International Journal of Education and Practice
2026 Vol. 14, No. 2, pp. 44-57
ISSN(e): 2310-3868
ISSN(p): 2311-6897
DOI: 10.18488/61.v14i2.4777

The impact of writing instruction based on ethnopedagogical approach assisted by GenAI and multimedia on students' writing ability

Hendra Apriyadi[1+]
Gunawan Suryoputro[2]
Wini Tarmini[3]

[1,2,3]*Department of Indonesian Language Education, Universitas Muhammadiyah Prof. Dr. Hamka, Indonesia.*
[1]*Email: hendraapriyadi@uhamka.ac.id*
[2]*Email: gunawan_suryoputro@uhamka.ac.id*
[3]*Email: winitarmini@uhamka.ac.id*

(+ Corresponding author)

Article History
Received: 22 April 2025
Revised: 6 January 2026
Accepted: 3 February 2026
Published: 13 February 2026

Keywords
Coherence
Cohesion
Ethnopedagogical approach
GenAI
Task response
Writing ability.

ABSTRACT

This study aims to investigate the impact of writing learning based on an ethnopedagogical approach assisted by GenAI on essay writing skills. This study used a quasi-experimental method involving 250 students from Senior High School of Muhammadiyah Tegal. The groups were divided into experimental and control groups. The experimental group received an ethnopedagogical approach-based writing learning intervention assisted by GenAI, while the control group received a conventional intervention. Data analysis used in this study included ANOVA, t-test, and Post Hoc test to investigate the impact of the intervention on students' writing skills. The results showed that writing learning based on an ethnopedagogical approach assisted by GenAI and multimedia mediated by Vygotsky's theory was not only able to improve essay writing skills in the dimensions of task achievement, grammar, vocabulary, coherence, and cohesion but also able to improve the ability to develop written ideas on socio-cultural themes. Improvements in students' task achievement aspects were seen in the quality of essays in terms of completeness of information, accuracy of information, and minimum word count. Improvements in grammar use were seen in the use of essay writing grammar, vocabulary complexity and sentence use, and improvements in cohesion and coherence were seen in the organization of cohesive and coherent ideas. Thus, ethnopedagogical-based and GenAI-assisted instruction not only improved the quality of essay construction but also the quality of essay content. This study suggests that support with writing instruction and learning environments offers significant potential if designed appropriately.

Contribution/Originality: This research contributes to the knowledge of designing the integration of ethnopedagogical approaches and GenAI technology in writing instruction. The originality of this research lies in the integration of ethnopedagogical approaches and GenAI technology in writing instruction, with content focused on sociocultural insights and broader dimensions of writing quality.

1. INTRODUCTION

Sociocultural theory is the foundation of the ethnopedagogical approach, which can make teaching and learning more dynamic, transforming individual learning by incorporating the cultural context of society to develop students' personalities (Bitar & Davidovitch, 2024; Saiti, Saha, Bunsch, Sitnik, & Theoharis, 2025). Teaching writing based on an ethnopedagogical approach is writing instruction that utilizes cultural knowledge as a medium or sociocultural values embedded in the teaching process. One example is media texts about culture and the value of cooperation

applied in the writing teaching process (Choi, Theobald, Velasco, & Eddy, 2025; Miccio et al., 2025). Furthermore, several contemporary studies demonstrate the importance of scaffolding and instructional methodology in improving language skills, particularly writing (Wang, 2025; Zizka, 2025). Teaching writing skills must not only present content in the classroom but also design learning experiences that engage students' interests and contribute to their writing skills. Writing skills require assignments that encourage collaborative problem-solving and engage students in active interaction with peers or the instructor, allowing students to have autonomy in completing assignments (Tate et al., 2025; Yang, Gao, & Shen, 2024). Exploring ethnopedagogical perspectives in writing learning has received attention in several previous studies. These studies have focused on the role of instruction based on an ethnopedagogical approach, as it can provide students with sociocultural insights along with the development of their writing skills. Previous studies have confirmed that a sociocultural concept-based language instruction model within explicit language pedagogy can improve students' writing skills and local cultural knowledge (Adams, Barter, McLean, Boehme, & Geary Jr, 2024). Another study revealed that the social value of collaboration through peer feedback can improve the quality of students' writing (Boehme, Adams, Barter, Geary Jr, & McLean, 2025; Engeness & Gamlem, 2025). Writing instruction based on a sociocultural framework is used to achieve both writing goals and cultural knowledge.

Writing instruction in schools is largely dominated by instruction that focuses on writing quality, without involving other knowledge that could potentially be incorporated into the teaching process. Through an ethnopedagogical approach to writing instruction, students are immersed in the context of local wisdom and community culture as scaffolds and media for improving the quality of their writing (Kim, Lee, Detrick, Wang, & Li, 2025; Zhang et al., 2025). Writing instruction aims to facilitate students' writing competencies that incorporate the structure of specific text types. However, teachers often overlook media that can serve as scaffolds in developing writing ideas, resulting in students still struggling when asked to develop texts with simple themes (Biju, Abdelrasheed, Bakiyeva, Prasad, & Jember, 2024; ElEbyary, Shabara, & Boraie, 2024). This is because the content used to develop writing is often not directly relevant to students' lives. This is reinforced by several previous studies that found that secondary school students still struggle to write essays on sociocultural themes (Mohammed & Khalid, 2025; Saleh & Alsubhi, 2025). Previous studies have revealed that secondary school students' writing skills regarding socio-cultural issues in their environment remain low (Al-Obaydi & Marcel, 2025; Punar Özçelik & Yangın Ekşi, 2024). Furthermore, other studies have revealed that the content of ideas in students' writing is still dominated by scientific and technological contexts (Campino, 2025; Huang, Wilson, & May, 2024). Based on these issues, an ethnopedagogical approach is needed in teaching essay writing.

Although some previous studies have investigated writing ability from an ethnopedagogical perspective, most of these studies have only examined the impact of one approach (Escalante, Pack, & Barrett, 2023; Punar Özçelik & Yangın Ekşi, 2024). There are still few studies that integrate conventional approaches and GenAI technology in writing learning. In addition, the aspects of writing quality that are investigated only focus on syntactic complexity (Bašić, Banovac, Kružić, & Jerković, 2023; Kieslich, Diakopoulos, & Helberger, 2024). Therefore, through this study, researchers integrate GenAI technology with an ethnopedagogical approach in teaching writing. This research examines various elements of writing quality among students, such as responses to tasks, range and accuracy of vocabulary, grammatical range and accuracy, and coherence and cohesion. Thus, the originality of the current research is the integration of ethnopedagogical approaches and GenAI technology in teaching writing; the content focuses on socio-cultural insights, and the broader dimensions of writing quality include task response, lexical range and accuracy, grammatical range and accuracy, and coherence and cohesion. This research contributes to a pedagogical design in writing instruction that prioritizes not only the quality of written construction but also the quality of written content. The integration of pedagogical approaches emphasizing sociocultural approaches and GenAI creates a combined pedagogical design for essay writing that prioritizes all aspects of writing. Therefore,

based on this explanation, the aim of this study is to investigate the impact of writing learning based on an ethnopedagogical approach assisted by GenAI on students' essay writing skills and socio-cultural knowledge.

2. LITERATURE REVIEW

2.1. Ethnopedagogic Approach in Learning to Write

Ethnopedagogy is a discipline that studies the interaction between culture and education. This concept combines ethnographic and pedagogical perspectives to understand how cultural values, norms, and practices influence the learning process (Choi et al., 2025; Zhang et al., 2025). In the context of education, ethnopedagogy plays an important role in developing a curriculum that is sensitive to cultural diversity and supports relevant learning for students from various backgrounds (Formosa, Bankins, Matulionyte, & Ghasemi, 2025; Guile & Popov, 2025). Local culture-based writing learning is an educational approach that aims to create an environment and learning experience by integrating local cultural elements into the writing learning process. The approach, using a "culturally appropriate" method, has been employed for more than ten years. This approach is easier to introduce to students because it includes cultural elements familiar to students' daily lives. The use of talk-story as a common communication style among students can help teachers encourage improved student learning outcomes in standardized reading tests (Banihashem, Kerman, Noroozi, Moon, & Drachsler, 2024; Miccio et al., 2025). In this approach, local culture is not only a background but also functions as an ethnopedagogical instrument that can increase student motivation in applying the knowledge gained in class. The culture of indigenous people contains local wisdom values (local genius) that are full of meaning and relevant to be used as a source of learning.

Culture-oriented writing education is categorized into four types: learning about culture, learning with culture, learning through culture, and cultured learning (Anani, Nyamekye, & Bafour-Koduah, 2025; Çimşir et al., 2024). Exploring culture positions it as a subject of academic research examined specifically within educational programs or courses dedicated to cultural studies. Simultaneously, learning with culture occurs when cultural elements serve as strategies or techniques to grasp specific content, including through diverse cultural depictions utilized as educational tools, instances of concept implementations, or frameworks for examining instructional materials (Mekheimer, 2025; Tengler & Brandhofer, 2025). The ethnopedagogical approach in this study uses Vygotsky's Sociocultural Theory because the theory emphasizes that human development cannot be separated from the interaction between interpersonal, social, cultural, historical, and individual factors (Brandtzaeg, Følstad, & Skjuve, 2025; Polakova & Ivenz, 2024). In the realm of culture-based learning, this theory is significant as it acknowledges the vital role of social and cultural surroundings as a dialectical space connecting students and knowledge. Thus, the ethnopedagogical approach based on Vygotsky's theory allows for a meaningful learning process through the internalization of local cultural values in daily learning activities (Kim, Yu, Detrick, & Li, 2025). This teaching model is a learning design that integrates three important aspects, namely technology, ethnopedagogy (local culture-based education), and knowledge materials. This model aims to help teachers or to enable them to apply learning that is in accordance with local environmental or cultural conditions, while still utilizing technological advances.

2.2. Ethnopedagogical and GenAI Technology-Based Writing Learning

Writing is a language skill that leverages linguistic abilities. The theoretical foundations for developing writing skills are quite complex due to the integration of constructivism, sociocultural theory, and experiential learning (Kim, Yu, et al., 2025; Yang et al., 2024). Writing skills require precise navigation to transform limited knowledge into effective written expression of ideas. In practice, students often face significant challenges when they lack appropriate guidance to facilitate this process. Integrating collaborative, sociocultural insights and peer support is considered an effective scaffolding for improving students' writing skills (Behrens, Marbach-Ad, & Kocher, 2025). An ethnopedagogical perspective, based on sociocultural theory, enhances students' involvement through intricate, cooperative writing tasks. The importance of student engagement in collaborative writing education not only

amplifies peer support but also improves students' higher-order thinking skills. A different study examined the characteristics of cooperation in writing education. It discovered that the scaffolding and materials utilized in the writing learning process are essential for enhancing the depth of written work and language skills that contribute to writing quality (Boehme et al., 2025; Evmenova, Regan, Mergen, & Hrisseh, 2024). An effective writing process is characterized by its phases, which consist of joint pre-writing, drafting, revising, obtaining feedback, editing, and completing. This cycle will strengthen the value of collaboration and community involvement while reinforcing the sociocultural perspective of the process (Bitar & Davidovitch, 2024; Engeness & Gamlem, 2025). Strengthening the ethnopedagogical approach, based on sociocultural theory, can also be achieved through the idea of developing content with sociocultural themes relevant to students' lives.

With the development of technology in language learning, the use of technologies such as GenAI has become an alternative for teachers to optimize the learning process. In addition to selecting the approach, the use of technology also plays a crucial role in facilitating students' achievement of writing learning objectives (Khojasteh, Kafipour, Pakdel, & Mukundan, 2025; Kim, Lee, et al., 2025). GenAI technology is highly appropriate when integrated with an ethnopedagogical approach because it can serve as a medium to deepen students' understanding of written content that addresses the sociocultural context of the community (ElEbyary et al., 2024; Ibrahim, 2023). Several studies have confirmed that the use of GenAI technology can improve writing skills (Mohammed & Khalid, 2025; Saleh & Alsubhi, 2025). Previous studies have shown that integrating GenAI into collaborative writing lessons can improve essay writing skills (Al-Obaydi & Marcel, 2025; Punar Özçelik & Yangın Ekşi, 2024). Furthermore, other studies have shown that using GenAI in writing lessons can improve the quality of students' argumentative writing learning (Campino, 2025; Choi et al., 2025). Furthermore, students' argumentation becomes more substantial with a comprehensive set of arguments, data, and theories. The use of GenAI is also currently employed in second language learning, especially in introducing native speaker culture to second language learners (Escalante et al., 2023; Liu et al., 2024).

3. METHOD

3.1. Design and Participants

This study employed a quasi-experimental method with a pretest-posttest control group design to investigate the impact of ethnopedagogy-based writing instruction assisted by GenAI on students' essay writing skills. The research involved 250 high school students from Senior High School of Muhammadiyah Tegal, with participants aged between 16 and 18 years. Students were divided into four groups: two experimental groups (intermediate and advanced) and two control groups (intermediate and advanced), with equal numbers in each group. The experimental groups received ethnopedagogy-based writing instruction supported by GenAI technology, whereas the control groups received conventional writing instruction without technological assistance. The interventions were conducted both offline and online via the Adobe Connect platform. During the interventions, GenAI was used to provide students with cultural insights aimed at enriching their understanding. The program spanned one semester, or six months, with each session lasting three hours, conducted four times a week. Recordings of the sessions were provided for students unable to attend in real-time. The Adobe Connect platform features utilized by students included discussion rooms, note-taking, a participation dashboard, and chat rooms, all designed to facilitate interaction and improve essay writing skills. Participation in the research was voluntary, with all participants signing consent forms without coercion. Additionally, the study received approval from the authors' affiliated institutions.

3.2. Instruments and Materials

Multiple research tools employed in this study comprised various text topics focusing on socio-cultural understanding, along with an essay writing assessment tool that evaluated task responses, lexical variety and precision, grammatical range and accuracy, as well as coherence and cohesion. Writing on socio-cultural subjects

increases the credibility and authenticity of writing while developing essay writing abilities. The evaluation included essay writing assignments that comprised two tasks: the first task asked students to describe a socio-cultural image or object. The second task required students to clarify or depict a graph, table, chart, or diagram. Furthermore, students were asked to describe the procedures involved in a process or the functioning of an object or occurrence. The assessment of essay writing encompasses task response, lexical range and accuracy, grammatical variety and correctness, as well as coherence and cohesion. The task achievement aspect involves presenting the main features, accurate information presentation, and adherence to the word count. The cohesion and coherence aspect includes information organization, paragraph appropriateness, and the use of conjunctions. The lexical aspect covers correct language use, collocation, and error frequency. The grammatical range and accuracy include language structure, tense, punctuation, and the number of errors. The score range for each aspect is 1-9 points. Writing task 1 contributes 40 percent of the total score, and writing task 2 contributes 60 percent. The overall essay writing ability score is the sum of all scores for the eight aspects of academic writing tasks 1 and 2, with intervals of 0.5. Inter-rater reliability assessments were performed to reduce subjectivity and bias in evaluation. According to the reliability test outcomes, the inter-rater consistency demonstrated a value of $r = 0.92$ and met the criteria. The essay writing assessment scores are as follows: a score below 9 indicates beginner level, 10–18 indicates breakthrough level, 19–29 indicates basic level, 30–39 indicates lower intermediate level, and 40–47 indicates intermediate level. Scores of 48–54 and 55–60 indicate advanced students.

3.3. Data Collection Procedure

The initial phase involved a pretest to evaluate students' foundational essay writing skills. Subsequently, a writing instructional intervention was implemented, grounded in an ethnopedagogical approach and supported by GenAI and multimedia tools. This intervention utilized socio-cultural materials derived from students' local environment, including Indonesian culture and various socially themed topics. The program was conducted both offline and online via the Adobe Connect platform. During each session, GenAI was employed to offer cultural insights, enriching students' understanding and engagement. The intervention spanned one semester, approximately six months, with each session lasting three hours, conducted four times weekly. Recordings of sessions were provided to accommodate students unable to attend live. The Adobe Connect platform features used by students included discussion rooms, note-taking functions, a participation dashboard, and chat rooms, all facilitating interaction among students to enhance their essay writing skills. Instructional design was based on ethnopedagogical principles and sociocultural theory, incorporating scaffolds such as socio-cultural materials, peer scaffolding, and instructor scaffolding to improve essay quality. In the posttest phase, students completed the same assessments as in the initial phase, with pretest essays serving as a baseline and final essays as posttest evaluations. Multiple instructors conducted assessments to ensure comprehensive evaluation of student progress.

3.4. Instruction for the Experimental Group

Instruction in the experimental group was conducted based on an ethnopedagogical approach, grounded in Vygotsky (1978) theory, and supported by GenAI technology and multimedia as learning media for writing. In the conventional classroom, the teacher initially introduced a subject related to a particular culture and allowed students to share their thoughts and discuss ideas about writing on that subject. In the schemata activation phase, GenAI technology and multimedia were also used to further explore the various cultures selected for the specific topic. The GenAI used (GenAI-Powered Animated Video) was employed to explore cultural themes to broaden knowledge and develop ideas for essay writing. After schemata generation, students were divided into small groups of 3-4 students. Writing assignments were given to be worked on collaboratively, both in-class and online, using the Adobe Connect platform. The essay writing assignment was divided among each group, ensuring each student had clear responsibilities. This writing assignment was also conducted online using the Adobe Connect platform. Students used

several features to interact with their groups, including discussion boards, note-taking, a participation dashboard, and a chat room. After completing the writing assignment, students were given the opportunity to evaluate their work by providing feedback on the task response, lexical range and accuracy, grammatical range and accuracy, and coherence and cohesion. The instructor also provided feedback to improve the writing. The final stage was for students to finalize their writing based on feedback from their peers and instructor.

3.5. Instruction for Control Group Writing

In contrast to the experimental group, the control group underwent conventional writing instruction without technological support. Instruction on writing centered exclusively on task response, lexical variety and precision, grammatical variety and precision, as well as coherence and cohesion, without delving into the subject or theme. Several aspects remained focused, such as participation, discussion, and evaluation. In the first phase, students were given a sample essay to explore the focused aspects. At this stage, the instructor provided opportunities for discussion to deepen the sample essay and provided guidance and further material. A thorough analysis of the sample writing was conducted with explicit instruction from the instructor regarding the focused aspects. Following the instructional phase, evaluation was conducted using two essay writing assignments.

3.6. Data Analysis

The data analysis employed in this research was ANOVA to examine variations in all facets of writing proficiency among all groups resulting from both interventions. Subsequently, a paired-sample t-test was conducted to examine variations in all facets of writing skill between the pretest and posttest stages. A post hoc test was ultimately performed to examine the intervention's effects on all variables and the distinctions between the experimental and control groups.

3.7. Ethical Considerations

All students participated in this study voluntarily and without coercion. Students were asked to complete a consent form prior to participating in the study. This study received permission from the Senior High School of Muhammadiyah Tegal, Indonesia. It was also approved by the Institutional Review Board of Muhammadiyah Prof. Dr. Hamka University, Indonesia, under protocol number Ref. No. 1153/B.04.02/2025, dated May 2, 2025. Written informed consent was obtained from all participants, and the research data was anonymized to protect participant confidentiality.

4. RESULTS

To answer the research questions, ANOVA analyses were conducted on four factors: grammatical range and accuracy, vocabulary range and precision, coherence and cohesion, and task response. Additionally, an examination was performed on their comprehension of the cultural themes they discussed. Before conducting further analysis, tests for normality and variance homogeneity were executed. The results of the normality tests indicated that the data were normally distributed and homogeneous. The Box covariance matrix equality test indicated homogeneity with a value ($p = .63$), whereas Mauchly's sphericity test confirmed sphericity (W Mauchly $= 0.20$, $p = .18$). The results of the effect test were conducted to assess the main effect. The findings from the analysis showed a significant effect of the intervention on writing abilities, with a value ($F(9,124) = 4.62$, $p = .00$, partial $\eta 2 = 0.26$, observed power $= 0.97$). In addition, to reduce error variance, a comparison was conducted between the scores of all groups. The outcomes of the ANOVA analysis were carried out to examine notable differences. The analysis results are shown in Table 1. The evaluation was carried out according to the groups' writing skill levels. According to the analysis results, notable differences were identified in several aspects with values such as (F (4, 35) $= 9.85$, $p = 0.00$; Wilk's $\Lambda = 0.57$, partial $\eta 2 = 0.46$).

There was no notable difference in progress between the intermediate and advanced groups, with a value of (F (4, 35) = 1.63, p = 0.25; Wilk's Λ = 0.91, partial η2 = 0.12). The findings indicate that both intermediate and advanced students gained similar benefits from the intervention. Significant differences were observed between the control and experimental groups, with a value of (F (4, 35) = 4.82, p = 0.00; Wilk's Λ = 0.73, partial η2 = 0.32). Additionally, individual changes were evident from the outcomes of the effect test. The results showed that participants exhibited notable differences in scores across all areas between the pretest and posttest phases, with a value of (F (4, 112) = 11.63, p = 0.00, partial η2 = 0.31). Variations in scores were also significant among different groups (F (4, 112) = 6.14, p = 0.02, partial η2 = 0.13).

Table 1. Results of the mixed multivariate ANOVA test on each aspect of writing.

Effect	Types of MANOVA tests	Value	F	Sig	Partial Eta squared	Observed power
Aspects of Writing	Pillai's Trace	0.45		0.00	0.46	0.98
	Wilks' Lambda	0.57	9.85	0.00	0.46	0.98
	Hotelling's Trace	0.80	9.85	0.00	0.46	0.98
	Roy's Largest Root	0.80	9.85	0.00	0.46	0.98
Aspects of Writing * level	Pillai's Trace	0.12	1.54	0.25	0.12	0.38
	Wilks' Lambda	0.91	1.54	0.25	0.12	0.38
	Hotelling's Trace	0.14	1.54	0.25	0.12	0.38
	Roy's Largest Root	0.14	1.63	0.25	0.12	0.38
Aspects of Writing * Group Ex Co	Pillai's Trace	0.32	4.82	0.00	0.30	0.87
	Wilks' Lambda	0.73	4.82	0.00	0.30	0.87
	Hotelling's Trace	0.45	4.82	0.00	0.30	0.87
	Roy's Largest Root	0.45	4.82	0.00	0.29	0.86
Aspects of Writing * level * Group Ex Co	Pillai's Trace	0.08	0.98	0.43	0.08	0.26
	Wilks' Lambda	0.93	0.98	0.43	0.08	0.26
	Hotelling's Trace	0.09	0.98	0.43	0.08	0.26
	Roy's Largest Root	0.09	0.98	0.43	0.08	0.26

Note: Ex = Experiment, Co = Control, *: across mixed multivariate.

Table 2. Paired sample T-test of the middle control group.

Paired sample T-test on each aspect		Paired differences					t	df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% confidence interval of the difference				
					Lower	Upper			
Paired samples test									
Pair 1	Pretest overall—overall posttest	− 1.03	0.48	0.15	− 1.35	− 0.68	− 6.72	8	0.00
Pair 2	Grammar pretest—G Posttest	− 0.80	0.53	0.18	− 1.16	− 0.51	− 5.82	8	0.00
Pair 3	Vocabulary pretest—V Posttest	− 0.70	0.40	0.121	− 0.96	− 0.42	− 5.73	8	0.00
Pair 4	CC pretest—CC Posttest	− 0.92	0.47	0.15	− 1.24	− 0.58	− 6.20	8	0.00
Pair 5	Task pretest—Task Posttest	− 0.96	0.60	0.19	− 1.42	− 0.55	− 5.13	8	0.00

Note: CC= Cohesion and Coherence, G=Grammar, V=Vocabulary.

Additionally, according to the outcomes of the between-subject effect analysis, a notable distinction was identified between the experimental and control groups with a value (F (1,38) = 5.10, p = 0.04, partial η2 = 0.14). Additionally, a paired-sample t-test was performed by contrasting the pretest and posttest scores within each group. Table 2 displays the outcomes of the paired-sample t-test. The analysis revealed that grammar and accuracy were not

particularly significant, whereas other factors exhibited notable differences. The average differences in other areas within the control group were also significant. Notable improvements were observed in cohesion and coherence at 0.91, task achievement at 0.96, and vocabulary at 0.70.

Table 3. Paired-sample t-test for the medium experimental group.

Paired sample T-test on each aspect		Paired differences					t	df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% confidence interval of the difference				
					Lower	Upper			
Paired samples test									
Pair 1	Pretest overall—overall posttest	− 1.37	0.64	0.20	− 1.8	− 0.90	− 7.73	8	0.00
Pair 2	Grammar pretest—GPosttest	− 0.94	0.66	0.22	− 1.40	− 0.48	− 5.52	8	0.00
Pair 3	Vocabulary pretest—V Posttest	− 0.65	0.83	0.27	− 1.23	− 0.04	− 3.52	8	0.05
Pair 4	CC pretest—CC Posttest	− 1.67	0.80	0.26	− 2.23	− 1.09	− 7.60	8	0.00
Pair 5	Task pretest—Task Posttest	− 1.92	0.84	0.28	− 2.62	− 1.42	− 8.42	8	0.00

Note: CC= Cohesion and Coherence, G=Grammar.

Table 4. Paired sample t-test of the follow-up control group.

Paired sample T-test on each aspect		Paired differences					t	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% confidence interval of the difference			
					Lower	Upper		
Paired samples test								
Pair 1	Grammar pretest—G Posttest	− 0.63	0.87	0.28	− 1.32	− 0.01	− 3.43	0.05
Pair 2	Vocabulary pretest—V Posttest	− 0.60	0.86	0.27	− 1.20	0.03	− 2.18	0.06
Pair 3	CC pretest—CC Posttest	− 0.74	0.53	0.18	− 1.10	− 0.37	− 5.35	0.00
Pair 4	Task pretest—Task-Posttest	− 0.94	0.79	0.26	− 1.50	− 0.40	− 4.82	0.00

Note: CC= Cohesion and Coherence, G=Grammar.

The T-test analysis was performed for the intermediate experimental group shown in Table 3, along with the analysis of the advanced control group in Table 4 and the advanced experimental group illustrated in Table 5. According to the results for the intermediate experimental group displayed in Table 3, the aspect that demonstrated the greatest enhancement was task response (M = 1.94, SD = 0.84, SEM = 0.28, p = 0.00). Coherence and cohesion exhibited an enhancement with M = 1.67 (SD = 0.80, SEM = 0.26, p = 0.00), subsequently followed by grammatical range and accuracy (M = 0.94, SD = 0.66, SEM = 0.22, p = 0.00), and vocabulary (M = 0.65, SD = 0.83, SEM = 0.27, p = 0.03). Table 4 provides additional insights into the advanced control group. The evaluation showed slight variations in grammar, accuracy, and vocabulary results between the pretest and posttest. Nevertheless, notable differences were observed in cohesion, coherence, and task response. Cohesion and coherence increased by 0.74 (SD = 0.53, SEM = 0.18, p = 0.00), whereas task response metrics improved by 0.94 (SD = 0.79, SEM = 0.26, p = 0.00). Additionally, the evaluation of the advanced experimental group in Table 5 showed notable enhancements in every

facet of writing ability. The evaluation showed a notable enhancement in task response, achieving a score of 1.57 (SD = 0.50, SEM = 0.17, p = 0.00). Subsequently, the aspects of coherence and cohesion exhibited progress (M = 0.97, SD = 0.63, SEM = 0.20, p = 0.00), accompanied by advancements in grammatical range and precision (M = 0.87, SD = 0.50, SEM = 0.17, p = 0.00), and lastly, vocabulary (M = 0.24, SD = 0.29, SEM = 0.10, p = 0.04).

Table 5. Paired sample T-test results of the advanced experimental group.

Paired sample T-test on each aspect		Paired differences					t	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% confidence interval of the difference			
					Lower	Upper		
Paired samples test								
Pair 1	Grammar pretest—G Posttest	− 0.87	0.50	0.17	− 1.20	− 0.52	− 6.51	0.00
Pair 2	Vocabulary pretest—V Posttest	− 0.24	0.29	0.10	− 0.44	− 0.03	− 3.60	0.04
Pair 3	CC pretest—CC Posttest	− 0.97	0.63	0.20	− 1.42	− 0.53	− 5.78	0.00
Pair 4	Task pretest—Task-Posttest	− 1.57	0.50	0.17	− 1.93	− 1.20	− 9.78	0.00

Note: CC= Cohesion and Coherence, G=Grammar.

Table 6. Post-hoc analysis results for all groups on various writing aspects.

Dependent variable	(I) group	(J) group	Mean difference (I-J)	Std. error	Sig.
Overall posttest	AE	AC	0.20	0.15	0.58
		IE	1.35*	0.15	0.00
		IC	1.70*	0.15	0.00
	IE	AE	− 1.35*	0.15	0.00
		AC	− 1.15*	0.15	0.00
		IC	0.35	0.15	0.13
Grammar post-test	AE	AC	− 0.10	0.25	0.97
		IE	1.40*	0.25	0.00
		IC	1.37*	0.25	0.00
	IE	AE	− 1.40*	0.25	0.00
		AC	− 1.50*	0.25	0.00
		IC	− 0.02	0.25	1.00
Vocabulary posttest	AE	AC	− 0.45	0.28	0.39
		IE	1.17*	0.28	0.00
		IC	1.22*	0.28	0.00
	IE	AE	− 1.17*	0.28	0.00
		AC	− 1.62*	0.28	0.00
		IC	0.05	0.28	0.99
Coherence and cohesion posttest	AE	AC	0.76	0.22	0.00
		IE	0.77*	0.22	0.00
		IC	1.52*	0.22	0.00
	IE	AE	− 0.77*	0.22	0.00
		AC	− 0.85*	0.22	0.00
		IC	0.76*	0.22	0.00
Task achievement posttest	AE	AC	0.89*	0.23	0.00
		IE	1.07*	0.23	0.00
		IC	2.05*	0.23	0.00
	IE	AE	− 1.07*	0.23	0.00
		AC	− 0.20	0.23	0.82
		IC	0.98*	0.23	0.00

Note: IC= Intermediate control, AC= Advanced control, AE= Advanced experimental, IE= Intermediate experimental.
*: Significant mean differences.

The concluding analysis included a post-hoc test to explore variations in all writing elements among different groups. The findings are presented in Table 6. The research revealed notable differences between the intermediate control group and the experimental group regarding coherence and cohesion (mean difference = 0.76, p = 0.00) as well as task achievement (mean difference = 0.98, p = 0.00). Additionally, the advanced control group and the advanced experimental group exhibited notable differences in cohesion and coherence, with scores (mean difference = 0.76, p = 0.00) and task responses (mean difference = 0.89, p = 0.00). Nonetheless, variations in vocabulary and grammar were not statistically meaningful.

5. DISCUSSION

This research sought to examine the effects of writing instruction grounded in ethnopedagogy, enhanced by GenAI and multimedia, on writing abilities. The findings indicated a notable enhancement in writing abilities within the experimental group across all aspects of task response, grammar, vocabulary, coherence, and cohesion. Additionally, enhancements were noted in the formulation of concepts related to socio-cultural topics. Students' written content was more comprehensive and meaningful. This was due to the teaching process utilizing GenAI and multimedia technology, which facilitated students' exploration of writing ideas before drafting, thus providing better-prepared schemata. Furthermore, several features within the Adobe Connect platform facilitated interaction and feedback, resulting in improved essay writing quality. These findings support previous research demonstrating that meaningful interactions and appropriate scaffolding can facilitate understanding and negotiation of meaning in the learning process (Formosa et al., 2025; Zizka, 2025). GenAI technology scaffolding can optimize the learning process, resulting in optimal student competency achievement. This finding is further supported by several previous studies that revealed that GenAI and multimedia technology can improve argumentative writing skills (Wang, 2025; Yang et al., 2024). Improvements in writing skills across all aspects of writing in the intermediate and advanced experimental groups showed similar increases.

The next finding is students' ability to develop sociocultural ideas better and more comprehensively in each section of the essay. This finding indicates that the GenAI technology and multimedia scaffolding can provide a more comprehensive understanding of the sociocultural themes presented. GenAI, which displays images and videos about Indonesian culture presented on the theme of writing, can enrich students' knowledge and understanding of writing ideas. This finding is in line with previous findings that indicate that GenAI scaffolding that is aligned with learning objectives will be more optimal in improving students' language skills (Saiti et al., 2025; Wang, 2025). In addition, the feedback process facilitated through the Adobe Connect platform with its various features can improve the quality of students' essay writing. This finding is reinforced by previous studies that show that the feedback process, whether carried out by peers or by instructors, when properly facilitated, will improve the quality of students' essay writing (Boehme et al., 2025; Evmenova et al., 2024). Another study reinforces this research finding that ethnopedagogy-based writing instruction can improve students' sociocultural writing skills (Engeness & Gamlem, 2025; Khojasteh et al., 2025). This finding is also supported by the theory that sociocultural-based language learning can improve writing skills effectively because, in the process, there is collaborative and dialogic negotiation between students and instructors that can help students evaluate their own mistakes (ElEbyary et al., 2024; Ibrahim, 2023).

Further findings indicate that explicit writing instruction in writing lessons improves students' abilities in the areas of task achievement, grammar, vocabulary, coherence, and cohesion. Improvements in students' task achievement are evident in their ability to meet key criteria in essay writing, such as completeness of information, accuracy of information, and minimum word count. Improved grammar use is evident in the use of essay writing grammar; improved vocabulary is evident in vocabulary complexity and sentence usage; and improved cohesion and coherence are evident in the organization of cohesive and coherent ideas. These improvements occurred because feedback from teachers and students through the Adobe Connect platform encouraged students to correct errors in all aspects. Furthermore, student idea generation also improved through discussion and categorization through mind

maps. Improvements in all aspects of writing ability also occurred due to the ethnopedagogical approach, which encourages students to have knowledge of cultural themes and GenAI technology, which deepens students' understanding of writing ideas better (Choi et al., 2025; Gao, Hashim, & Md Yunus, 2025). These findings are supported by several previous studies, which demonstrated that an ethnopedagogical approach not only increases the complexity of cultural content development in writing but also improves other aspects, such as cohesion, coherence, task achievement, grammar, and the complexity of vocabulary and sentences used in writing (Biju et al., 2024; Mohammed & Khalid, 2025).

The ethnopedagogical-based and multimedia-assisted writing instruction process that can improve the quality of students' essays is supported by diverse peer opinions. Furthermore, content enriched through GenAI technology can significantly improve essay writing quality in aspects such as cohesion, coherence, and task achievement. Additionally, this intervention can enhance working memory and grammatical range appropriate to the text. Ethnopedagogical-based and GenAI-assisted writing instruction can also improve students' writing skills and motivation. The intervention process, which integrates various elements such as corrective feedback from the instructor, peer assessment, group dynamics, interactive learning processes, and exploration of cultural themes, can enhance all aspects that contribute to the quality of students' essay writing. The findings are reinforced by the theory that an ethnopedagogical approach mediated by Vygotsky's theory will provide more meaningful writing instruction, not only focusing on the grammatical aspects of writing but also improving students' writing idea development abilities (Escalante et al., 2023; Parker et al., 2024). The findings of this study are also reinforced by previous studies investigating ethnopedagogical approaches in language learning, which not only improve students' language skills but also enhance students' ability to adapt to the target language culture (Banihashem et al., 2024; Gu, Sun, Beltrán, & de Vega, 2025). In addition, other studies also confirm that the combination of conventional and technological approaches will enrich learning content and be more effective in achieving learning competencies (Hu, Zhou, & Hashim, 2025; Miccio et al., 2025).

6. CONCLUSION

The ethnopedagogical approach, assisted by GenAI and multimedia mediated by Vygotsky's theory, not only improved writing skills in the dimensions of task achievement, grammar, vocabulary, coherence, and cohesion but also enhanced the ability to develop writing ideas on socio-cultural themes. Improvements in students' task achievement were evident in their ability to meet key criteria for essay writing, such as completeness of information, accuracy of information, and minimum word count. Improved grammar usage was evident in essay writing; vocabulary improvement was evident in vocabulary complexity and sentence use; and cohesion and coherence were evident in the organization of cohesive and coherent ideas. These improvements occurred because feedback from both teachers and students via the Adobe Connect platform encouraged students to correct errors in all these aspects. Furthermore, student idea generation improved through discussion and categorization using mind maps. Improvements in all aspects of writing ability also occurred due to the ethnopedagogical approach, which encouraged students to develop knowledge of cultural themes, and GenAI technology, which deepened students' understanding of writing ideas. This research implies that support with writing instruction and a learning environment offers significant potential if designed appropriately. Writing instruction based on an ethnopedagogical approach and assisted by GenAI and multimedia is not only able to overcome the challenges of writing instruction, especially in developing comprehensive writing ideas and content, but also able to improve writing skills in aspects of task achievement, grammar, vocabulary, coherence, and cohesion. In addition, the ethnopedagogical approach not only improves writing skills but also is able to improve critical thinking, collaboration, and effective communication. This study has several limitations, including focusing on writing skills, being limited to several dimensions of writing and content development, not investigating the psychological aspects of writing, and the absence of qualitative data to support the research findings. Based on these limitations, this study recommends several suggestions for further

research, including the need to test an ethnopedagogical approach on other language skills, such as reading and speaking. Further research should also investigate psychological aspects that may contribute to writing skills, such as anxiety and writing motivation, and should be supported by qualitative data to make the research findings more comprehensive.

Funding: This study received no specific financial support.
Institutional Review Board Statement: The ethical approval for this study was granted by the Senior High School of Muhammadiyah Tegal, Indonesia, on 15 July 2025 (Ref. No. 001/III.4.AU/F/2025), and Muhammadiyah Prof. Dr. Hamka University, Indonesia, on 2 May 2025 (Ref. No. 1153/B.04.02/2025). Written informed consent was obtained from all participants, and the research data was anonymized to ensure participant confidentiality.
Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.

REFERENCES

Adams, I. T., Barter, M., McLean, K., Boehme, H. M., & Geary Jr, I. A. (2024). No man's hand: Artificial intelligence does not improve police report writing speed. *Journal of Experimental Criminology*, 1-18. https://doi.org/10.1007/s11292-024-09644-7

Al-Obaydi, L. H., & Marcel, P. (2025). AI partner versus human partner: Comparing AI-based peer assessment with human-generated peer assessment in examining writing skills. *Language Testing in Asia*, *15*(1), 38. https://doi.org/10.1186/s40468-025-00375-8

Anani, G. E., Nyamekye, E., & Bafour-Koduah, D. (2025). Using artificial intelligence for academic writing in higher education: The perspectives of university students in Ghana. *Discover Education*, *4*(1), 46. https://doi.org/10.1007/s44217-025-00434-5

Banihashem, S. K., Kerman, N. T., Noroozi, O., Moon, J., & Drachsler, H. (2024). Feedback sources in essay writing: Peer-generated or AI-generated feedback? *International Journal of Educational Technology in Higher Education*, *21*(1), 23. https://doi.org/10.1186/s41239-024-00455-4

Bašić, Ž., Banovac, A., Kružić, I., & Jerković, I. (2023). ChatGPT-3.5 as writing assistance in students' essays. *Humanities and Social Sciences Communications*, *10*(1), 750. https://doi.org/10.1057/s41599-023-02269-7

Behrens, K. A., Marbach-Ad, G., & Kocher, T. D. (2025). AI in the genetics classroom: A useful tool but not a replacement for creative writing. *Journal of Science Education and Technology*, *34*, 621–635. https://doi.org/10.1007/s10956-024-10160-6

Biju, N., Abdelrasheed, N. S. G., Bakiyeva, K., Prasad, K., & Jember, B. (2024). Which one? AI-assisted language assessment or paper format: an exploration of the impacts on foreign language anxiety, learning attitudes, motivation, and writing performance. *Language Testing in Asia*, *14*(1), 45. https://doi.org/10.1186/s40468-024-00322-z

Bitar, N., & Davidovitch, N. (2024). Cultural adaptation of digital learning tools in israeli higher education: A case study of lecturer perceptions and practices. *TechTrends*, *68*(6), 1152-1165. https://doi.org/10.1007/s11528-024-01007-3

Boehme, H., Adams, I. T., Barter, M., Geary Jr, I. A., & McLean, K. (2025). Writing at the speed of hype: Officers' post-experimental perceptions of AI report writing. *Journal of Experimental Criminology*, *17*(1), 16–31. https://doi.org/10.1007/s11292-025-09679-4

Brandtzaeg, P. B., Følstad, A., & Skjuve, M. (2025). Emerging AI individualism: How young people integrate social AI into everyday life. *Communication and Change*, *1*(1), 11. https://doi.org/10.1007/s44382-025-00011-2

Campino, J. (2025). Unleashing the transformers: NLP models detect AI writing in education. *Journal of Computers in Education*, *12*, 645–673.

Choi, Y. H., Theobald, E., Velasco, V., & Eddy, S. L. (2025). Exploring how course social and cultural environmental features influence student engagement in STEM active learning courses: A control–value theory approach. *International Journal of STEM Education*, *12*(1), 4. https://doi.org/10.1186/s40594-025-00526-6

Çimşir, E., Çapar, M., Folostina, R., Iacob, C. I., Tuszyńska-Bogucka, W., Mirowska, L., & Bozkurt, A. (2024). Cross-cultural measurement invariance of the online learning readiness self-check (OLRSC) survey: a study across Turkish, Romanian, and Polish college students. *Discover Education*, *3*(1), 246. https://doi.org/10.1007/s44217-024-00336-y

ElEbyary, K., Shabara, R., & Boraie, D. (2024). The differential role of AI-operated WCF in L2 students' noticing of errors and its impact on writing scores. *Language Testing in Asia*, *14*(1), 59. https://doi.org/10.1186/s40468-024-00312-1

Engeness, I., & Gamlem, S. M. (2025). Exploring AI-driven feedback as a cultural tool: A cultural-historical perspective on design of AI environments to support students' writing process. *Integrative Psychological and Behavioral Science*, *59*(1), 23. https://doi.org/10.1007/s12124-025-09894-8

Escalante, J., Pack, A., & Barrett, A. (2023). AI-generated feedback on writing: Insights into efficacy and ENL student preference. *International Journal of Educational Technology in Higher Education*, *20*(1), 57. https://doi.org/10.1186/s41239-023-00425-2

Evmenova, A. S., Regan, K., Mergen, R., & Hrisseh, R. (2024). Improving writing feedback for struggling writers: Generative AI to the rescue? *TechTrends*, *68*(4), 790-802. https://doi.org/10.1007/s11528-024-00965-y

Formosa, P., Bankins, S., Matulionyte, R., & Ghasemi, O. (2025). Can ChatGPT be an author? Generative AI creative writing assistance and perceptions of authorship, creatorship, responsibility, and disclosure. *Ai & Society*, *40*(5), 3405-3417. https://doi.org/10.1007/s00146-024-02081-0

Gao, H., Hashim, H., & Md Yunus, M. (2025). Assessing the reliability and relevance of DeepSeek in EFL writing evaluation: a generalizability theory approach. *Language Testing in Asia*, *15*(1), 33. https://doi.org/10.1186/s40468-025-00369-6

Gu, B., Sun, X., Beltrán, D., & de Vega, M. (2025). Faces of different socio-cultural identities impact emotional meaning learning for L2 words. *Scientific Reports*, *15*(1), 616. https://doi.org/10.1038/s41598-024-84347-7

Guile, D., & Popov, J. (2025). Machine learning and human learning: a socio-cultural and-material perspective on their relationship and the implications for researching working and learning. *AI and Society*, *40*(2), 325-338. https://doi.org/10.1007/s00146-024-01891-6

Hu, H., Zhou, Q., & Hashim, H. (2025). Negotiating identity in the age of ChatGPT: non-native English researchers' experiences with AI-assisted academic writing. *Humanities and Social Sciences Communications*, *12*(1), 965. https://doi.org/10.1057/s41599-025-05351-4

Huang, Y., Wilson, J., & May, H. (2024). Exploring the long-term effects of the statewide implementation of an automated writing evaluation system on students' state test ELA performance. *International Journal of Artificial Intelligence in Education*, *9*(2), 1–16. https://doi.org/10.1007/s40593-024-00443-9

Ibrahim, K. (2023). Using AI-based detectors to control AI-assisted plagiarism in ESL writing:"The Terminator Versus the Machines". *Language Testing in Asia*, *13*(1), 46. https://doi.org/10.1186/s40468-023-00260-2

Khojasteh, L., Kafipour, R., Pakdel, F., & Mukundan, J. (2025). Empowering medical students with AI writing co-pilots: design and validation of AI self-assessment toolkit. *BMC Medical Education*, *25*(1), 159. https://doi.org/10.1186/s12909-025-06753-3

Kieslich, K., Diakopoulos, N., & Helberger, N. (2024). Anticipating impacts: Using large-scale scenario-writing to explore diverse implications of generative AI in the news environment. *AI and Ethics*, 1-23. https://doi.org/10.1007/s43681-024-00497-4

Kim, J., Lee, S.-S., Detrick, R., Wang, J., & Li, N. (2025). Students-Generative AI interaction patterns and its impact on academic writing. *Journal of Computing in Higher Education*, 1-22. https://doi.org/10.1007/s12528-025-09444-6

Kim, J., Yu, S., Detrick, R., & Li, N. (2025). Exploring students' perspectives on Generative AI-assisted academic writing. *Education and Information Technologies*, *30*(1), 1265-1300. https://doi.org/10.1007/s10639-024-12878-7

Liu, J. Q., Hui, K. T., Al Zoubi, F., Zhou, Z. Z., Samartzis, D., Yu, C. C., . . . Wong, A. Y. (2024). The great detectives: Humans versus AI detectors in catching large language model-generated medical writing. *International Journal for Educational Integrity*, *20*(1), 8. https://doi.org/10.1007/s40979-024-00155-6

Mekheimer, M. (2025). Generative AI-assisted feedback and EFL writing: A study on proficiency, revision frequency and writing quality. *Discover Education*, *4*(1), 170. https://doi.org/10.1007/s44217-025-00602-7

Miccio, L. A., Agapitos, P., Gamez-Perez, C., González, F., Suarez, J. L., & Schwartz, G. A. (2025). Wikipedia as a cultural lens: A quantitative approach for exploring cultural networks. *Humanities and social sciences communications*, *12*(1), 262. https://doi.org/10.1057/s41599-025-04772-5

Mohammed, S. J., & Khalid, M. W. (2025). Under the world of AI-generated feedback on writing: Mirroring motivation, foreign language peace of mind, trait emotional intelligence, and writing development. *Language Testing in Asia*, *15*(1), 7. https://doi.org/10.1186/s40468-025-00343-2

Parker, J. L., Richard, V. M., Acabá, A., Escoffier, S., Flaherty, S., Jablonka, S., & Becker, K. P. (2024). Negotiating meaning with machines: AI's role in doctoral writing pedagogy. *International Journal of Artificial Intelligence in Education*, 1-21. https://doi.org/10.1007/s40593-024-00425-x

Polakova, P., & Ivenz, P. (2024). The impact of ChatGPT feedback on the development of EFL students' writing skills. *Cogent Education*, *11*(1), 2410101. https://doi.org/10.1080/2331186X.2024.2410101

Punar Özçelik, N., & Yangın Ekşi, G. (2024). Cultivating writing skills: The role of ChatGPT as a learning assistant—a case study. *Smart Learning Environments*, *11*(1), 10. https://doi.org/10.1186/s40561-024-00296-8

Saiti, E., Saha, S., Bunsch, E., Sitnik, R., & Theoharis, T. (2025). An automated approach for difference detection in cultural heritage applications. *Multimedia Tools and Applications*, 1-21. https://doi.org/10.1007/s11042-025-20690-9

Saleh, S., & Alsubhi, A. I. (2025). The role of techno-competence in AI-based assessments: Exploring its influence on students' boredom, self-esteem, and writing development. *Language Testing in Asia*, *15*(1), 6. https://doi.org/10.1186/s40468-025-00344-1

Tate, T. P., Harnick-Shapiro, B., Ritchie, D. R., Tseng, W., Dennin, M., & Warschauer, M. (2025). Incorporating generative AI into a writing-intensive undergraduate course without off-loading learning. *Discover Computing*, *28*(1), 72. https://doi.org/10.1007/s10791-025-09563-9

Tengler, K., & Brandhofer, G. (2025). Exploring the difference and quality of AI-generated versus human-written texts. *Discover Education*, *4*(1), 113. https://doi.org/10.1007/s44217-025-00529-z

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Wang, C. (2025). Exploring students' generative AI-assisted writing processes: Perceptions and experiences from native and nonnative English speakers. *Technology, Knowledge and Learning*, *30*, 1825–1846. https://doi.org/10.1007/s10758-024-09744-3

Yang, H., Gao, C., & Shen, H.-z. (2024). Learner interaction with, and response to, AI-programmed automated writing evaluation feedback in EFL writing: An exploratory study. *Education and Information Technologies*, *29*(4), 3837-3858. https://doi.org/10.1007/s10639-023-11991-3

Zhang, Z., van Lieshout, L. L., Colizoli, O., Li, H., Yang, T., Liu, C., . . . Bekkering, H. (2025). A cross-cultural comparison of intrinsic and extrinsic motivational drives for learning. *Cognitive, Affective, & Behavioral Neuroscience*, *25*(1), 25-44. https://doi.org/10.3758/s13415-024-01228-2

Zizka, L. (2025). It looks good enough": Recognizing the quality of generative ai output in academic writing tasks in higher education. *Journal of Hospitality & Tourism Education*, 1-10. https://doi.org/10.1080/10963758.2025.2496663