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Error Visualization Art: A Study on Mitigating English Learning Frustration through Grammatical Mistake Transformation Strategies—A Case Study of a Middle School in Taiyuan

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Abstract

In middle school English teaching, students often feel frustrated when confronted with grammatical mistakes, which affects their learning motivation and effects. On the basis of the demand for improving students' English learning experience and teaching quality, this study introduces an innovative way to transform grammatical mistakes into visual artwork. The study takes 320 middle school students from a middle school in Taiyuan as the research objects and adopts a questionnaire survey and work analysis as the research methods. This study aims to explore (1) the effects of a grammatical mistake transformation strategy on reducing students' grammar-related frustration and (2) the influence of flow experience in the creative process on the reconstruction of students' error cognition. The results show that error visualization can effectively reduce students' grammar-related frustration by helping them shift their mindset from “avoiding failure” to “appreciating growth trajectory” and provide new teaching strategies and ideas for middle school English teaching.

Keywords

error visualization, english learning frustration, grammatical-mistake transformation strategies

1. Introduction

1.1 Research Background

In middle school English learning, grammar is widely recognized as a challenging area for students. The English grammatical system is characterized by its highly structural, abstract, and complex nature, encompassing multiple rules, including tense, voice, subject–predicate consistency, and clause structures. In contrast, Chinese, as a typical analytic language, presents significant grammatical differences from English. This typological disparity imposes considerable cognitive load on Chinese students during their acquisition of English grammar, leading to frequent errors in exercises and examinations, such as wrong tenses, subject-predicate inconsistency, misuse of articles, inappropriate prepositional collocations, and so on. These errors not only influence the accuracy and fluency of language expression but also may hinder the development of students' reading comprehension, writing expression, and oral communication skills (Brown, 2017).

More importantly, repeated grammatical errors tend to trigger frustration and anxiety among students (Krashen, 1982). According to the affective filter hypothesis, when learners receive frequent negative feedback due to errors, their affective barriers are heightened, thereby inhibiting the effective absorption of language input (Dörnyei, 2005). In exam-oriented educational environments, teachers often prioritize error correction over analysing the root causes of mistakes. This approach predisposes students to develop negative attitudes toward grammar learning and may even lead to avoidance behaviors (Ellis, 2008). Over time, students' self-efficacy may decline, their motivation may gradually diminish, and ultimately, their overall English learning efficiency may be adversely affected (Bandura, 1997).

Traditional error-correction methods are predominantly confined to mechanical rectification, such as directly marking correct answers on test papers or requiring students to repeatedly copy correct sentence patterns (Nunan, 2003). While this approach may enhance short-term memorization of specific grammatical points, it lacks systematic analysis of error origins, making it difficult for students to construct a comprehensive cognitive framework of grammar (Larsen-Freeman, 2015). Furthermore, error correction exercises often neglect students' emotional needs, failing to effectively alleviate frustration caused by error accumulation and potentially reinforcing resistance to grammar learning (Dweck, 2006). Recent studies in educational psychology suggest that integrating artistic expression with learning processes can reduce learners' anxiety levels and enhance their cognitive engagement (Eisner, 2002). However, how to specifically apply this concept to the correction of English grammatical errors and emotional regulation still needs to be further explored.

On the basis of the above background information, this study proposes an innovative strategy termed “error visualization art,” which aims to transform students' grammatical errors through visual and artistic means, converting mere “error markings” into tangible and analysable “learning materials.” This method seeks not only to help students understand grammatical rules more intuitively but also to mitigate their frustration through creative activities, thereby fostering a positive attitude toward grammar learning. By targeting middle school students as participants, this research investigates the effectiveness of this strategy in reducing frustration associated with grammatical errors, with the goal of providing new theoretical and practical insights for English grammar teaching.

1.2 Literature Review

1.2.1 English Grammar Error Analysis and Teaching Strategy Research

As an important research area in second language acquisition, error analysis has served as an important foundation for improving grammar instruction since Corder (1967) established its systematic theoretical framework. Wang (2010) emphasized that error analysis should not only focus on surface-level error correction but also reveal the developmental patterns of learners' interlanguage. Through an analysis of middle school students' writing samples, Zhong (2012) identified three predominant error types: wrong tenses (36.7%), misuse of articles (28.4%), and subject–predicate inconsistency (22.1%). These findings corroborate Brown's (2017) “Grammar Sensitivity Hierarchy Theory,” which suggests that Chinese native speakers commonly exhibit cognitive blindness in English inflectional morphology.

With respect to intervention strategies, traditional error correction methods have significant limitations. Mere repetition of corrected exercises yields only short-term memorization effects, with an error recurrence rate as high as 62%. In contrast, Zheng (2019) pioneered a visualization approach that concretizes abstract grammar rules through mind mapping, improving learners' comprehension accuracy by 40%. This provides critical inspiration for the current study's “artistic transformation of errors” approach.

1.2.2 Psychological Mechanisms and Interventions of Learning Frustration

In academic discourse, frustration is defined as “a negative emotional state arising from goal obstruction” (Dollard et al., 1939). Zeng et al.'s (2024) longitudinal study demonstrated a significant positive correlation between grammar learning frustration and cortisol levels among middle school students, with perceived stress serving as a mediating factor affecting academic engagement. Gong's (1994) early educational experiment proved that reframing errors as “learning signposts” could reduce frustration by 37%, echoing Dweck's (2006) growth mindset theory across different eras.

Flow experience theory offers a fresh perspective. Csikszentmihalyi (1990) defined flow as “the optimal experiential state achieved through complete immersion in an activity,” characterized by clear goals,

immediate feedback, and a balance between skills and challenges. In language learning contexts, Egbert (2003) reported that when error correction activities incorporated appropriate artistic elements, learners' flow experiences increased by 2.3 times, providing direct support for the current study's artistic transformation hypothesis.

1.2.3 Research Gaps and Innovative Points of This Study

Through a systematic review of the literature, this study identified three critical research gaps that warrant further investigation:

(1) Insufficient attention to affective dimensions

Current studies on grammatical errors have focused predominantly on error correction mechanisms while neglecting in-depth exploration of learners' emotional experiences during the error correction process. Gong's (1994) research demonstrated that overlooking learners' affective needs may lead to diminished returns in correction effectiveness.

(2) Scarcity of Artistic Intervention Research

Research on transforming grammatical errors into artistic representations remains virtually nonexistent. Such artistic transformation may offer novel cognitive pathways for grammar learning.

(3) Deficiencies in Positive Learning Experience Research

Building upon Csikszentmihalyi's (1990) flow theory, positive psychological experiences during learning significantly impact learning outcomes. However, existing research (Egbert, 2003) has yet to systematically examine how to create this optimal experiential state within grammatical error correction contexts.

To address these research gaps, this study proposes the following innovative solutions:

(1) Dual-dimensional intervention strategy

This study implements a dual-pronged intervention approach that simultaneously addresses grammatical error correction while regulating learners' emotional states through artistic creation activities. This design draws upon Zeng et al.'s (2024) findings regarding the impact of affective factors on learning outcomes.

(2) Systematic Artistic Transformation Framework

This study develops a comprehensive artistic conversion protocol, including innovative methods such as visualizing tense errors as timeline narrative comics and transforming syntactic errors into visual collage artworks. This artistic processing modality transcends the limitations of traditional error management approaches.

(3) Flow State Measurement Integration

This study incorporates flow state measurement indicators to empirically validate the improvement effects of artistic interventions on learning experiences. While this innovation receives indirect support from Ludke's (2022) research on artistic language learning, it represents pioneering work in the specific domain of grammatical error transformation.

1.3 Research Questions and Objectives

1.3.1 Research Questions

This study addresses the following three specific research questions:

1. What specific forms of frustration do middle school students exhibit when they encounter grammatical errors?

2. Can converting grammatical errors into visual artworks (e.g., timeline comics, symbolic collages) effectively reduce students' frustration?

3. Do students experience flow states during artistic creation? Does this immersive state facilitate the cognitive reconstruction of grammatical errors?

1.3.2 Research Objectives

This study focuses on a critical issue in middle school English grammar teaching. On the basis of the current situation, such as middle school students' frustration caused by grammatical errors in English learning and the limitations of traditional error correction methods, this study aims to explore the effectiveness of the grammatical error transformation strategy in reducing students' frustration related to grammar errors, analyse the impact of the flow experience during the creative process on students' cognitive reconstruction of errors, and thus provide new strategies and ideas with both theoretical depth and practical value for middle school English grammar teaching to compensate for the gaps in existing research in terms of the affective dimension, artistic intervention, and research on positive learning experiences.

2. Research Design

2.1 Research Participants

This study employed a stratified random sampling method to select 320 students from a middle school in Taiyuan as participants. The sample composition is as follows (Tab. 1):

Table 1: Sample composition

Gender Composition	Grade Distribution	English Proficiency Distribution
• Male: 156 (48.75%) • Female: 164 (51.25%)	Categorized by average scores from three monthly exams: • High proficiency (top 30%): 97 • Intermediate (middle 40%): 130 • Basic (bottom 30%): 93	• 4 classes randomly selected from each grade (Grades 8-11) • 20 students sampled per class
The sample selection considered the following factors: • Gender balance: Approximately 1:1 male-to-female ratio • Proficiency stratification: Representation across all English proficiency levels • Class diversity: Prevention of sampling bias from individual classes		

2.2 Research Methods

This study employs a mixed research method that integrates the questionnaire method and work analysis method to comprehensively examine the impact mechanism of visual error transformation strategies on middle school students' frustration in English grammar learning.

For the quantitative component, a Quasi-experimental design was implemented with an experimental group (n=160) and a control group (n=160), utilizing pretest and post-test comparisons to evaluate intervention effects. The research instruments include (1) a self-developed English grammar learning questionnaire assessing three dimensions—error cognition (error frequency, type identification, and attribution patterns), learning emotions (frustration intensity), and strategy acceptance (usage frequency, ease-of-use evaluation, and perceived effectiveness)—measured via 5-point Likert scales.

The qualitative component involves three types of materials: (1) Student error notebooks (n=320); (2) visual error correction works (mind maps, error classification tables, etc.); and (3) unit test error analyses. A three-tier coding system was established: Level 1 applies Burt's (1975) error classification framework (morphological errors, syntactic errors, and pragmatic errors); Level 2 evaluates visual representation quality (completeness, systematicity, creativity); and Level 3 examines improvement levels (error recurrence rate, cognitive depth, and solution feasibility).

2.3 Research Procedures

This study adopts a Quasi-experimental design to systematically investigate the effects of visualization strategies on frustration in English grammar learning through a carefully structured intervention program. The complete research process spanned 10 weeks and was implemented in four distinct phases.

2.3.1 Preparation Phase (Week 1)

The preparation phase involves two foundational tasks. First, we conducted a pretest screening across 16 classes in the participating school. By using stratified random sampling, 320 participants were selected to ensure balanced representation across grade levels, gender, and English proficiency. Second, the research team developed and validated all the measurement instruments, including a revised version of the English grammar learning questionnaire, a grammar error visualization artifact evaluation rubric.

2.3.2 Assessment Phase (Week 2)

During the assessment phase, we collect comprehensive baseline data through multiple methods. Students completed questionnaires measuring their grammatical error cognition (including error frequency, type identification, and attribution patterns) and learning emotions (particularly frustration intensity). Additionally, error samples from three recent unit tests were collected to establish individual error profiles for students, while systematic observations documented students' typical approaches to error correction. Rigorous data quality control measures were implemented, resulting in the exclusion of 8 invalid questionnaires from the final analysis.

2.3.3 Core Intervention Phase (Weeks 3--8)

The intervention phase featured the innovative integration of visualization strategies into regular grammar teaching. The experimental group participants engaged in two specialized weekly sessions:

(1) Monday: “Error visualization workshops” guided students in transforming their errors into artistic representations (including timeline comics and symbolic collages) with color-coded annotations for error types and frequency.

(2) Thursday: “Progress Visualization Displays” focused on creating comparative charts that juxtaposed incorrect expressions with correct versions and mobile devices. The control group maintained standard instructional approaches while receiving equivalent time devoted to grammar practice, ensuring comparable intervention intensity across conditions.

2.3.4 Outcome Evaluation Phase (Weeks 9--10)

The final phase employed a mixed-methods approach to assess intervention outcomes comprehensively. The quantitative measures included readministration of questionnaires and analysis of midterm test errors, with statistical comparisons (paired samples t tests) examining changes in frustration levels. Qualitative analysis involved systematic examination of student-generated visual artefacts. Crucially, researchers have implemented data triangulation procedures, cross-validating questionnaire results with artifact analysis findings to increase the reliability and validity of study conclusions. This multimethod evaluation strategy provided robust evidence regarding the intervention's effectiveness while capturing nuanced aspects of students' learning experiences.

3. Research Results

3.1 Quantitative Results Analysis

The quantitative analysis revealed significant improvements in the experimental group following the 10-week intervention. Grammatical test results demonstrated a 37.2% reduction in morphological errors (42.3% →26.6%), a 28.5% decrease in syntactic errors (35.7%→25.5%), and a 19.8% decline in pragmatic errors (22.0%→17.6%). Most notably, the experimental group showed a substantial reduction in frustration levels (3.82→2.24, 41.3% decrease), significantly outperforming the minimal change observed in the control group (3.79→3.43, 9.6% decrease). The questionnaire responses indicated that 86.4% of the students found the visualization tools easy to use, whereas 72.8% reported an improved understanding of the causes of error.

3.2 Qualitative Results Analysis

Qualitative analysis revealed deeper transformational processes. The student work quality improved markedly, with high-quality artifacts increasing from 23.5% to 67.8%, particularly in the completeness

dimension (44.3% improvement). Flow states were experienced by 81.2% of the students during creative processes, showing a significant positive correlation with error correction effectiveness (r=0.63). Artifact analysis demonstrated that 89.7% of the students could systematically classify error types, with 76.3% of the studies incorporating multimodal error explanations.

The integration of quantitative and qualitative data revealed that artistic error transformation operates through dual cognitive and affective pathways: reducing working memory load while simultaneously regulating negative emotions. Flow experience served as a crucial mediator, with the high-flow group demonstrating significantly better error attribution accuracy than the low-flow group did (t=5.42).

4. Conclusion

This study employed an innovative strategy of transforming grammatical errors into visual artworks, which effectively reduced students' frustration in English grammar learning. This finding is highly consistent with the theory in educational psychology that artistic expression promotes learning. Eisner's (2002) “aesthetic cognition” theory points out that visual arts can reduce learners' language anxiety. In this study, the participants in the experimental group transformed grammatical errors into art forms such as timeline comics and symbolic collages. During the creative process, they converted their originally negative perceptions of errors into positive artistic exploration, thus significantly alleviating their frustration. For example, Student Zhang frequently made mistakes in learning tenses. After participating in the “Error Visualization Workshop,” he presented the errors of different tenses in the form of timeline comics, distinguishing the error cases of the past tense, present tense, and future tense with different colors, and adding interesting dialogue bubbles to explain the causes of the errors. In this process, Zhang not only understood the tense rules more clearly but also stated that he was no longer afraid of grammar learning. Instead, he looked forward to discovering and solving new errors. This shift in mindset from “avoiding failure” to “appreciating the growth trajectory” confirms the effectiveness of this strategy in regulating students' emotional states.

From the perspective of cognitive reconstruction, the “flow state” experienced by students during the creation of artworks plays a crucial role in the reconstruction of their error cognition. Csikszentmihalyi (1990) suggested that when an individual is fully immersed in an activity and reaches a flow state, their learning effect is significantly enhanced. In this study, 81.2% of the students entered the flow state during the creative process, and there was a significant positive correlation ($r = 0.63$) between flow experience and the effectiveness of error correction. Take Student Li as an example. When making a collage of grammatical errors, she devoted herself to the classification of errors and the design of visual elements. By disassembling the sentences with syntactic errors into different graphic modules and then recombining them into the correct structure, this intuitive visual presentation enabled her to have a deeper understanding of the grammatical structure, and the accuracy rate of error attribution was greatly improved. This fully demonstrates that the flow state can promote students' in-depth cognition and effective correction of grammatical errors.

During the implementation of a specific strategy, teachers play a vital guiding role. In the “Error Visualization Workshop,” teachers first guide students to sort out their own types of grammatical errors and then demonstrate how to transform these errors into artistic elements. For example, for tense errors, teachers instruct students to use a timeline as the basis, represent different tenses with icons of different shapes and colors, and mark the error cases at the corresponding time nodes. For syntactic errors, students are encouraged to intuitively show the differences between the correct and incorrect sentence structures through graphic collages. In the “Progress Visualization Display” session, teachers organize students to share their work, guide them to learn from each other and have discussions. Through peer communication and feedback, students can further deepen their understanding of grammatical knowledge. At the same time, teachers will also provide targeted guidance and suggestions in a timely manner according to the students' work and discussion situations, helping students continuously improve their understanding of grammatical rules.

However, this study also has certain limitations. Although the error visualization art strategy has shown significant advantages in reducing students' frustration and improving the effectiveness of grammar learning, there are differences in the acceptance and benefits of this strategy among students with different English proficiency levels. Students with a weak foundation may encounter more difficulties in transforming errors into artwork and may require more detailed guidance from teachers. In addition, the research cycle is relatively short. Long-term follow-up research can be conducted in the future to further observe the sustained impact of

this strategy on students' English learning. Moreover, how to apply the error visualization art strategy more widely to different teaching scenarios and English learning content is also a direction worthy of in-depth exploration.

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Conflicts of Interest

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