

Reimagining EFL grammar instruction: Integrating reflective and reasoning-based learning in the digital age

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ABSTRACT

Traditional EFL grammar instruction often emphasizes rote memorization and rule drilling, limiting learner autonomy and critical engagement. This study aimed to reimagine grammar teaching in the digital age by integrating reflective learning and reasoning-based activities into a curriculum for first-year undergraduates. Employing a sequential explanatory mixed methods design, quantitative data were gathered through pre- and post-grammar tests, an 18-item Likert survey measuring perceptions of reflective and reasoning-based learning, followed by open-ended questions, and an 11-item classroom observation checklist tracking journal entries, error-analysis or analysis tasks, peer and lecturer feedback, and reasoning discussions. Semi-structured interviews with ten purposively sampled students provided qualitative depth. Paired-samples t-tests revealed significant gains in grammatical accuracy ($p < 0.05$) and in self-reported critical thinking. At the same time, aligning with the sequential explanatory design, descriptive analysis of observations and thematic coding of interviews served as an explanatory mechanism, showing how these quantitative gains were achieved by revealing heightened metacognitive awareness, increased learner autonomy, and greater confidence in articulating complex grammar rules. These findings demonstrate that combining digital reflective journals, collaborative error analysis, and structured reasoning exercises fosters deeper analytical engagement with language and a culturally inclusive, student-centered pedagogy. This model offers a scalable approach for reimagining EFL grammar instruction in the digital era.

Keywords: Critical thinking; digital grammar instruction; reasoning-based learning; reflective learning

Received:
22 August 2025

Accepted:
12 May 2026

Revised:
17 April 2026

Published:
30 May 2026

How to cite (in APA style):

La Sunra, Abduh, A., Amaliah, S., Syamsuddin, M. R., & Mansyur. (2026). Reimagining EFL grammar instruction: Integrating reflective and reasoning-based learning in the digital age. *Indonesian Journal of Applied Linguistics*, 16(1), 117-128.
<https://doi.org/10.17509/dj00qe27>

INTRODUCTION

Grammar instruction has long been a cornerstone of English as a Foreign Language (EFL) education. Traditionally, it has been delivered through teacher-centered methods focused on rule memorization, form manipulation, and decontextualized practice (Gondra & Aguiló-Mora, 2024). These approaches, deeply influenced by behaviorist learning theory, often reduce grammar to a set of fixed rules to be mastered through drills, thereby limiting learners' opportunities for critical engagement and meaningful use (DeWaelshche, 2015). While such

methods may produce short-term gains in accuracy, they often fail to foster a deep understanding of language use or transferable grammatical competence (Solmaz, 2024).

The rise of digital technologies and constructivist approaches to education has transformed the way grammar can and should be taught (Cope & Kalantzis, 2021). Learners in the digital age are not merely passive recipients of rules but active participants in constructing linguistic knowledge (Kurahila & Kotilainen, 2020; Zeng, 2018; Zhao, 2023). With the increasing demands of

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21st-century communication, grammar instruction must evolve to support not only correctness but also learner autonomy, metacognitive awareness, and critical thinking (Mohebbi, 2025). This necessitates a shift from rote instruction to pedagogies that integrate digital tools with reflective and analytical processes (Kayal, 2024; Koretsky et al., 2018).

However, in many EFL contexts, grammar instruction remains overwhelmingly traditional, test-oriented, and decontextualized, prioritizing structural correctness over creative analysis (Cushing & Helks, 2021; Jiang et al., 2025). This rigid, behaviorist paradigm relies heavily on mechanical drills, in which teachers take center stage, and students remain passive recipients of rules (Kuntso, 2024; Li & Xu, 2023; Sun & Zhang, 2021). Such practices persist partly because teachers often lack the training to implement innovative methods (Oso, 2023), and institutional pressures to meet standardized benchmarks discourage pedagogical risk-taking and classroom reflection (Indrawati et al., 2024; Uysal, 2022). Consequently, this disconnect between form-focused instruction and real-world application yields surface-level knowledge that is difficult to transfer to authentic communication contexts (Adejare, 2022; Alahmad, 2019; Lee & Lyster, 2023; Wang, 2024). Ultimately, grammar learning remains isolated from the kinds of critical engagement and learner agency required in contemporary EFL education (Bacon, 2017; Jiménez & Gutiérrez, 2019).

Such methods limit learners' ability to apply grammatical knowledge in authentic communication and stifle their engagement with language as a dynamic system (Quamer et al., 2024). Moreover, students are often discouraged from questioning grammar rules or exploring alternatives, reducing grammar to a mechanical rather than intellectual activity (Sato & Oyanedel, 2019). This disconnect between grammar learning and critical engagement represents a key pedagogical concern in current EFL classrooms.

A growing body of research has begun to explore innovative approaches to grammar instruction, such as task-based learning (East, 2015), input enhancement (Bakhshandeh-Rostami & Jafari, 2018), and form-focused instruction (Bataineh et al., 2017). These approaches aim to contextualize grammar and promote interaction. However, there remains a lack of systematic exploration of the combined use of reflective learning, in which students analyze and monitor their grammatical development, and reasoning-based instruction, which challenges learners to justify and explain their language choices (van Rijt et al., 2020). These strategies are even less commonly implemented within digital platforms, despite their affordances for scaffolding learning and tracking growth (Karimpour et al., 2025).

Recent studies have emphasized that integrating reflective activities such as journal writing, peer feedback, and self-assessment into grammar instruction enhances metalinguistic awareness and supports deeper learning (Shaddad & Jember, 2024). Similarly, reasoning-based tasks, such as collaborative error analysis, argumentation about grammatical choices, and rule explanation, have been shown to foster critical thinking and learner autonomy (Eftekhari et al., 2016). Digital tools such as blogs, collaborative platforms, and grammar apps can further amplify these effects by offering real-time feedback and opportunities for asynchronous reflection (Alharbi, 2025).

In light of these considerations, this study seeks to reimagine EFL grammar instruction for the digital age by embedding reflective and reasoning-based learning strategies into a curriculum for first-year undergraduates. Through a sequential explanatory mixed-methods approach, the study investigates how this model impacts grammatical accuracy, critical thinking, and learner autonomy. By situating grammar learning within a digitally mediated, cognitively rich environment, this research contributes to a growing movement toward student-centered, reflective, and analytic grammar pedagogy (Teng & Zhang, 2021). It also offers practical insights for educators seeking to align grammar instruction with contemporary educational goals and learner needs.

To guide this investigation, the study addresses three interrelated research questions:

1. To what extent does the integration of digital reflective and reasoning-based learning strategies improve students' grammatical accuracy?
2. What are students' perceptions regarding the impact of this digital model on their critical thinking skills and learner autonomy?
3. How do the qualitative findings from student reflections and interviews explain the quantitative gains achieved in their grammar competence?

Reflective Learning in Grammar Pedagogy

Reflective learning emphasizes students' active role in monitoring, analyzing, and evaluating their own grammar use, offering an alternative to the passive rule-recall model of traditional instruction (Ilmi et al., 2022; Thu, 2020). Through tools such as learning journals, self-assessment checklists, and peer feedback, learners become more aware of their grammatical strengths and weaknesses, which not only improves metacognition and autonomy but also fosters motivation and long-term retention of grammar structures (Tran, 2024; Ukrayinska, 2020; Vuogan & Li, 2022). When embedded in a broader curriculum, reflection allows students to internalize

grammar rules in meaningful, personally relevant ways (Dao et al., 2020; Wijnands et al., 2021).

Reasoning-based Grammar and the Role of Digital Tools

Reasoning-based grammar instruction challenges learners to explain and justify their grammatical choices, encouraging critical thinking and analytical engagement with language (Ismail & Dedi, 2021). Such approaches align with cognitive learning theories that promote deeper processing through elaboration and hypothesis-testing (Harun et al., 2019). Activities like collaborative rule exploration, error justification, and form-function analysis empower learners to take ownership of grammar as a system of meaning rather than a list of rules (Calzada & García Mayo, 2020; Chiu et al., 2022). This reasoning process often leads to more durable learning outcomes and supports higher-order language awareness (Alghamdi, 2024; Dielemans & Coppen, 2020).

Digital tools can effectively support reasoning-based instruction by enabling learners to engage with grammar tasks collaboratively and reflectively (Barrot, 2020; Refat et al., 2020). Platforms such as Google Docs, Edmodo, and Flipgrid offer opportunities for students to explain grammar rules asynchronously and receive peer feedback, thereby reinforcing analytical thinking (Adhami & Taghizadeh, 2022; Al-Harbi & Alshumaimeri, 2016; Hoang & Hoang, 2024; Rochmahwati et al., 2025). Instructors can design tasks that integrate guided reasoning with multimedia feedback, which has been shown to increase learner confidence and grammatical control (Asl et al., 2017). When paired with reflective learning, reasoning-based grammar creates a synergistic model that promotes both depth and agency in EFL grammar acquisition (Liu & Hwang, 2023; Rad, 2021).

In summary, while existing literature highlights the individual benefits of reflective practices and reasoning-based instruction, their combined integration within a digital EFL context remains underexplored. The conceptual framework of this present study is constructed upon this theoretical intersection. By synergizing digital tools (such as collaborative documents) with reflective metacognitive monitoring and critical grammar reasoning, this study proposes a unified pedagogical model. This framework posits that transitioning grammar instruction from passive, form-focused drills to an active, digitally mediated inquiry process will simultaneously enhance students' grammatical accuracy and their higher-order critical thinking skills.

METHOD

Research Design

This study employed a sequential explanatory mixed-methods design, integrating quantitative and

qualitative data to examine the impact of reflective, reasoning-based learning on EFL students' grammar mastery and critical thinking. The rationale for this design was, first, to capture measurable outcomes related to grammatical accuracy and learner perceptions, and, subsequently, to explore students' learning experiences in greater depth. The quantitative phase involved pre- and post-tests and a Likert-scale survey, while the qualitative phase consisted of classroom observations, open-ended reflections, and semi-structured interviews. This design allowed for data triangulation and deeper insight into how learners engaged with the pedagogical model throughout the intervention (Creswell & Plano Clark, 2017).

Research Participants

The participants of this study were 42 first-year undergraduate students enrolled in a required grammar course in an Indonesian university's English Education program. All participants had previously experienced traditional grammar instruction methods such as rule memorization and drills. From this group, 10 students were purposively selected for qualitative interviews based on their engagement in the course and their varying performance on grammar assessments. Purposive sampling ensured a range of perspectives, including those of high-, medium-, and lower-achieving students. Participation in all phases of the study was voluntary, and informed consent was obtained from all students before data collection. According to the institutional guidelines, formal ethical clearance was not required for this classroom-based educational research. Nevertheless, ethical procedures were followed to ensure confidentiality, anonymity, and respect for student autonomy.

Table 1
Demographic Profile of Participants (N = 42)

Variable	Category	N	(%)
Gender	Male	18	42.9%
	Female	24	57.1%
Age Range	18–19 years	27	64.3%
	20–21 years	15	35.7%
Pre-Test Score Range	40–59	10	23.8%
	60–79	25	59.5%
	80–100	7	16.7%
Interview Language Preference (n = 10)	English	6	60.0%
	Bahasa Indonesia	4	40.0%

Instruments

The study utilized four key instruments. First, a grammar pre-test and post-test, each consisting of 30 multiple-choice questions, were developed to measure changes in grammatical accuracy over the eight-week course. Second, an 18-item Likert-scale questionnaire was developed to measure students' perceptions of the reflective and reasoning-based learning model, including items assessing critical

thinking, metacognitive awareness, and learner autonomy. Third, an 11-item classroom observation checklist was used weekly to document the presence of reflective activities such as journal writing, peer and instructor feedback, error analysis, and in-class reasoning discussions. Lastly, a semi-structured interview protocol was designed to guide individual interviews with selected students, focusing on their experiences with the new approach and the perceived effects on their grammar learning, motivation, and confidence.

Before data collection, all research instruments, including the grammar tests, Likert-scale questionnaire, classroom observation checklist, and interview protocol, underwent content validation by two experts in English Language Teaching and educational research. The experts reviewed the instruments for relevance, clarity, alignment with the research objectives, and appropriateness for the target participants. Based on their feedback, several revisions were made to improve the wording of items, the clarity of instructions, and the alignment of questionnaire items with the constructs of reflective learning, reasoning-based learning, critical thinking, and learner autonomy.

Data Collection

The data collection was conducted over eight consecutive weeks. During the first week, students completed the grammar pre-test. Starting in the second week, the experimental instruction began, combining digital reflective journals, collaborative error analysis, and structured grammar-reasoning activities. Throughout the intervention, the instructor completed weekly classroom observation checklists. In the final week of the course, students took the grammar post-test and completed the perception survey. Following this, semi-structured interviews were conducted with the 10 selected participants. Interviews were held in either English or Bahasa Indonesia, depending on the students' preference, and were audio-recorded for transcription. Each interview lasted approximately 30–40 minutes and explored students' attitudes, strategies, and perceived growth in understanding grammar.

Data Analysis

Quantitative data from the grammar pre- and post-tests were analyzed using paired samples t-tests to determine whether there were statistically significant improvements in students' grammatical performance. The Likert-scale survey data were processed using descriptive statistics, including means, standard deviations, and frequency distributions, to interpret students' perceptions of the learning model. The qualitative data, including interview transcripts and classroom observation notes, were analyzed using thematic analysis (Braun

& Clarke, 2006). Recurring codes and themes related to metacognitive awareness, learner autonomy, grammar reasoning, and instructional effectiveness were identified through an iterative process. The integration of both datasets through methodological triangulation provided a well-rounded understanding of the pedagogical impact and helped validate the study's findings.

Data Analysis Procedures

The 90-minute instructional model transitions learners from passive rule recall to active grammatical inquiry across five sequential phases. The phases are as follows.

- a) Phase 1: Opening & Reflective Activation (10 mins). The lecturer uses prompts to activate prior knowledge, asking students to identify common errors and challenging homework segments.
- b) Phase 2: Collaborative Grammar Reasoning (20 mins). Working in groups via shared Google Docs, students analyze sentence errors and justify linguistic choices while the lecturer asks probing questions.
- c) Phase 3: Guided Whole-Class Discussion (25 mins). Groups present conflicting answers and reasoning processes from their logs. The lecturer facilitates by correcting misconceptions and modeling analytical thinking.
- d) Phase 4: Contextualized Application (20 mins). Students complete contextual tasks directly in Google Docs, editing authentic texts and reconstructing complex sentences under the lecturer's monitoring.
- e) Phase 5: Metacognitive Closing (15 mins). Students complete reflective journal entries in private Google Docs files to evaluate their progress, while the lecturer provides final constructive feedback.

RESULTS

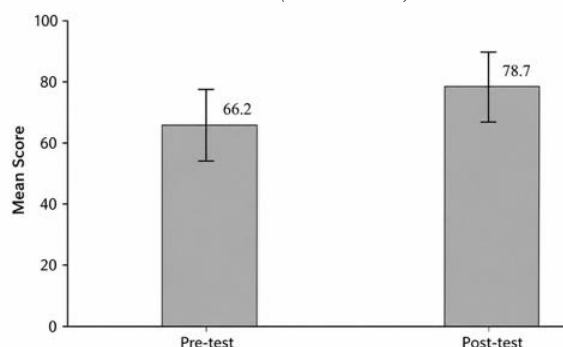
Improvement in Grammatical Accuracy

To determine whether reflective and reasoning-based grammar instruction led to measurable learning gains, students' grammar knowledge was assessed using a pre-test and post-test composed of 30 multiple-choice items aligned with the course syllabus. The tests were administered in Week 1 and Week 8, respectively, and the results are shown in Table 2 and Figure 1. The mean post-test score (78.7) was significantly higher than the mean pre-test score (66.2), representing an average gain of 12.5 points. The decrease in standard deviation suggests that not only did students perform better overall, but also with greater consistency across the group. A paired samples t-test was conducted to

Table 2
Descriptive Statistics

Metric	Pre-test	Post-test
Mean Score	66.2	78.7
Standard Deviation	9.3	8.1
Minimum Score	48	60
Maximum Score	84	95
Mean Gain	-	12.5

Figure 1
Comparison of Pre-test and Post-test Mean Scores with Standard Deviations (Error Bars)



Note. Error bars represent standard deviations (Pre-test SD = 9.3; Post-test SD = 8.1).

compare the two sets of scores. The result revealed a statistically significant difference, $t(41) = 9.82$, $p < 0.001$. This confirms that the improvement was unlikely due to chance and supports the effectiveness of the instructional model. Figure 1 illustrates the difference between pre-test and post-test scores, with error bars representing the standard deviation. It visually emphasizes both the increase

in mean score and the reduction in score variability. This visual trend reinforces the conclusion that the instructional intervention had a substantial and consistent impact on learners' grammatical development.

Student Perceptions of Reflective and Reasoning-based Grammar Instruction

To explore how students perceived the integration of reflective and reasoning-based learning into their grammar instruction, an 18-item Likert-scale questionnaire was administered at the end of the intervention. Each item was rated on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). The questionnaire was designed to capture students' views on five key domains: (1) confidence in grammar use, (2) metacognitive reflection, (3) collaborative learning, (4) motivation and enjoyment, and (5) learner autonomy.

Table 3 displays the overall pattern of responses, which indicates high student satisfaction and engagement with the new instructional approach. Notably, the mean scores for all items exceeded 3.8, with the highest-rated items related to confidence in grammar explanation ($M = 4.31$), learning from reflection ($M = 4.24$), and deeper understanding through collaboration ($M = 4.18$). These results suggest that most students felt positively challenged by the model and appreciated being placed in a more active, analytic role during grammar learning. Furthermore, the standard deviations were relatively low, generally under 0.75, indicating a high degree of agreement across the student cohort.

Table 3
Descriptive Statistics of 18 Likert-Scale Items on Student Perception (N = 42)

No.	Item	Mean	SD
1	I feel more confident in explaining grammar rules.	4.31	0.59
2	Reflecting on mistakes helps me learn grammar better.	4.24	0.66
3	Collaborative analysis improves my understanding of grammar rules.	4.18	0.71
4	I enjoy grammar learning more than before.	3.98	0.74
5	This instruction increased my awareness of grammar beyond memorization.	4.07	0.68
6	I think more critically about grammar now.	4.12	0.63
7	Peer feedback helps me identify grammar errors.	4.05	0.70
8	I often reflect on my grammar choices in writing.	4.00	0.69
9	I prefer reasoning-based tasks over memorizing grammar rules.	3.92	0.73
10	I can justify my grammar choices more confidently.	4.09	0.65
11	I feel more independent in learning grammar.	4.00	0.68
12	Digital journal writing helps me process grammar deeply.	3.87	0.76
13	I actively participate in peer grammar discussions.	3.95	0.67
14	The classroom feels more student-centered than before.	4.02	0.69
15	I notice grammar patterns more often in daily English use.	3.89	0.71
16	I enjoy reflecting on why grammar rules work.	4.11	0.62
17	The method motivates me to study grammar more regularly.	4.03	0.70
18	I feel more responsible for monitoring my grammar development.	4.06	0.66

These findings are consistent with the qualitative interview data, in which students reported increased ability to monitor their grammar

use, explain grammar rules, and reflect on their own errors. The integration of digital tools, such as reflective journals and structured group discussions,

appears to have supported students' internalization of grammar concepts beyond surface-level memorization. In sum, the student perception data affirm the pedagogical effectiveness and cognitive depth of the reflective and reasoning-based approach.

Learner Experience with Reflective and Reasoning-based Grammar Instruction

Qualitative data obtained through weekly classroom observations and semi-structured interviews with 10 selected students revealed three major findings that capture how learners experienced the instructional model: (1) the development of metacognitive awareness, (2) growing confidence in grammar reasoning, and (3) increased learner autonomy and self-regulation. These findings not only confirm the quantitative results but also offer insight into the underlying cognitive and affective processes triggered by the intervention.

Development of Metacognitive Awareness

The most salient change reported by students was a heightened awareness of their own grammatical performance. Through reflective journal writing, students moved from relying on external correction to diagnosing their own errors. This aligns with Flavell's (1979) concept of metacognitive monitoring, in which learners become aware of how they process language and begin to regulate their output accordingly.

Students described how reflective practice revealed patterns in their grammar mistakes, particularly with tense consistency, subject-verb agreement, and article usage. Several began forming individualized strategies, such as error checklists or pre-writing routines, which points to the development of what Wenden (1991) terms learner training for self-directed learning.

I never thought grammar could be something I analyze, like a puzzle. Now, I write down my mistakes and look for patterns. I found out I often confuse past perfect with simple past. (R26)

Before, I just accepted that I was wrong. But after writing my reflections, I started asking myself: what rule did I break and why? (R11)

Observation logs supported these reflections, with students seen actively identifying their own errors during collaborative tasks and referencing prior journal entries in peer discussions. This shift signals the development of grammar consciousness-raising (Ellis, 2002), where learners begin to treat grammar not just as output but as an object of inquiry.

Growing Confidence in Reasoning in Grammar

The second major finding concerns learners' confidence in discussing, justifying, and applying grammar rules. In contrast to conventional grammar

instruction, which emphasizes correctness without explanation, the reasoning-based model encourages students to verbalize their grammatical choices. This aligns with sociocognitive theories (Swain, 2006; Vygotsky, 1978), which suggest that externalizing thought through collaborative dialogue enhances internal processing.

Students reported that explaining grammar to peers not only clarified their understanding but also made the rules more memorable. Group tasks that involved defending tense usage or debating alternative structures fostered analytical thinking and self-efficacy, two factors crucial for advanced language development.

Explaining grammar to others helps me learn it better. When I said it out loud, it made more sense to me, too. (R10)

We used to memorize the rules. Now we have to prove them. It's harder, but I finally understand why a tense is used in certain sentences. (R21)

Classroom observations documented that during peer review and collaborative editing sessions, students used metalinguistic terms (e.g., "past participle," "modifier") and initiated discussions of grammar without teacher prompting. These behaviors indicate transfer of grammatical knowledge from passive recognition to active reasoning, a shift often cited as evidence of deeper processing (Schmidt, 1990).

Increased Learner Autonomy and Self-Regulation

The final finding points to the emergence of self-regulated learning behaviors, with students taking greater ownership of their grammar development. Learners reported actively seeking out resources (e.g., grammar checkers, online videos), reviewing class materials independently, and revising their own writing with minimal teacher intervention. This behavior is consistent with Zimmerman's (2000) self-regulation model, which identifies forethought (goal setting), performance (strategy use), and self-reflection as key phases of autonomous learning. Reflective journaling played a pivotal role in promoting this shift by providing students with a structured space to monitor and evaluate their progress in grammar.

I used to wait for the teacher to tell me what was wrong. Now, I fix my grammar before I submit, and I even write notes to remind myself. (R05)

The journal made me feel like grammar is my responsibility. I know where I'm weak, and I try to improve that area. (R38)

Teacher field notes also noted that several students submitted revised versions of assignments after rewatching class recordings or applying peer feedback. These behaviors suggest a transition from teacher-directed correction to learner-initiated improvement, a hallmark of effective long-term grammar development.

Collectively, these three findings demonstrate that integrating reflection and reasoning into grammar instruction not only improves students' grammatical accuracy but also reshapes their relationship with grammar itself. Learners began to view grammar not as a static system of rules but as a dynamic, logical structure that they could observe, explain, and master through internal strategies. This shift toward metacognitive, analytical, and autonomous learning is especially critical in the digital age, where learners are expected to independently manage complex linguistic input.

The findings also reveal a pedagogical synergy: reflective journaling supports awareness and autonomy, while reasoning-based collaboration fosters confidence and depth. Together, these elements form a student-centered grammar ecosystem, which contrasts sharply with traditional form-drill instruction. Ultimately, the qualitative data validate the instructional model's capacity to cultivate not just better grammar users, but better grammar thinkers.

DISCUSSION

The integration of reflective and reasoning-based instruction in EFL grammar teaching has led to observable gains in both grammatical accuracy and learner cognition. The findings of this study indicate that students developed stronger metacognitive awareness, became more confident in articulating grammatical rules, and demonstrated increased autonomy in managing their learning. These outcomes align with a growing body of research emphasizing the value of reflection and reasoning in second language acquisition, particularly in digital learning environments.

Reflective journaling was a key mechanism that promoted metacognitive growth. Through structured weekly entries, students were able to track their own errors, identify patterns, and formulate personalized strategies for improvement. This aligns with Alt and Raichel (2020), who found that reflective journal writing improved students' metacognitive awareness and self-monitoring capacities in EFL writing classes. Similarly, Hammad Al-Rashidi and Aberash (2024) reported that reflective writing enhanced learners' ability to self-regulate and critically analyze their language use. These findings support the conclusion that reflection transforms grammar learning from a mechanical task into a cognitive process centered on awareness and intentionality.

Alongside reflection, the use of reasoning-based tasks enabled learners to develop confidence in explaining grammar rules and justifying linguistic choices. Students engaged in activities such as peer teaching, collaborative error analysis, and justification discussions, all of which fostered deeper processing of grammatical concepts. This

finding supports Larsen-Freeman's (2003) argument that grammar learning is most effective when students engage in metalinguistic reasoning rather than simply passively applying rules. In the same vein, Bordag and Opitz (2025) demonstrated that learners who verbalize explanations of grammar are more likely to retain grammatical forms and transfer them to actual use.

The synergy between reflective practice and reasoning tasks also appears to strengthen learner autonomy. Students in this study reported increased initiative in reviewing their own work, revisiting recorded lessons, and seeking digital tools to support grammar development. These behaviors reflect the characteristics of self-regulated learners as described in Zimmerman's (2000) model. This is consistent with findings from Huang et al. (2023), who noted that digital reflection tools scaffold autonomous learning by allowing students to track and evaluate their progress over time. Moreover, empirical evidence in EFL pedagogy has increasingly emphasized that autonomy is a foundational goal of grammar instruction in modern, technology-enhanced educational contexts (Dizon & Gold, 2023; Wang, 2025).

The consistency between the quantitative and qualitative results in this study reinforces the pedagogical effectiveness of the model. A statistically significant increase in grammar test scores was supported by rich learner narratives describing how reflection and reasoning changed their relationship with grammar. This methodological triangulation echoes East's (2014) description of a critical strategy for assessing pedagogical innovation: combining learner outcomes with learner voices to provide a holistic understanding of impact.

Despite the significant overall learning gains, a closer inspection of the data reveals an interesting pedagogical phenomenon regarding the "outliers," specifically, the 7 students who initially scored in the 80–100 high-proficiency range on the pre-test and showed no further increase on the post-test. This stagnation in the top tier can be attributed to a statistical ceiling effect, in which the 30-item multiple-choice test lacked the advanced syntactic complexity needed to capture deeper metalinguistic growth among already high-achieving learners. Qualitatively, however, their Google Docs reflective journals revealed that while their test scores remained flat, their cognitive engagement shifted from mere rule memorization to higher-order linguistic awareness and greater confidence in articulating complex grammar mechanisms to peers.

Furthermore, the intervention highlighted subtle constraints related to the digital divide and varying levels of digital literacy among the first-year undergraduates. While the integration of Google Docs offered powerful affordances for tracking asynchronous reflection, students with lower digital

literacy or unstable internet connectivity initially faced cognitive overload, balancing technical troubleshooting with grammatical analysis. This variance in digital readiness occasionally slowed collaborative reasoning tasks during the early weeks of the intervention. Acknowledging these digital constraints is crucial, as it underscores that the success of reflective digital grammar pedagogy depends heavily on providing adequate technical scaffolding alongside conceptual instruction.

From a practical standpoint, this study affirms the feasibility of implementing reflective and reasoning-based grammar instruction in typical undergraduate EFL classrooms. Teachers can incorporate weekly reflection prompts, design peer grammar analysis tasks, and use basic digital platforms to support learner tracking. These strategies are not resource-intensive, yet they align with recent proposals in the ELT Journal literature advocating a grammar pedagogy that is task-based, cognitively engaging, and socially collaborative. Such an approach addresses both linguistic accuracy and learner development, responding to the dual demands of EFL instruction in the 21st century.

Nevertheless, this study is not without limitations. Conducted in a single institutional setting with a moderate sample size, the generalizability of findings remains constrained. Future research could replicate the model across varied proficiency levels and age groups, or adopt a longitudinal design to explore whether gains in reflection and autonomy are sustained over time. Further investigation might also examine how artificial intelligence, such as grammar-aware journaling assistants or real-time feedback systems, can enhance or extend the reflective learning process in EFL grammar classrooms.

Ultimately, the pedagogical implications of these findings contribute to a growing movement in language education that seeks to reimagine grammar not as a fixed body of rules to be memorized, but as a dynamic system to be explored, reasoned with, and mastered through awareness and autonomy. By integrating structured reflection and collaborative reasoning within a digital framework, the instructional model described here offers a replicable, student-centered approach for improving grammatical accuracy while fostering lifelong learning habits. This pedagogical shift is supported not only by empirical results but also by contemporary theoretical frameworks and best practices in EFL grammar instruction.

CONCLUSION

This study set out to reimagine EFL grammar instruction by integrating reflective and reasoning-based learning strategies into a digital classroom context. Drawing from both quantitative improvements and qualitative insights, it is evident

that this pedagogical model contributes meaningfully to students' grammatical development. The first major finding, students' heightened metacognitive awareness, demonstrated how structured reflective journaling transformed grammar from a passive exercise into an active, self-monitored process. Students began to recognize patterns in their errors, reflect critically on their language use, and take greater responsibility for their improvement. This internalization of grammar learning, often overlooked in traditional instruction, signals a foundational cognitive shift.

The second key finding, the rise in confidence through grammar reasoning, further highlights the role of collaborative and analytical learning in grammar mastery. When students were encouraged to justify grammatical choices and articulate rules in peer discussions, grammar became a subject of inquiry rather than a matter of authority. This process not only strengthened rule retention but also empowered learners to use grammar with clarity and intention. The third finding, the development of learner autonomy and self-regulation, illustrates how the fusion of reflection and reasoning prepared students to take ownership of their language learning journey. Beyond the classroom, they began applying strategies, using digital tools, and setting learning goals, reflecting a mature, self-directed approach to grammar learning.

Taken together, these three interrelated findings affirm that reflective and reasoning-based grammar instruction holds promise for fostering deeper, more sustainable grammatical competence. The approach not only improves accuracy but also cultivates the cognitive habits necessary for lifelong language development. As grammar teaching continues to evolve in the digital age, models that integrate metacognition, reasoning, and learner agency should be embraced as essential components of effective EFL pedagogy.

From a broader perspective, these findings offer critical pedagogical implications for educational policymakers and curriculum designers. To cultivate future-ready language users, institutional policies should actively shift from traditional assessment-driven grammar models toward curricula that integrate digital reflective practices. Furthermore, while this instructional model was successfully trialed among first-year undergraduates, it is highly scalable and can be effectively adopted in secondary school contexts (e.g., senior high schools). In secondary classrooms, teachers can use simplified Google Docs reflection prompts to scaffold younger learners' metalinguistic awareness and adapt collaborative reasoning tasks to their proficiency levels.

Before widespread scaling can occur, however, the findings of this study must be considered in light of its inherent limitations. Because the intervention was conducted within a single institutional setting

with a relatively moderate sample size ($N = 42$), the generalizability of the findings to broader or more diverse EFL student populations remains constrained. Future longitudinal research is therefore necessary to investigate whether the observed gains in grammatical accuracy and self-regulated learning habits are sustained over a longer duration across different educational tiers.

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