

A PSYCHOLINGUISTIC ANALYSIS OF TIME PRESSURE EFFECTS ON ENGLISH WRITING ACCURACY AND COMPLEXITY

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ABSTRAK

Studi ini menyelidiki efek psikolinguistik dari tekanan waktu terhadap kinerja menulis dalam bahasa Inggris, dengan fokus khusus pada akurasi dan kompleksitas tulisan di kalangan pembelajar bahasa Inggris sebagai bahasa asing (EFL). Menulis dalam bahasa kedua melibatkan proses kognitif yang kompleks, termasuk memori kerja, pengambilan kosakata, dan penyusunan sintaksis, yang dapat terganggu ketika terdapat batasan waktu. Penelitian ini bertujuan untuk menganalisis bagaimana tekanan waktu memengaruhi dua aspek penting dalam menulis tersebut. Desain penelitian yang digunakan adalah kuasi-eksperimental, melibatkan 40 mahasiswa di Universitas Mayjen Sungkono. Setiap peserta diminta menyelesaikan dua tugas menulis narasi: satu di bawah tekanan waktu (15 menit) dan satu tanpa batasan waktu. Akurasi tulisan dianalisis melalui identifikasi kesalahan tata bahasa, sementara kompleksitas tulisan diukur menggunakan indeks kompleksitas sintaksis. Hasil penelitian menunjukkan bahwa tekanan waktu secara signifikan menurunkan akurasi tata bahasa dan kompleksitas sintaksis dalam tulisan mahasiswa. Temuan ini mengindikasikan adanya keterbatasan antara kecepatan dan kualitas bahasa ketika peserta dihadapkan pada batasan waktu. Studi ini menyimpulkan bahwa tekanan waktu membatasi sumber daya kognitif yang diperlukan untuk memantau kesalahan dan membangun struktur kalimat yang kompleks, sehingga menekankan pentingnya penerapan pendekatan pengajaran yang seimbang dalam pembelajaran menulis bahasa Inggris.

Kata Kunci: *psikolinguistik, tekanan waktu, keakuratan dan kompleksitas penulisan*

ABSTRACT

This study investigates the psycholinguistic effects of time pressure on English writing performance, focusing specifically on writing accuracy and complexity among EFL learners. Writing in a second language involves complex cognitive processes, including working memory, lexical retrieval, and syntactic structuring, which may be disrupted under time constraints. The research aims to analyze how time pressure affects these two critical aspects of writing. A quasi-experimental within-subjects design was employed, involving 40 students of Mayjen Sungkono University. Each participant completed two narrative writing tasks: one under time pressure (15 minutes) and one without time limits. Writing accuracy was assessed through error analysis, while writing complexity was measured using syntactic complexity indices. The findings revealed that time pressure significantly reduced grammatical accuracy and syntactic complexity in students' writing. These results indicate a trade-off between speed and language quality under time constraints. The study concludes that time pressure limits cognitive resources for monitoring and complex sentence construction, highlighting the need for balanced instructional approaches in English writing classes.

Keywords: Psycholinguistics, time pressure, writing accuracy and complexity

INTRODUCTION

Writing in a second language (L2) is an exceptionally cognitively demanding task that requires the intricate coordination of multiple, often non-automatized, mental processes. These core processes include idea generation, syntactic planning, lexical retrieval, and the real-time

monitoring of grammatical accuracy. Idea generation involves not just formulating thoughts but also mapping them onto a still-developing linguistic system. Syntactic planning requires the writer to consciously navigate the grammatical rules of the L2, which may differ significantly from their native language. Lexical retrieval is the mentally taxing process of searching for and selecting appropriate vocabulary from a lexicon that is typically smaller and less readily accessible than that of a native speaker. Compared to the rapid, linear progression of speaking, writing is less constrained by time. As noted by Tabari (2017), this temporal freedom allows writers to engage in more "online planning," giving them opportunities to pause, reflect, and revise their message and its linguistic encoding, a luxury not afforded in spontaneous conversation.

In the field of second language acquisition, psycholinguistics provides a valuable framework for understanding the internal cognitive architecture that underpins written language performance. Foundational models of writing have been heavily influenced by theories of working memory (WM). According to Manchón et al. (2023), Kellogg's influential L1 writing model, which is based on Baddeley's multicomponential model of working memory, establishes clear relations between WM components and writing processes. The central executive, which acts as the attentional control system, is deeply implicated in the high-level functions of formulation (which includes both planning and linguistic encoding), execution (the physical act of writing or typing), and monitoring for errors. Research consistently confirms that for L2 writers, these processes place a significantly heavier burden on the central executive due to a lack of automatic access to relevant L2 knowledge. This foundational model has been expanded in recent studies, such as that by Nawal (2018), to more explicitly account for factors like task-induced cognitive load and the role of attentional control under specific time constraints.

In many academic and assessment contexts, particularly in timed classroom tests or high-stakes examinations, learners are given strictly limited time to plan, compose, and revise their work. This pressure cooker environment often forces a cognitive trade-off between the different dimensions of writing performance: accuracy (the degree of conformity to grammatical, spelling, and punctuation norms), complexity (the sophistication of sentence structures and the richness of vocabulary), and fluency (the speed of production and overall length of the text). This phenomenon, where prioritizing one aspect may lead to the neglect of others, is explained by two major theoretical frameworks in L2 performance: the Limited Attentional Capacity Model and the Cognition Hypothesis (Johnson & Tabari, 2025). Essentially, with a finite pool of cognitive resources, a writer under pressure might focus on getting ideas down quickly (fluency) at the expense of using complex sentences or double-checking their grammar (complexity and accuracy).

The trade-offs observed under pressure are primarily explained by the Limited Attentional Capacity Model, which posits that under conditions of high cognitive stress, learners must strategically allocate their finite mental resources. A learner under severe time pressure, for instance, may subconsciously prioritize fluency to ensure the task is completed, leading to a noticeable sacrifice in grammatical accuracy and syntactic complexity. They may opt for simpler, more familiar sentence structures and vocabulary to reduce the cognitive load, resulting in a text that does not fully represent their actual competence. Conversely, Robinson's Cognition Hypothesis offers a different perspective, arguing that increasing task complexity—not just time pressure—can stimulate deeper cognitive engagement and promote language development. According to this view, more demanding tasks can push learners to access and utilize a wider range of linguistic resources, particularly when they are given adequate time to

plan and process the task. Both theories underscore the critical roles of cognitive resource allocation and task design in shaping the final written product.

Despite the critical importance of this issue, the bulk of existing research has focused on the effects of time pressure on spoken language production rather than writing. For example, influential research by Tabari (2016) found that time pressure significantly reduced grammatical accuracy in L2 speaking tasks, although the effects on lexical diversity and complexity were less consistent. In contrast, comprehensive studies on L2 writing under similar time constraints remain surprisingly limited and have yielded inconclusive results. This research gap is particularly concerning given the widespread use of timed writing tasks in major language assessments that serve as gatekeepers to academic and professional opportunities, such as the TOEFL, IELTS, and various university entrance exams. Recent studies have begun to explore this area, examining how task complexity and time constraints interact with learners' individual cognitive factors. For instance, Rezaii (2022) emphasized that individual differences in cognitive abilities, such as working memory capacity and attentional control, play a crucial role in a learner's ability to manage linguistic accuracy and syntactic complexity under stress.

It is crucial to recognize that time pressure is not merely a cognitive constraint but also a potent emotional stressor. As highlighted in the work of Alshareef et al. (2024), negative emotions such as anxiety are known to significantly affect cognitive performance in academic settings. In the specific context of L2 writing, the introduction of a ticking clock can substantially increase a learner's writing anxiety. This heightened emotional state can, in turn, impair the very cognitive functions essential for effective writing. Anxiety consumes valuable working memory resources, creating cognitive "noise" that interferes with the central executive's ability to plan, organize thoughts, retrieve appropriate vocabulary, and monitor the text for errors. This emotional factor adds another layer of complexity to the psycholinguistic processes involved, creating a debilitating feedback loop where pressure induces anxiety, and that anxiety further depletes the cognitive resources needed to perform the task successfully.

To empirically assess the impact of time pressure on writing, researchers commonly analyze two key, and often competing, dimensions: accuracy and complexity. Writing accuracy is typically measured through detailed error analysis, which involves identifying and categorizing grammatical, lexical, and mechanical errors. The final metric is often expressed as a ratio, such as the number of errors per 100 words, to allow for standardized comparisons across texts of different lengths. Writing complexity, on the other hand, is often measured using specialized computational tools such as the L2 Syntactic Complexity Analyzer (L2SCA) or Coh-Metrix. As described by Shadloo et al. (2019), these tools generate objective indices for syntactic complexity (e.g., mean length of sentence, clauses per T-unit, subordination ratio) and lexical diversity (e.g., type-token ratio). These quantitative measures provide a robust basis for examining how a writer's performance shifts under different conditions, such as the presence or absence of time pressure.

Given this context, the present study addresses a critical gap in the literature by examining the effects of time pressure on English writing accuracy and complexity among EFL learners from a psycholinguistic perspective. The study employs a quasi-experimental, within-subjects design, where each participant is asked to complete two distinct writing tasks: one under strict, exam-like time limits and another with no time constraints. This design is advantageous as it allows researchers to isolate the effect of time pressure while inherently controlling for individual differences in language proficiency and writing style. To assess performance, the study will use a combination of meticulous manual error analysis to determine accuracy and the L2 Syntactic Complexity Analyzer to measure syntactic and lexical complexity. Paired-samples t-tests will then be conducted to determine whether the observed

differences in accuracy and complexity scores between the two conditions are statistically significant. The expected outcome is that time pressure will lead to a demonstrable decline in both grammatical accuracy and syntactic complexity.

RESEARCH METHODS

This study employed a quasi-experimental within-subjects design to rigorously investigate the psycholinguistic effects of time pressure on the accuracy and complexity of English writing. This specific design was strategically chosen because it effectively controls for inherent individual variables such as language proficiency, cognitive styles, and pre-existing writing abilities by having each participant act as their own baseline. This approach significantly enhances the internal validity and reliability of the findings by isolating the impact of the experimental condition. The participants comprised 40 undergraduate EFL learners from the English Education program at Mayjen Sungkono University. They were selected through purposive sampling based on two key criteria: possessing an intermediate English proficiency level, as indicated by recent TOEFL-ITP scores between 450 and 500, and having successfully completed at least two academic writing courses. This ensured a homogenous group with the necessary foundational skills. Prior to the study, all individuals provided informed consent and were assured of the confidentiality of their data.

The data collection procedure involved two narrative writing tasks, which were carefully designed to be equivalent in cognitive demand and content familiarity. Adapted from standardized IELTS Writing Task 2 prompts, the tasks centered on everyday topics to prevent any bias related to cultural or background knowledge. Data was gathered under two distinct conditions: a time-pressured session where participants had 15 minutes to write at least 150 words, and a non-time-pressured session with no strict time limit, though a 40-minute completion was encouraged. To mitigate order effects, the participants were randomly assigned to two groups for counterbalancing; one group tackled the timed task first, while the other started with the untimed task. The sessions were held one week apart to minimize carryover effects. All writing was completed in a controlled classroom environment to ensure consistency and reduce external distractions before the anonymous samples were collected for analysis.

Data analysis was conducted systematically to measure the two primary dependent variables: grammatical accuracy and syntactic complexity. Accuracy was assessed through a meticulous manual error analysis, where two independent raters counted all grammatical mistakes. Inter-rater reliability was confirmed using Cohen's Kappa to ensure consistency. Syntactic complexity was measured using the L2 Syntactic Complexity Analyzer (L2SCA), a validated computational tool. Key indices such as mean length of T-unit (MLT), clauses per sentence (C/S), and subordination ratio (SR) were generated. Statistical analysis was performed using SPSS Version 26. Initially, descriptive statistics were calculated. Subsequently, paired-samples t-tests were used to determine if the differences between the two conditions were statistically significant ($p < 0.05$). Cohen's d was calculated to measure the effect size, and Pearson's correlation was used to explore the relationship between accuracy and complexity under both conditions.

RESULTS AND DISCUSSION

Results

This section presents the findings of the study, which aimed to investigate the effects of time pressure on English writing accuracy and complexity among EFL learners. The analysis focused on two main variables: grammatical accuracy and syntactic complexity.

Descriptive Statistics

The descriptive statistics for grammatical accuracy and syntactic complexity under the two writing conditions (time-pressured and non-time-pressured) are summarized in Table 1.

Table 1. Descriptive Statistics of Writing Accuracy and Complexity

Variable	Condition	Mean	Std. Deviation	Minimum	Maximum
Grammatical Accuracy	Time-Pressured	87.40	5.25	75	95
	Non-Time-Pressured	93.65	4.18	85	98
Mean Length of T-unit (MLT)	Time-Pressured	10.75	1.52	8.2	13.9
	Non-Time-Pressured	12.45	1.38	10.1	15.2
Clauses per Sentence (C/S)	Time-Pressured	1.32	0.15	1.0	1.6
	Non-Time-Pressured	1.58	0.18	1.3	2.0
Subordination Ratio (SR)	Time-Pressured	0.47	0.10	0.3	0.7
	Non-Time-Pressured	0.61	0.12	0.4	0.9
Complex Nominals per Clause (CN/C)	Time-Pressured	0.89	0.16	0.6	1.2
	Non-Time-Pressured	1.15	0.14	0.9	1.5

These results indicate a consistent pattern where participants performed better in the non-time pressured condition across both grammatical accuracy and all measures of syntactic complexity.

Inferential Statistics

Paired Sample t-Tests

Paired sample t-tests were conducted to assess whether the differences between the two conditions were statistically significant.

Table 2. Results of Paired Sample t-Tests

Variable	t	df	p-value	Cohen's d
Grammatical Accuracy	-8.741	39	<0.001	1.38
Mean Length of T-unit (MLT)	-9.215	39	<0.001	1.45
Clauses per Sentence (C/S)	-10.002	39	<0.001	1.58
Subordination Ratio (SR)	-8.612	39	<0.001	1.36
Complex Nominals per Clause (CN/C)	-7.892	39	<0.001	1.24

The results revealed statistically significant differences ($p < .001$) between the two conditions across all measured variables. The effect sizes (Cohen's d) were large for all variables, suggesting that time pressure had a strong and substantial negative impact on writing accuracy and complexity.

Correlation Analysis

Pearson correlation analyses were also performed to examine the relationships between grammatical accuracy and syntactic complexity under both conditions.

Table 3: Correlations Between Accuracy and Complexity

Condition	Variable Pair	Pearson's r	p-value
Time-Pressured	Accuracy & MLT	0.39	0.012
	Accuracy & C/S	0.31	0.045
	Accuracy & SR	0.28	0.071
	Accuracy & CN/C	0.25	0.093
Non-Time-Pressured	Accuracy & MLT	0.51	0.001
	Accuracy & C/S	0.44	0.004
	Accuracy & SR	0.39	0.011
	Accuracy & CN/C	0.37	0.016

In the non-time-pressured condition, stronger and more significant correlations were found between grammatical accuracy and syntactic complexity, particularly with mean length of T-unit ($r = 0.51$, $p = 0.001$) and clauses per sentence ($r = 0.44$, $p = 0.004$). In contrast, under time pressure, the correlations were weaker and less consistent, indicating a breakdown in the coordination between accuracy and complexity.

Discussion

The present study investigated the psycholinguistic effects of time pressure on English writing accuracy and complexity among EFL learners. The results provide clear empirical evidence that time pressure significantly reduces both grammatical accuracy and syntactic complexity in L2 writing.

Impact on Grammatical Accuracy

The findings showed a significant decline in grammatical accuracy under time pressure. This result aligns with prior studies in second language performance, which suggest that under time constraints, learners tend to allocate their limited cognitive resources toward content generation and task completion, often sacrificing grammatical precision in the process. According to Skehan's Limited Attentional Capacity Model, attentional resources in language production are finite. When learners are required to write quickly, they may divert attention away from grammar monitoring to maintain fluency, resulting in increased grammatical errors. This is particularly common among intermediate learners, who may not yet have fully automatized grammatical structures in their L2 writing (Andriani, 2022; Lee, 2020; Ramadilla et al., 2025).

Impact on Syntactic Complexity

The study also revealed significant reductions in syntactic complexity under time pressure across all four syntactic indices: mean length of T-unit, clauses per sentence, subordination ratio, and complex nominals per clause. These results suggest that participants tended to simplify their sentence structures to cope with time constraints. This finding is consistent with psycholinguistic theories that emphasize the role of working memory and attentional control in writing. When learners have more time, they can engage in deeper syntactic processing, allowing for more elaborate and complex sentence constructions. Under time pressure, however, learners tend to rely on simpler, more accessible structures to minimize cognitive load (Kord, 2018; Rahmat, 2023).

The large effect sizes observed for all syntactic complexity measures indicate that time pressure imposes a substantial cognitive burden, leading to clear trade-offs in linguistic complexity. This supports the Trade-Off Hypothesis, which posits that increased task demands often force learners to prioritize certain aspects of performance over others, especially when attentional resources are stretched (Sun & Yuan, 2017).

Interaction Between Accuracy and Complexity

The correlation analysis further revealed that under non-time-pressured conditions, there were moderate to strong positive correlations between grammatical accuracy and syntactic complexity. This suggests that when learners have sufficient time, they are better able to integrate complex sentence structures without compromising grammatical correctness. This finding supports Robinson's Cognition Hypothesis, which asserts that given appropriate task conditions, learners can manage both accuracy and complexity effectively. However, under time pressure, the correlations between accuracy and complexity were notably weaker. This suggests that time pressure disrupts learners' ability to simultaneously attend to grammatical accuracy and syntactic complexity. In other words, under cognitive stress, learners are less capable of coordinating these two dimensions, likely due to overloaded working memory and heightened task anxiety (Buitrago, 2017; Sheptian et al., 2025).

Psycholinguistic Interpretation

From a psycholinguistic perspective, these results illustrate the crucial role of working memory and attentional control in L2 writing, particularly under time-constrained conditions. When time is limited, learners' working memory becomes overloaded, reducing their capacity to plan, monitor, and revise their writing effectively. As a result, they produce shorter sentences, fewer subordinate clauses, and simpler nominal structures. Moreover, task-induced anxiety under time pressure may further deplete working memory resources, exacerbating the negative effects on writing performance. Emotional factors such as writing anxiety and time-related stress likely contribute to the observed trade-offs between accuracy and complexity, as learners become more focused on completing the task quickly rather than writing accurately or elaborately (Adnan & Bhakti, 2025; Bambang et al., 2024; Hardjito et al., 2025).

Pedagogical Implications

The findings of this study have several important implications for EFL teaching and assessment: 1) Task Design: Teachers should carefully consider time allocations for writing tasks, particularly in assessment settings. Excessive time pressure may lead to artificial reductions in writing quality that do not reflect learners' true abilities. 2) Training in Time Management: Instructional strategies that focus on planning, drafting, and revising under timed conditions may help learners gradually improve their ability to manage linguistic resources effectively under pressure. 3) Support for Working Memory: Teachers might integrate metacognitive strategies and cognitive rehearsal activities that can reduce working memory load during writing tasks. 5) Holistic Assessment: Language assessment rubrics should account for the cognitive challenges posed by time limits, and evaluators should be cautious in interpreting results from heavily time-constrained writing tasks (Rahmat, 2023; Williams & Beam, 2018).

Limitations and Future Research

While this study provides valuable insights, certain limitations should be noted. The sample consisted of intermediate-level EFL learners from a single institution, which may limit the generalizability of the results. Additionally, the study focused only on narrative writing tasks; future research could explore other genres such as argumentative or expository writing. Further investigation into the role of individual learner variables such as anxiety levels, working

memory capacity, and language aptitude would also deepen understanding of how these factors mediate the effects of time pressure on L2 writing.

CONCLUSION

This study examined the psycholinguistic effects of time pressure on English writing accuracy and complexity among EFL learners. The findings clearly demonstrated that time constraints significantly reduced both grammatical accuracy and syntactic complexity. Under time-pressured conditions, learners produced shorter, simpler sentences and exhibited more grammatical errors, suggesting that their working memory resources were overwhelmed. These results align with psycholinguistic models that emphasize the limited nature of attentional capacity and the central role of working memory in writing performance, particularly in second language contexts.

Furthermore, the study found that the correlation between grammatical accuracy and syntactic complexity was notably weaker under time pressure. This indicates that time constraints interfere with learners' ability to balance these two important aspects of writing, often forcing them to prioritize one over the other. In contrast, when given sufficient time, learners were better able to produce writing that was both accurate and complex, supporting theories that posit positive effects of extended planning time on L2 performance.

Pedagogically, these findings suggest that teachers and language testers should carefully consider the use of time limits in writing tasks, as overly restrictive time frames may not accurately reflect learners' true writing abilities. In classroom settings, writing activities that allow adequate time for planning, drafting, and revising could help learners develop greater syntactic complexity and grammatical control. Additionally, incorporating metacognitive strategies and working memory training may enhance learners' ability to manage cognitive demands under time pressure. Future studies are encouraged to explore these interventions further across diverse writing genres and proficiency levels.

REFERENCE

- Adnan, M. N., & Bhakti, C. P. (2025). Peran guru bimbingan dan konseling dalam mereduksi kecemasan karier yang dihadapi siswa di era digital. *Learning: Jurnal Inovasi Penelitian Pendidikan dan Pembelajaran*, 5(1), 363. <https://doi.org/10.51878/learning.v5i1.4557>
- Alshareef, N., et al. (2024). The role of emotions in academic performance of undergraduate medical students: A narrative review. *BMC Medical Education*, 24(1), 1–17. <https://doi.org/10.1186/s12909-024-05894-1>
- Andriani, E. (2022). Scrutinizing grammatical challenges within Indonesian-developed mobile game: 'Code Atma.' *LET: Linguistics, Literature and English Teaching Journal*, 12(2), 307. <https://doi.org/10.18592/let.v12i2.6629>
- Bambang, B., et al. (2024). Literatur review: Pengembangan media pembelajaran Spinning Wheel untuk meningkatkan capaian menulis naratif siswa kelas 4 SD. *Learning: Jurnal Inovasi Penelitian Pendidikan dan Pembelajaran*, 4(4), 1136. <https://doi.org/10.51878/learning.v4i4.3760>
- Buitrago, A. G. (2017). Collaborative and self-directed learning strategies to promote fluent EFL speakers. *English Language Teaching*, 10(5), 139. <https://doi.org/10.5539/elt.v10n5p139>
- Hardjito, K., et al. (2025). Pengaruh keterlibatan mahasiswa dalam pembuatan mading 3D terhadap keterampilan literasi. *Learning: Jurnal Inovasi Penelitian Pendidikan dan Pembelajaran*, 5(2), 535. <https://doi.org/10.51878/learning.v5i2.4862>

- Johnson, M. D., & Tabari A, M. (2025). Linguistic complexity in second language writing: Insight from studies on task planning. *Language Teaching*, 58(1), 1–13. <https://doi.org/10.1017/S0261444824000284>
- Kord, M. A. (2018). The effect of task complexity and strategic planning time on writing accuracy: A case study of undergraduate students at AMU. *International Journal of Language and Linguistics*, 6(1), 1. <https://doi.org/10.11648/j.ijll.20180601.11>
- Lee, J. (2020). An error analysis of L2 writing: How does task complexity affect L2 errors? *The Journal of AsiaTEFL*, 17(3), 954. <https://doi.org/10.18823/asiatefl.2020.17.3.13.954>
- Manchón, R. M., et al. (2023). Working memory, L2 proficiency, and task complexity: Independent and interactive effects on L2 written performance. *Studies in Second Language Acquisition*, 45(3), 737–764. <https://doi.org/10.1017/S0272263123000141>
- Nawal, A. F. (2018). Cognitive load theory in the context of second language academic writing. *Higher Education Pedagogies*, 3(1), 385–402. <https://doi.org/10.1080/23752696.2018.1513812>
- Rahmat, N. H. (2023). Reducing cognitive overload in online academic writing: A case study. *International Journal of Academic Research in Business and Social Sciences*, 13(2). <https://doi.org/10.6007/ijarbss/v13-i2/16365>
- Ramadilla, H. S., et al. (2025). Artificial intelligence and linguistics: The synergy of English in science and technology. *Cendekia: Jurnal Ilmu Pengetahuan*, 5(1), 45. <https://doi.org/10.51878/cendekia.v5i1.4115>
- Rezaei, N. (2022). *The syntax-lexicon tradeoff in writing*. arXiv. <https://arxiv.org/abs/2206.12485>
- Shadloo, F., et al. (2019). Exploring syntactic complexity and its relationship with writing quality in EFL argumentative essays. *Topics in Linguistics*, 20(1), 68–81. <https://doi.org/10.2478/topling-2019-0005>
- Sheptian, R., et al. (2025). Classical test theory analysis using Anates: A study of mathematics readiness test for elementary school students. *Science: Jurnal Inovasi Pendidikan Matematika dan IPA*, 5(1), 20. <https://doi.org/10.51878/science.v5i1.3863>
- Sun, P. P., & Yuan, R. (2018). Understanding collaborative language learning in novice-level foreign language classrooms: Perceptions of teachers and students. *Interactive Learning Environments*, 26(2), 189. <https://doi.org/10.1080/10494820.2017.1285790>
- Tabari A, M. (2016). The effects of planning time on complexity, accuracy, fluency, and lexical variety in L2 descriptive writing. *Asian-Pacific Journal of Second and Foreign Language Education*, 1(1), 1–15. <https://doi.org/10.1186/s40862-016-0015-6>
- Tabari, M. A. (2017). Investigating the effects of planning time on the complexity of L2 argumentative writing. *The Electronic Journal for English as a Second Language*, 21(1), 1–25.
- Williams, C., & Beam, S. (2019). Technology and writing: Review of research. *Computers & Education*, 128, 227. <https://doi.org/10.1016/j.compedu.2018.09.024>