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[Leyli Nouraei Yeganeh](#)^{*} and Majid Nemati

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Article

The Impact of Self-Regulated Learning Strategies on Argumentative Writing in Flipped Learning Environments

Leyli Nouraei Yeganeh *  and Majid Nemati 

Department of Foreign Languages and Literature, University of Tehran; Tehran, Iran

* Correspondence: leili.yeganeh@ut.ac.ir

Abstract: Flipped Learning (FL) is widely used in higher education for promoting active learning and improving academic achievement, but challenges like the lack of immediate feedback and self-discipline remain. This pilot study examined how integrating Self-Regulated Learning (SRL) strategies into FL affects medical students' Argumentative Writing (AW) proficiency. Using a quasi-experimental pretest-posttest design, 120 senior medical students were divided into an experimental group (FL with SRL strategies) and a control group (standard FL instruction). The study applied the Toulmin model of Argumentation to assess students' claims and qualifiers, while the Self-Regulated Learning Questionnaire (SRQ) measured self-reported SRL skills. Results showed that students in the experimental group significantly improved AW proficiency and self-regulation behaviors compared to the control group, with large effect sizes confirming SRL's impact. These findings suggest that explicit SRL training enhances meta-cognitive awareness and writing skills in FL settings. The study highlights the need for systematic SRL integration in FL courses and calls for further research on long-term effectiveness and broader applicability across disciplines. Future studies with larger samples and longer durations are needed to validate and scale SRL-enhanced FL instruction in diverse educational settings.

Keywords: flipped learning; self-regulated learning; argumentative writing; medical students

1. Introduction

Flipped Learning (FL) has emerged as an innovative instructional model that shifts traditional direct instruction to pre-class activities, allowing for more interactive and student-centered engagement during in-class sessions [1]. This approach has been widely adopted across various disciplines due to its potential to enhance student motivation, engagement, and academic success [2]. However, despite these advantages, FL presents several challenges, including the absence of immediate feedback, insufficient course structure, demands for self-discipline, and the time-intensive nature of preparing pre-class materials [3]. To address these challenges, scholars have emphasized the importance of incorporating Self-Regulated Learning (SRL) strategies, which empower students to take control of their learning through goal setting, study management, and strategic adaptation of their learning processes [4].

SRL plays a vital role in student-centered learning environments, particularly within FL settings, where learners are expected to engage independently with instructional content before attending class [5]. Integrating SRL strategies in FL contexts has been associated with enhanced academic performance and increased student engagement [6]. Nevertheless, research exploring the explicit integration of SRL in FL remains limited, particularly in the domains of English for Specific Purposes (ESP) and English as a Foreign Language (EFL) writing instruction [7]. Writing in a foreign language is inherently complex. Argumentative Writing (AW) is particularly challenging due to the cognitive demands of constructing well-reasoned arguments that require critical thinking and structured reasoning [8]. In FL-based writing instruction, students must engage in pre-class writing exercises, draft argumentative essays, and analyze argument structures independently, necessitating a high degree of self-regulation

[9]. According to Zimmerman, writing is inherently a self-regulated process, encompassing goal setting, self-monitoring, revision, and reflection [4]. However, many EFL learners struggle to formulate strong argumentative claims and effectively incorporate qualifiers—key components in persuasive academic writing [10].

Given these challenges, recent studies have suggested that digital tools and social media platforms can serve as effective scaffolding mechanisms for promoting peer collaboration and self-regulated writing development [4]. Technology-enhanced learning environments offer valuable support for FL-based writing instruction by facilitating automated feedback, real-time evaluation, and opportunities for collaborative writing [11]. Tools such as Grammarly, Turnitin, and Google Docs allow students to refine their self-directed writing skills, while social media platforms—including Facebook, Twitter, Instagram, and WhatsApp—promote collaborative learning experiences [12]. Research in Malaysia has demonstrated that incorporating social media into ESL writing instruction significantly enhances student engagement and English writing proficiency [13]. Despite the extensive body of research affirming FL's effectiveness across educational contexts, a critical gap remains regarding the systematic integration of FL with SRL strategies to optimize students' AW skills [14]. Additionally, prior studies have identified persistent FL-related challenges, such as delayed feedback, lack of structured instructional resources, and time constraints associated with pre-class preparation [15]. These issues underscore the need for further exploration into instructional designs that incorporate structured learning materials, timely feedback mechanisms, and self-regulation support to maximize the effectiveness of FL in developing AW proficiency.

This study employs the Toulmin model of Argumentation, a widely recognized framework for structuring and analyzing persuasive discourse, to investigate the effects of embedding SRL strategies in FL-based AW instruction [16]. Toulmin's model provides a systematic method for constructing arguments by categorizing key components such as claim, grounds, warrant, qualifier, rebuttal, and backing [17]. Given the essential role of claims and qualifiers in constructing compelling academic arguments, this study specifically focuses on these elements to assess how students develop argumentative claims and use qualifiers to enhance their persuasiveness [17]. The research examines the impact of integrating SRL strategies within FL environments on medical students' AW proficiency, particularly in improving their ability to construct well-supported argumentative claims and apply qualifiers within the Toulmin model framework. Additionally, the study explores the influence of SRL-enhanced FL instruction on students' self-reported SRL skills, focusing on motivation, planning, learning assessment, and self-directedness. Considering the increasing emphasis on blended learning approaches and learner autonomy, this study offers valuable insights into optimizing FL by incorporating SRL strategies to foster AW development in medical education.

2. Materials and Methods

2.1. Theoretical Framework

This study is grounded in FL and SRL theories, emphasizing active, student-centered learning. FL shifts instruction to pre-class activities, enabling interactive engagement during class. At the same time, based on Zimmerman's model, SRL equips students with goal setting, self-monitoring, and reflection strategies to enhance independent learning [18]. Integrating these approaches, this study explores their impact on AW development, employing the Toulmin model of Argumentation to analyze students' ability to construct and support claims using qualifiers [19]. The convergence of FL, SRL, and the Toulmin model aligns with socio-cognitive and meta-cognitive perspectives, reinforcing the importance of structured support in academic writing, particularly in ESP contexts. By providing a framework for interactive learning, self-regulation, and structured argumentation, this study offers insights into optimizing FL for AW proficiency.

2.2. Participants

The study involved 120 senior medical students in Iran, all of whom had an intermediate level of English proficiency as determined by a placement test. Participants aged between 18 and 22 were enrolled in a university medical department. To maintain ecological validity, the study was conducted in two pre-existing classes. One class (N = 60) served as the experimental group, receiving instruction through the FL model combined with SRL strategies. In contrast, the other class (N = 60) acted as the control group, following the FL model without SRL integration. Class selection was based on administrative scheduling to ensure comparability in academic background and instructor quality. Ethical approval was obtained from the University of Arak, Iran, with adherence to all institutional guidelines. Written informed consent was collected from all participants, ensuring voluntary participation. Students were informed about the study's objectives, their right to withdraw at any time without academic repercussions, and the confidentiality of their responses. Subsequent materials were made available after the study to address potential disadvantages for the control group. Participant anonymity was maintained using coded identifiers instead of personal details.

2.3. Instructional Design

The study's instructional design integrated FL with SRL strategies to improve students' AW skills over one academic semester (Fall 2024). An experienced ESP instructor conducted the course following a structured syllabus to maintain content consistency while allowing flexibility for SRL interventions. In the experimental group, students accessed pre-recorded lectures, readings, and digital resources before class, engaging in peer discussions, collaborative writing tasks, and argumentation workshops during in-class sessions. The instructor provided guidance, feedback, and opportunities for self-reflection. To strengthen SRL skills, students received explicit training in goal setting, self-monitoring, and reflection, utilizing tools such as Google Documents for progress tracking, Ed Puzzle for formative assessments, Padlet for collaborative brainstorming, and Trello for time management. In contrast, the control group followed the same FL framework but lacked structured SRL support. While both groups worked on AW skills using the Toulmin model of Argumentation, only the experimental group benefited from structured SRL strategies, fostering greater autonomy in writing and refining argumentative structures over time.

2.4. Data Collection and Assessment Tools

The study employed multiple assessment tools to examine the impact of Flipped Learning (FL) and SRL strategies on students' AW skills. A placement test at the semester's start ensured all participants had an intermediate level of English proficiency, controlling for language differences. Students' writing progress was measured through pretests and post-tests, requiring them to write argumentative essays under standardized conditions, and assessed using a rubric based on the Toulmin model of argumentation. Two independent raters evaluated the essays to ensure scoring reliability. Additionally, students' self-regulation skills were assessed using the Self-Regulated Learning Questionnaire (SRQ), a 41-item instrument measuring Motivation, Planning, Learning Assessment, and Self-Directedness. The questionnaire was administered at the beginning and end of the semester to track changes in SRL behaviors. Statistical analyses included Independent Sample t-tests to compare pretest scores, Paired Sample t-tests to assess within-group improvements, and the Mann-Whitney U Test for self-reported SRL skills, with effect sizes calculated using Cohen's d and r values. The combination of writing assessments, self-reported data, and statistical analysis comprehensively evaluated FL-SRL integration, ensuring validity and reliability in measuring students' AW development.

2.5. Data Analysis

The collected data from pretests, post-tests, and SRQs were analyzed using SPSS 22.0 to ensure precise statistical interpretation. An Independent Samples t-test was conducted on the pretest scores to confirm that both the experimental and control groups had comparable baseline AW proficiency. Paired Samples t-tests assessed within-group progress from the pretest to the post-test, identifying

significant improvements in students' AW skills. Additionally, specific writing components, such as claims and qualifier use, were analyzed separately to determine which aspects improved the most. A second Independent Samples t-test compared post-test results between the groups to evaluate the impact of integrating SRL strategies in FL instruction. Effect sizes were calculated using Cohen's *d*, with benchmarks indicating small (0.2), medium (0.5), and large (0.8) effects, providing insights into the practical significance of the findings. The SRQ data were analyzed using the Mann-Whitney U Test, a non-parametric method suitable for non-normally distributed data, with effect sizes measured using *r* values (0.1 for small, 0.3 for medium, and 0.5 or greater for large effects). By employing both parametric and non-parametric statistical analyses, the study ensured a rigorous evaluation of the impact of FL and SRL strategies on medical students' AW skills, offering meaningful interpretations of the effectiveness of SRL-enhanced FL instruction.

3. Results

This section presents the study's findings in a structured manner, ensuring clarity through multiple subsections. The results are derived from statistical analyses of pretest and post-test scores and SRQ responses, focusing on group comparisons, within-group progress, and specific improvements in AW components. To confirm the initial comparability of the experimental and control groups, an Independent Samples t-test was conducted on their pretest scores. This analysis aimed to ensure that any observed differences in post-test performance resulted from the instructional intervention rather than pre-existing disparities in AW proficiency. The results, presented in Table 1, showed no statistically significant difference between the groups' pretest scores ($p > 0.05$), indicating that both groups had similar writing abilities at the study's outset. This finding reinforces the study's validity by establishing a reliable baseline, ensuring that any improvements in the post-test scores were due to integrating SRL strategies within the FL approach rather than differences in initial writing skills. The homogeneity between groups strengthens the credibility of the findings, confirming that observed effects stem from the instructional intervention rather than pre-existing academic disparities. An Independent Samples t-test was conducted on the pretest scores of both the experimental and control groups to verify their initial comparability. The results, shown in Table 1, indicated no statistically significant difference between the groups, confirming that students had a similar level of AW proficiency at the beginning of the study. This ensures that any differences observed in the post-test results can be attributed to the instructional interventions rather than variations in students' initial writing abilities.

Table 1. Independent Samples t-test for Pre-test Scores

		F	Sig.	t	df	Sig. (2-tailed)	Mean Differ- ence	Std. Error Dif- ference	95% Confidence Interval of the Difference	
									Lower	Upper
Pre-tests	Equal variances assumed	0.06	0.77	0.78	237	0.41	0.22	0.28	-0.33	0.80
	Equal variances not assumed			0.79	237.93	0.41	0.22	0.28	-0.33	0.80

3.1. Within-Group Comparisons

To assess each group's progress independently, paired samples t-tests were conducted to compare pretest and post-test scores within both the experimental and control groups. As shown in Table 2, both groups exhibited statistically significant improvements in their AW skills from pretest to post-test ($p < 0.05$). However, the experimental group, which received FL instruction integrated with SRL strategies, demonstrated a notably greater increase in writing scores than the control group. This suggests that incorporating SRL strategies provided an additional benefit to students' writing development. While the control group also improved under the FL model, its progress was more moderate, indicating that students may struggle to maximize the advantages of FL without structured self-regulation support. In contrast, the experimental group, which engaged in goal setting, self-monitoring, and self-reflection as part of SRL interventions, achieved more substantial gains in writing proficiency. The larger effect size observed in this group underscores the practical significance of integrating SRL

strategies into FL instruction, emphasizing the role of self-regulation in enhancing students' writing skills. These findings confirm that while FL alone contributes to writing development, its effectiveness is significantly amplified when paired with structured SRL strategies.

Table 2. Independent Samples t-test for Post-test Scores.

		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower		Upper
Post-tests	Equal variances assumed	0.00	0.89	6.21	237	0.00	2.00	0.31	1.36	2.64
	Equal variances not assumed			6.21	237.92	0.00	2.00	0.31	1.36	2.64

3.2. Between-Group Comparisons

To evaluate whether the experimental group outperformed the control group after the intervention, an Independent Samples t-test was conducted on their post-test scores. The results, presented in Table 3, revealed a statistically significant difference ($p < 0.05$), with the experimental group scoring higher than the control group. This suggests that integrating SRL strategies within the FL model impacted students' AW skills more than FL without SRL support. The substantial mean difference between the groups highlights the effectiveness of incorporating structured self-regulation techniques into writing instruction. These findings align with existing research on the benefits of SRL in enhancing academic performance, as students who engaged in explicit SRL strategies—such as goal setting, self-monitoring, and reflection—achieved superior writing outcomes compared to those relying solely on FL instruction. The effect size analysis further confirms the practical significance of these results, emphasizing that SRL strategies are an essential component of effective FL implementation. This study reinforces the importance of integrating meta-cognitive and self-directed learning approaches to optimize students' writing development in educational settings, demonstrating that SRL-supported FL instruction is more effective than FL alone in improving AW proficiency.

Table 3. Independent Samples t-test Comparing Posttest Scores Between Groups.

		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
						Lower	Upper		
Pair 1	Pretest Claim - Pretest Qualifier	8.05	3.42	0.30	-	-7.43	-25.70	118	0.00
Pair 2	Posttest Claim - Posttest Qualifier	6.27	4.41	0.39	-	-5.47	-15.54	118	0.00

3.3. Effect Size Analysis

To assess the practical significance of the observed differences in AW performance, Cohen's d was calculated for both within-group and between-group comparisons. As shown in Table 4, the experimental group demonstrated a large effect size ($d > 0.8$), while the control group showed a moderate effect size ($d \approx 0.5$). This indicates that although both instructional approaches contributed to writing improvement, the integration of SRL strategies had a significantly greater impact. The strong effect size in the experimental group highlights the effectiveness of SRL strategies in enhancing learning outcomes within the FL framework. Additionally, the between-group effect size confirmed the substantial practical significance of SRL-supported instruction, reinforcing its advantages in fostering deeper engagement, self-monitoring, and skill refinement. These findings align with existing research emphasizing the role of meta-cognitive and SRL strategies in improving academic performance. The results provide compelling evidence that incorporating structured self-regulation techniques into FL instruction leads to more substantial and lasting improvements in AW proficiency, supporting the integration of SRL-based instructional designs in educational curricula.

Table 4. Effect Sizes (Cohen's *d*) for AW Improvement.

Group	Cohen's <i>d</i>	Interpretation
Experimental	0.84	Large effect ($d > 0.8$)
Control	0.54	Medium effect ($d \approx 0.5$)

3.4. Argumentative Writing Elements: Claims and Qualifiers

A detailed examination of AW components was conducted to evaluate improvements in claims and qualifiers, two key elements of structured argumentation based on the Toulmin model. Paired Samples t-tests were performed separately for each element, with the results summarized in Table 5. The analysis showed that both groups significantly enhanced their use of claims and qualifiers from pretest to post-test ($p < 0.05$). However, the experimental group, which received FL instruction with integrated SRL strategies, demonstrated a more substantial increase in both areas than the control group. The structured support provided by SRL techniques, such as goal setting, self-monitoring, and revision, enabled students to construct more coherent and well-supported arguments. Notably, the improvement in qualifiers was particularly pronounced in the experimental group, suggesting that SRL strategies played a vital role in helping students refine their ability to develop nuanced and well-reasoned arguments. Since qualifiers enhance the persuasiveness of arguments by indicating the strength and scope of claims, their increased usage among students who engaged in SRL activities highlights the effectiveness of explicit self-regulation training. These findings emphasize the importance of incorporating structured meta-cognitive strategies into writing instruction, reinforcing the value of integrating SRL techniques within FL environments to support the development of well-structured and persuasive argumentative texts.

Table 5. Paired Samples t-test for Claims and Qualifiers.

		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Pretest Claim - Pretest Qualifier	0.04	0.22	0.01	0.00	0.09	2.70	118	0.07
Pair 2	Posttest Claim - Posttest Qualifier	-0.43	0.48	0.03	-0.52	-0.34	9.69	118	0.00

3.5. Self-Regulated Learning

The impact of SRL strategies on students' self-reported learning behaviors was evaluated using the SRL Questionnaire, administered both before and after the intervention. As shown in Table 6, the pretest results indicated no significant difference between the experimental and control groups ($p > 0.05$), confirming that both groups had comparable baseline SRL skills. This equivalence ensures that any differences observed in the post-test can be attributed to the instructional intervention rather than pre-existing variations in learning behaviors. The pretest findings validated that both groups started with similar motivation levels, planning, learning assessment, and self-directedness. However, the post-test results, displayed in Table 7, showed a statistically significant improvement in SRL skills among students in the experimental group compared to the control group ($p < 0.05$). The experimental group exhibited notable progress in all four dimensions of self-regulation, with particularly strong gains in goal setting, self-monitoring, and reflection. The effect size (*r* values) ranged from medium to large, reinforcing the meaningful impact of integrating SRL strategies within the FL model. These results suggest that structured self-regulation support enhances students' ability to manage their writing processes independently, fostering greater autonomy and long-term learning success. The Mann-Whitney U Test confirmed these findings, demonstrating that SRL strategies significantly improved self-regulation skills in FL instruction. Additionally, the experimental group outperformed the control group in overall AW proficiency, particularly in developing claims and qualifiers. These findings support the hypothesis that SRL strategies enhance learning outcomes in FL settings. The next section explores the implications of these results for instructional design and future research.

Table 6. Mann-Whitney U Test for Pre-test of Independent Samples.

Pair	SRQ Question	Test Type	P-Value	Hypothesis Result
1	The distribution of Motivation Activity is consistent throughout control categories.	The Mann-Whitney U test for independent samples.	0.13	Remain the null hypothesis.
2	The distribution of Planning Goalsetting is consistent throughout control categories.	The Mann-Whitney U test	0.12	Remain the null hypothesis.
3	The distribution of Learning Assessment is consistent throughout control categories.	The Mann-Whitney U test	0.14	Remain the null hypothesis.
4	The distribution of Self-directness is consistent throughout control categories.	The Mann-Whitney U test	0.11	Remain the null hypothesis.
5	The distribution of Sums is consistent throughout control categories.	The Mann-Whitney U test	0.13	Remain the null hypothesis.

Table 7. Mann-Whitney U Test for Post-test of Independent Samples.

Pair	SRQ Question	Test Type	P-Value	Hypothesis Result
1	The distribution of Motivation Activity is consistent throughout control categories.	The Mann-Whitney U test	0.00	Refute the null hypothesis.
2	The distribution of Planning Goal-setting is consistent throughout control categories.	The Mann-Whitney U test	0.00	Refute the null hypothesis.
3	The distribution of Learning Assessment is consistent throughout control categories.	The Mann-Whitney U test	0.00	Refute the null hypothesis.
4	The distribution of Self-directness is consistent throughout control categories.	The Mann-Whitney U test	0.00	Refute the null hypothesis.
5	The distribution of Sums is consistent throughout control categories.	The Mann-Whitney U test	0.00	Refute the null hypothesis.

4. Discussion

The findings of this study provide strong empirical evidence for the benefits of integrating SRL strategies within the FL model to enhance AW proficiency among medical students. The results demonstrated that students in the experimental group who received explicit SRL training significantly improved their AW skills compared to those in the control group. This aligns with previous research emphasizing the effectiveness of FL in promoting active learning and engagement [20] while addressing its key limitations, such as the lack of immediate feedback and the need for structured learning support [3]. The study extends these findings by highlighting that explicit SRL integration enhances students' ability to self-regulate their learning, leading to superior academic outcomes. The significant progress

observed in the experimental group supports existing literature that underscores the importance of SRL strategies—including goal setting, self-monitoring, and self-reflection—for successful learning in student-centered environments [21]. Given that FL-based writing instruction requires students to engage in independent learning before class and apply their knowledge during interactive sessions, a high level of self-regulation is necessary, as described in Zimmerman's SRL model [4]. This study's findings confirm that explicit SRL instruction equips students with essential self-management skills, particularly for cognitively demanding tasks like AW.

A major contribution of this study is its detailed analysis of AW components—specifically, claims and qualifiers—through the Toulmin model of Argumentation [16]. The experimental group improved significantly more in structuring claims and using qualifiers effectively, which are crucial for constructing persuasive arguments. These results align with prior research indicating that EFL learners often struggle to support their claims in AW [10]. By integrating SRL strategies into FL instruction, this study highlights a pedagogical approach that helps students construct more nuanced and well-supported arguments, reinforcing the importance of meta-cognitive strategies in writing development. Additionally, the self-reported improvements in SRL skills among experimental group students suggest that SRL-enhanced instruction has benefits beyond immediate academic performance. Significant gains in motivation, planning, learning assessment, and self-directedness align with previous studies emphasizing how explicit SRL instruction fosters long-term autonomous learning behaviors [22]. Effect size analysis further confirmed the intervention's substantial impact, underscoring the practical significance of incorporating SRL strategies into FL settings.

5. Conclusions

This study provided strong evidence that integrating SRL strategies within FL environments significantly improved students' AW proficiency by promoting autonomy, meta-cognitive awareness, and structured learning behaviors. The results showed that students in the experimental group, who received explicit SRL training, performed better in formulating claims and applying qualifiers—essential components of argumentation based on the Toulmin model than the control group. The statistically significant improvements in writing proficiency and self-reported SRL skills confirmed the pedagogical value of structured self-regulation interventions, supporting prior research on the role of meta-cognitive strategies in student-centered learning. By addressing common FL challenges, such as the absence of immediate feedback and the need for self-discipline, the integration of SRL strategies enabled students to take greater ownership of their learning, resulting in more structured, coherent, and persuasive arguments. Furthermore, the large effect sizes highlighted the practical significance of these interventions, particularly in ESP and EFL contexts. The study emphasized the importance of incorporating SRL-based instruction in FL settings, utilizing digital tools to enhance goal setting, self-monitoring, and collaborative engagement.

Beyond its immediate impact on writing skills, this study contributed to the broader field of SRL and FL research by demonstrating that explicit self-regulation training enhanced academic performance and essential lifelong learning behaviors. The findings reinforced the necessity of structured self-regulation support in FL environments, particularly for complex academic tasks such as AW. As higher education increasingly adopted blended and student-centered learning models, integrating SRL strategies into FL instruction presented a promising approach for improving learning outcomes and fostering student autonomy. Future research should examine the long-term effects of SRL-enhanced FL instruction and its adaptability across various academic disciplines, ensuring the scalability and sustainability of these findings. This study provided valuable insights for educators and institutions seeking to enhance digital and interactive learning environments, equipping students with the skills necessary for academic success and self-directed learning in an evolving educational landscape.

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and editing, L.N.Y., and M.N.; visualization, L.N.Y., and M.N.; supervision, M.N.; project administration, L.N.Y., and M.N.; funding acquisition, L.N.Y., and M.N. All authors have read and agreed to the published version of the manuscript.

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References

1. Dalbani, H.; Eissa, S.; Syed-Ahmad, S.F.; Almusharraf, N. Transitioning to flipped classrooms: Instructors' perspectives. *Sustainability* **2022**, *14*, 13426.
2. Radovan, M.; Radovan, D.M. Harmonizing Pedagogy and Technology: Insights into Teaching Approaches That Foster Sustainable Motivation and Efficiency in Blended Learning. *Sustainability* **2024**, *16*, 2704.
3. Cevikbas, M.; Kaiser, G. Can flipped classroom pedagogy offer promising perspectives for mathematics education on pandemic-related issues? A systematic literature review. *ZDM—Mathematics Education* **2023**, *55*, 177–191.
4. Hwang, S. Unpacking the Impact of Writing Feedback Perception on Self-Regulated Writing Ability: The Role of Writing Self-Efficacy and Self-Regulated Learning Strategies. *Behavioral Sciences* **2025**, *15*, 100.
5. Loyens, S.M.; Van Meerten, J.E.; Schaap, L.; Wijnia, L. Situating higher-order, critical, and critical-analytic thinking in problem-and project-based learning environments: A systematic review. *Educational Psychology Review* **2023**, *35*, 39.
6. Estévez, I.; Rodríguez-Llorente, C.; Piñeiro, I.; González-Suárez, R.; Valle, A. School engagement, academic achievement, and self-regulated learning. *Sustainability* **2021**, *13*, 3011.
7. Nakamura, S. Mindsets in Language Education/Edited Adrian Leis, Åsta Haukås. *Psychological Science* **2025**, *14*, 481–496.
8. Malik, A.R.; Pratiwi, Y.; Andajani, K.; Numertayasa, I.W.; Suharti, S.; Darwis, A.; et al. Exploring artificial intelligence in academic essay: higher education student's perspective. *International Journal of Educational Research Open* **2023**, *5*, 100296.
9. Sukerti, G.N.A.; Rudiastari, E.; Susana, K.Y. The effectiveness of flipped learning in teaching writing. *Soshum: Jurnal Sosial dan Humaniora* **2020**, *10*, 78–92.
10. Darmawansah, D.; Rachman, D.; Febiyani, F.; Hwang, G.J. ChatGPT-supported collaborative argumentation: Integrating collaboration script and argument mapping to enhance EFL students' argumentation skills. *Education and Information Technologies* **2024**, pp. 1–25.
11. Yeganeh, L.N.; Fenty, N.S.; Chen, Y.; Simpson, A.; Hatami, M. The Future of Education: A Multi-Layered Metaverse Classroom Model for Immersive and Inclusive Learning. *Future Internet* **2025**, *17*, 63.
12. Chen, X. Theory and Practice of E-Afl in L2 Writing at Primary Schools. In *Implementing E-assessment for Learning in Primary EFL Writing: A Case Study in China*; Springer, 2025; pp. 33–63.
13. Jin, S. Tapping into social media: transforming EFL learners' writing skills and alleviating anxiety through YouTube. *Education and Information Technologies* **2024**, *29*, 10707–10728.
14. Zare, J.; Delavar, K.A.; Derakhshan, A.; Pawlak, M. The relationship between self-regulated learning strategy use and task engagement. *International Journal of Applied Linguistics* **2024**.
15. Li, R.; Lund, A.; Nordsteien, A. The link between flipped and active learning: a scoping review. *Teaching in Higher Education* **2023**, *28*, 1993–2027.
16. Wang, X.; Wang, B.; Wu, Y.; Ning, Z.; Guo, S.; Yu, F.R. A survey on trustworthy edge intelligence: From security and reliability to transparency and sustainability. *IEEE Communications Surveys & Tutorials* **2024**.
17. Rapanta, C.; Macagno, F.; Jensen, G. A close look at children's and adolescents' arguments: combining a developmental, educational, and philosophical perspective. *European Journal of Psychology of Education* **2025**, *40*, 3.
18. Sanz-Angulo, P.; Galindo-Melero, J.; De-Diego-Ponceta, S.; Martín, Ó. Promoting soft skills in higher engineering education: Assessment of the impact of a teaching methodology based on flipped learning, cooperative work and gamification. *Education and Information Technologies* **2025**, pp. 1–44.
19. Zarebski, T. Wittgenstein and Toulmin's Model of Argument: The Riddle Explained Away. *Argumentation* **2024**, *38*, 435–455.

20. Wong, Z.Y.; Liem, G.A.D. Student engagement: Current state of the construct, conceptual refinement, and future research directions. *Educational Psychology Review* **2022**, *34*, 107–138.
21. Paris, S.G.; Paris, A.H. Classroom applications of research on self-regulated learning. In *Educational Psychology*; Routledge, 2003; pp. 89–101.
22. Teng, M.F.; Wang, C. Assessing academic writing self-efficacy belief and writing performance in a foreign language context. *Foreign Language Annals* **2023**, *56*, 144–169.

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