evaluate the specific extent of ALA's impact on enhancing students' writing abilities, we utilised the total score data of participants before and after the tests and computed Cohen's *d* value as 0.687 (Table 5). Following Cohen (2013) delineation, the critical points distinguishing small, medium, and large effect sizes were 0.20, 0.50, and 0.80, respectively. Consequently, based on the obtained effect size value of 0.687, we concluded that ALA demonstrates a moderate level of effectiveness in enhancing L2 students' writing abilities.

Table 5. Effect size results for ALA

| EG (n=22) | | CG (n=19) | $t$ | $p$ | $df$ | Cohen's $d$ |
|---|---|---|---|---|---|---|
| Total Writing Score 11.95±1.49 | 11.03±1.17 | | 2.194 | 0.034* | 39.000 | 0.687 |

*$p < 0.05$; EG=Experimental Group, CG=control group

### 4.2 Results of the Qualitative Data

Our analysis of student interviews through text transcription and coding revealed three benefits of ALA for students: 1) enhanced inspiration and deep thinking, 2) emphasis on communication and feedback, and 3) improved problem-solving skills.

#### 4.2.1 Enhanced Inspiration and Deep Thinking

Most students expressed that ALA facilitated multidimensional deep thinking through the enumeration of attributes, as evidenced by the following quotations:

- I find it to be an incredibly useful tool, helping me to clarify my thoughts more rapidly and generate deeper and more creative ideas. (S3)

- It prompts me to focus more on organising and elaborating my thoughts, rather than just skimming the surface. Considering the implications behind each sentence I write makes me feel like it will add depth and uniqueness to my compositions. (S5)

- It encourages me to pay closer attention to details and comprehensiveness, as I strive to enumerate various attributes and characteristics of a topic as comprehensively as possible, thus expanding the scope of my thinking. (S6)

- As I was writing an article on environmental pollution, I began enumerating various attributes of pollution, such as air pollution, water pollution, and noise pollution. Suddenly, I realised that traffic congestion in cities and emissions from factories are major contributors to air pollution, and plastic waste in water bodies poses a threat to marine life. These insights enriched the content of my article, making it more vivid and compelling. Moreover, they prompted me to contemplate the significance of environmental conservation. (S9)

#### 4.2.2 Emphasis on Communication and Feedback

All students unanimously acknowledged the profound importance of communication and feedback in this instructional activity. As expressed by S5, in an assignment on the topic of 'my hometown', the sample essay depicted the seasonal changes in their hometown.

> However, being from Thailand, I was only familiar with the hot summer season and struggled to write about other seasons. Yet, one of my classmates suggested that I could write about unique attractions in Thailand, since she had always dreamt of traveling there. This suggestion was truly enlightening for me, prompting me to imagine Thailand's stunning landmarks like the Grand Palace in Bangkok. It made me realize that I could forgo descriptions of seasons I'm not familiar with and instead focus on depicting scenes I know well. By describing these attractions, I shared the unique scenery and culture of Thailand, allowing readers to gain a deeper understanding of my hometown.

Similarly, S2 mentioned that when faced with unfamiliar topics, they engaged in discussions with peers:

> Sometimes, a casual remark from a peer can provide me with significant inspiration.

Additionally, S8 stated that when confronted with abstract or complex topics, they sought assistance from teachers and peers:

> Sometimes I find it challenging to determine which attributes to enumerate, so I seek advice and opinions from others. Discussing with classmates or teachers can help me gain more inspiration and ideas.

S4 highlighted that sometimes, when the writing became overly verbose, they sought solutions through peer discussions:

> Sometimes I get too caught up in the details due to familiarity with the topic, resulting in exceeding the word count with just one paragraph. However, through repeated discussions with classmates, adjustments, and revisions, we eventually produce a satisfactory article.

#### 4.2.3 Improved Problem-solving Skills

The core pedagogical principle of ALA entails the decomposition of complex issues into smaller, manageable components, subsequently addressing these incremental challenges to ultimately resolve the overarching problem. Most

students unequivocally acknowledged ALA's efficacy in enhancing their analytical and problem-solving abilities. For instance, S7, employing the scenario of identifying a faulty bicycle, attested:

> Indeed, I find ALA to be instrumental. Upon discovering my bicycle malfunctioning on my ride home yesterday, my initial instinct was to deconstruct the bicycle's structure to pinpoint the issue. Though I'm not yet proficient in repair, I instinctively strategised towards resolving the problem.

Similarly, S1 articulated how ALA has alleviated the perceived difficulty of writing tasks:

> When confronted with challenging tasks, this approach proves highly effective. Initially overwhelmed by the task prompt, I gradually enumerate keywords and proceed step by step in my writing process, ultimately realising substantial content output. I believe I can now produce extensive written work; previously, encountering unfamiliar prompts often led to a propensity for surrender.

While students generally expressed a positive sentiment towards the ALA program, there were also discernible instances of negative feedback, primarily centred around concerns regarding potential impediments to writing progress due to excessive enumeration. Some of these sentiments are exemplified below:

- At times, I find myself engaging in excessive analysis, dedicating considerable time to enumerating details, which consequently impedes my ability to accurately articulate my thoughts. (S1)

- Spending time breaking down a topic into various attributes and subsequently enumerating them can sometimes leave me feeling a bit delayed and time-inefficient. This is especially true when I'm already familiar with the topic, as this approach may seem redundant, considering I could typically generate ideas quickly on my own. (S4)

- Overreliance on this technique may lead to rigidity in my writing, trapping me in a fixed mindset. Additionally, an excess of detailed description could result in lengthy articles, detracting from their clarity and conciseness. (S9)

These perspectives underscore a nuanced aspect of ALA: While the detailed breakdown of tasks can be beneficial in certain contexts, it may present challenges in maintaining writing efficiency and coherence. We have thoroughly considered these viewpoints and speculate that this issue can also be observed through the language usage scores in students' composition tests. ALA encourages students' deep thinking, resulting in longer compositions; it falls short regarding language precision, prioritising quantity over quality. Therefore, this will also be a focal point for future project optimisation. We are considering reducing both the frequency and duration of enumeration phases to enhance language usage.

## 5. Discussion

The experimental results indicate a significant positive correlation between writing self-efficacy and writing proficiency, aligning with the findings of Bruning et al. (2013), Zhang and Guo (2012), and Prat-Sala and Redford (2012). ALA intervention significantly enhances students' writing self-efficacy and proficiency. Writing self-efficacy facilitates writing performance, and the resulting higher achievement nurtures the development of writing self-efficacy (Robinson et al., 2022). We contend that this technique offers dual benefits in educational practise: It furnishes educators with a robust tool to guide students in enhancing their writing skills, aiding them in mastering practical writing knowledge and strategies (Gupta & Woldemariam, 2011). Concurrently, by encouraging students to experiment with novel writing techniques and strategies, it further bolsters their confidence in writing (Flower & Hayes, 1981; Silva, 1993).

Additionally, ALA provides students with beneficial writing techniques, stimulating inspiration and creative material acquisition through observing and analysing various attributes of phenomena (Rimm et al., 2018). By deconstructing intricate writing tasks, ALA cultivates students' problem-solving abilities, pivotal for academic learning and professional advancement (Astuti et al., 2021). Furthermore, through the attribute listing method, students engage in a process where they actively identify and list various characteristics or attributes of objects, events, or concepts in their daily lives. By integrating this practical exercise into language learning, students not only enhance their linguistic skills but also deepen their understanding of the world around them. This approach facilitates a seamless connection between theoretical knowledge and real-life application, fostering an organic amalgamation of learning and action. Hedge (2001) contended that writing becomes a meaningful learning process only when combined with learners' personal experiences.

ALA's emphasis on learners actively engaging in and constructing knowledge underscores the notion that learners are constructors of knowledge (Krahenbuhl, 2016). Through interaction with their environment, learners develop their understanding and meaning. At the core of this approach lies the involvement of students in task decomposition and attribute listing, which encourages comprehensive problem-solving, the establishment of cognitive frameworks, and the

practical application of understanding to problem resolution (Ackermann, 2004). This approach underscores learners' agency and involvement, placing significance on their ability to think critically, explore, and solve problems throughout the learning process. However, ALA's implementation also reveals certain shortcomings. One such flaw is the potential oversight of linguistic precision. While students may construct their cognitive frameworks through task decomposition and attribute listing, failure to accurately articulate their ideas, understandings, and solutions may impede effective communication and comprehension by others. Consequently, the implementation of ALA necessitates a comprehensive consideration of students' cognitive construction processes and linguistic expression abilities, ensuring not only the establishment of effective cognitive frameworks but also the clear articulation and communication of their ideas.

## 6. Conclusions

This study provides empirical evidence supporting the efficacy of the Attribute Listing Approach (ALA) as an innovative pedagogical intervention in L2 writing instruction. Through a quasi-experimental design, findings demonstrated that ALA significantly improved learners' writing structure and content quality, and enhanced their writing self-efficacy in ideation and self-regulation. The moderate effect size (Cohen's d = 0.687) further substantiates ALA's practical value in addressing cognitive and motivational challenges in L2 writing. However, the lack of significant improvement in language accuracy suggests that while ALA supports idea generation and organization, it should be supplemented with grammar-focused instruction to ensure linguistic precision.

The findings also underscore the importance of integrating cognitive strategy training with collaborative feedback in writing pedagogy. Moving forward, future research should investigate the long-term effects of ALA and its adaptability across different linguistic and cultural contexts, including its application to other L2 genres such as argumentative or academic writing. Additionally, studies employing larger and more diverse samples, as well as refined interventions that balance idea development with language accuracy, will be essential in fully realising ALA's potential and expanding our understanding of problem-solving-based approaches in second language writing instruction.

### Authors contributions

Not applicable.

### Competing interests

The authors declare no conflict of interest.

### Informed consent

Obtained.

### Ethics approval

The Publication Ethics Committee of the Redfame Publishing.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

### Provenance and peer review

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### Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

### Data sharing statement

No additional data are available.

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### A.    Appendix

### A.1 Chinese Proficiency Test Essay Scoring Guidelines

The Hanyu Shuiping Kaoshi (HSK), is an international standardised Chinese proficiency exam designed to assess the Chinese proficiency of learners whose native language is not Chinese. Level 6 is the highest level of the HSK exam. The scoring criteria for the composition section of the exam are outlined in Table A1.

Table A1: Chinese Proficiency Test essay scoring guidelines

| Dimensions | Description |
| --- | --- |
| Language use | Is the language used accurately? Is the language expression rich? |
| Structure | Are sentences and paragraphs coherent? Is the logic of the writing smooth and coherent? |
| Content | Is the content relevant? Is the content sufficient? |

### A.2 Writing Self-Efficacy Questionnaire

Table A2: Writing Self-Efficacy Questionnaire

Writing Self-Efficacy Questionnaire

1. I can think of many ideas for my writing.
2. I can put my ideas into writing.
3. I can think of many words to describe my ideas.
4. I can think of a lot of original ideas.
5. I know exactly where to place my ideas in my writing.
6. I can spell my words correctly.
7. I can write complete sentences.
8. I can punctuate my sentences correctly.
9. I can write grammatically correct sentences.
10. I can begin my paragraphs in the right spots.
11. I can focus on my writing for at least one hour.
12. I can avoid distractions while I write.
13. I can start writing assignments quickly.
14. I can control my frustration when I write.
15. I can keep writing even when it is difficult.