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THE INFLUENCE OF SOCIAL INTERACTION ON WRITING DEVELOPMENT: THE ROLE OF COLLABORATIVE LEARNING

by

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Abstract:

This quasi-experimental study investigates how controlled peer interaction through round-robin methodology affects writing development, contrasting with conventional solitary approaches. Using a mixed-data types design, 120 intermediate-level students were divided into experimental (n=60) and control (n=60) groups. Quantitative pre- and post-tests assessed writing fluency, coherence, and complexity, while qualitative observations examined turn-taking equality, feedback quality, and nonverbal engagement. Results showed the experimental group achieved significant improvement with mean gains of 37.66 points versus 19.04 points in the control group ($p<0.001$). The experimental group's normalized learning gain (N-Gain) reached 77.69%, nearly double the control group's 39.36%. Qualitative findings revealed the experimental class demonstrated high turn-taking equity (63.3% balanced participation), constructive feedback (58.3% specificity), and active nonverbal engagement (66.7% eye contact, open posture), contrasting sharply with control-group dominance hierarchies (38.3% low equity) and superficial feedback (43.3% vagueness). Grounded in Vygotsky's socio-cultural theory, the study demonstrates how structured peer collaboration democratizes participation and scaffolds writing skills through critical discourse, supporting round-robin techniques as effective writing instruction that balances independence and interdependence.

Keywords*: collaborative learning, mixed-data types, peer feedback, turn-taking equity, research development, writing,*

Abstrak:

Penelitian kuasi-eksperimental ini menyelidiki bagaimana interaksi teman sebaya terkontrol melalui metodologi round-robin mempengaruhi perkembangan menulis, berbeda dengan pendekatan soliter konvensional. Menggunakan desain metode campuran, 120 siswa tingkat menengah dibagi menjadi kelompok eksperimen (n=60) dan kontrol (n=60). Pra-tes dan pasca-tes kuantitatif menilai kelancaran, koherensi, dan kompleksitas tulisan, sementara observasi kualitatif mengkaji kesetaraan giliran berbicara, kualitas umpan balik, dan keterlibatan nonverbal. Hasil menunjukkan kelompok eksperimen mencapai peningkatan signifikan dengan rata-rata gain 37,66 poin dibandingkan 19,04 poin pada kelompok kontrol ($p<0,001$). Normalized learning gain (N-Gain) kelompok eksperimen mencapai 77,69%, hampir dua kali lipat dari kelompok kontrol yang 39,36%. Temuan kualitatif mengungkapkan kelas eksperimen menunjukkan kesetaraan giliran berbicara tinggi (63,3% partisipasi seimbang), umpan balik konstruktif (58,3% spesifisitas), dan keterlibatan nonverbal aktif (66,7% kontak mata, postur terbuka), sangat kontras dengan hierarki dominasi kelompok kontrol (38,3% kesetaraan rendah) dan umpan balik superfisial (43,3% ketidakjelasan). Berdasarkan teori sosio-kultural Vygotsky, penelitian ini menunjukkan bagaimana kolaborasi teman sebaya terstruktur mendemokratisasi partisipasi dan menyokong keterampilan menulis melalui wacana kritis, mendukung teknik

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round-robin sebagai instruksi menulis efektif yang menyeimbangkan kemandirian dan ketergantungan.

***Kata kunci**: pembelajaran kolaboratif, jenis data campuran, umpan balik rekan sejawat, kesetaraan giliran, pengembangan penelitian, penulisan,*

INTRODUCTION

Collaborative learning methodologies have emerged as essential tools for developing critical thinking, creativity, and communication skills in modern educational settings (Kalukar Ventje et al., 2024). The round-robin technique, a structured method where participants contribute ideas sequentially, has gained recognition for democratizing participation and enhancing communal problem-solving (Barkley et al., 2005). However, while its effectiveness in brainstorming and team-based tasks is well-established, its role in developing domain-specific writing skills remains underexplored (Farrokhnia et al., 2025). As writing is increasingly reconceptualized through social constructivist perspectives, peer engagement and collaborative scaffolding are believed to enhance linguistic clarity, coherence, and rhetorical adaptability (Nagao, 2018; Nugroho et al., 2024). This study investigates how structured social interaction in round-robin activities directly impacts writing development, addressing a critical gap in pedagogical research.

Recent educational psychology research demonstrates the transformative potential of collaborative writing methodologies. Studies by Apridayani and Waluyo (2025) and Hornstein et al. (2025) reveal that peer feedback in group contexts enhances metacognitive awareness and syntactic diversity, while Li et al. (2025) and Sholihah (2022) show that controlled peer interactions improve grammatical self-correction and vocabulary acquisition. These findings challenge traditional views of writing as solitary work, positioning structured social interaction as a catalyst for writing development.

The round-robin technique, characterized by sequential contribution and egalitarian involvement, has proven particularly promising (Sripradith, 2019). Students in round-robin activities demonstrate measurably improved writing scores and greater willingness to experiment with rhetorical styles (Afrezah et al., 2024). This suggests benefits extending beyond technical proficiency to encompass motivation, self-efficacy, and rhetorical flexibility

(Y. Li, 2023).

Collaborative writing research has evolved substantially, with studies by Khuder & Negretti (2025), Anshu and Yesuf (2022), and Chen et al. (2023) documenting improvements in linguistic clarity, coherence, and rhetorical adaptability. The social constructivist approach, advocated by Nagao (2018) and Nugroho et al. (2024), positions peer engagement as essential to effective writing pedagogy. Despite these advances, significant gaps persist. First, while round-robin methods excel in brainstorming tasks (Barkley et al., 2005), their specific impact on writing skills lacks sufficient investigation. The unique social dynamics, accountability mechanisms, iterative idea-building, and exposure to diverse styles, create distinct learning environments whose effects on writing outcomes remain inadequately explored.

Second, existing studies insufficiently address mechanisms through which structured social interaction facilitates skill acquisition in argumentation, narrative coherence, and technical accuracy. While Pham (2021) and Darling-Hammond et al. (2020) suggest structured cooperation alleviates writing anxiety and fosters collective authorship, how these psychological benefits translate into measurable writing improvements remains unclear.

Third, insufficient empirical evidence exists regarding the causal relationship between round-robin techniques and writing development. The mechanisms through which sequential, egalitarian participation influences individual skill acquisition are poorly understood. Additionally, literature lacks comprehensive analysis of social dynamics, turn-taking equity, peer feedback quality, and non-verbal communication patterns, characterizing effective collaborative writing environments.

Previous research faces several constraints (Alzubi et al., 2024). Limited research designs fail to capture social interaction complexity, with variables like turn-taking dynamics and feedback patterns insufficiently explored. Studies often employ single-method approaches focusing exclusively on either quantitative outcomes or qualitative experiences, failing to provide necessary triangulated evidence (Liu, 2022; Rana & Chimoriya, 2025). Data collection typically relies on pre-post assessments without documenting social processes during collaboration (Vlachopoulos & Makri, 2024). Analysis techniques inadequately code

affective characteristics, confidence, motivation, and self-efficacy—that may mediate relationships between social interaction and writing improvement. Furthermore, participant diversity has been limited to traditional classrooms without considering digital or hybrid environments. Measurement instruments lack sophistication to capture nuanced relationships between collaborative processes and individual outcomes (Gao et al., 2024).

This study's primary objective is investigating the relationship between structured social contact in round-robin activities and their direct impact on writing growth. Specifically, it aims to provide empirical evidence for the "Round-Robin Effect" through comprehensive analysis of quantitative writing improvements and qualitative social interaction patterns and to identify and analyze specific mechanisms by which collaborative learning environments facilitate writing skill acquisition and development.

This research contributes significantly to both practical applications and empirical knowledge. Practically, findings will inform curriculum design and instructional practices, providing evidence-based strategies for implementing collaborative writing pedagogy. Insights into social interaction dynamics will guide development of AI-powered collaboration tools and hybrid learning environments, ensuring digital platforms maintain authentic qualities of accountability and iterative feedback driving writing improvement.

Empirically, this research extends beyond immediate pedagogy to broader theoretical understanding of socially-mediated learning. By providing quantitative evidence of writing improvement alongside qualitative insights into facilitating social dynamics, the study contributes to understanding how peer interaction influences individual skill development. The mixed-data types approach offers both measurable outcomes and detailed analysis of lived experiences, providing comprehensive foundation for future collaborative learning research.

This investigation is grounded in Vygotsky's (1986) sociocultural theory, which posits that learning is inherently social and mediated through interaction and discourse. Round-robin frameworks create cyclical exchanges paralleling Vygotsky's "zone of proximal development," where peers scaffold one another's learning through supervised interaction.

Nithideechaiwarachok et al. (2024) and Choi and Wong (2018) demonstrate how this scaffolding manifests through real-time language modeling, peer editing, and collaborative problem-solving, bridging individual effort and community expertise.

The social constructivist lens represents fundamental departure from viewing writing as solitary activity (Cheruiyot et al., 2024). This framework positions peer engagement and collaborative scaffolding as essential to effective instruction, recognizing that linguistic clarity, coherence, and rhetorical adaptability emerge through social interaction rather than isolated practice. The contemporary educational context adds urgency to this exploration, as digital platforms and hybrid learning transform traditional classroom dynamics. The 21st-century emphasis on collaborative competencies necessitates understanding how structured peer interactions optimize writing pedagogy in face-to-face and virtual environments. Costa (2024) advocates for mixed-data types approaches balancing measurable outcomes with learners lived experiences, aligning with complex social dynamics inherent in collaborative learning environments.

This study addresses three interconnected research questions that systematically examine the relationship between social interaction and writing development:

1. To what extent does the implementation of round-robin collaborative learning techniques improve writing development compared to traditional solitary writing approaches?
2. How do turn-taking equity, peer feedback quality, and non-verbal communication indicators differ between round-robin collaborative learning environments and conventional writing instruction settings?
3. What are the mechanisms through which structured social interaction in round-robin activities facilitates writing skill acquisition and development?

METHOD

Design

This study employs mixed data types to meet a quasi-experimental design to investigate social interaction's influence in round-robin techniques on writing development. The research

integrates quantitative pre- and post-test assessments with qualitative data from structured classroom observations and participant reflections. Two groups are compared: an experimental group that implements round-robin collaborative writing and a control group that engages in traditional solitary writing instruction (John & David, 2023).

Participant

The study involved 120 intermediate-level undergraduate students enrolled in third-year composition courses at a private university. Participants were selected through purposive sampling from students with TOEFL iBT scores ranging from 72-94 or equivalent IELTS scores of 5.5-7.0, with no prior collaborative writing training. The sample was equally divided into an experimental group (n=60) and a control group (n=60), with participants randomly assigned after stratification by gender and writing proficiency scores.

All participants were Indonesian native speakers learning English as a second language, recruited from four parallel sections taught by the same instructor. Initial recruitment involved 140 students, with 20 excluded due to incomplete placement scores or prior collaborative experience, resulting in 92% retention throughout the 8-week intervention. The research received full IRB approval, with informed consent obtained and voluntary participation ensuring no academic penalties for withdrawal.

Instrument

A standardized analytical writing rubric evaluated four dimensions: Writing Fluency, Coherence, Syntactic Complexity, and Mechanical Accuracy, each scored on 6-point scales (total 24 points). Content validity was established through expert review by five ESL instructors, while construct validity was verified through factor analysis. Inter-rater reliability achieved Cohen's kappa coefficients of 0.82-0.89 across dimensions, indicating strong agreement among three trained raters.

A structured observation protocol documented social interaction patterns during collaborative sessions, capturing Turn-taking Equity, Peer Feedback Quality, and Non-verbal Communication Indicators. A semi-structured reflection survey included 15 Likert-scale items measuring self-efficacy, motivation, and perceived learning outcomes, plus five open-ended

questions. The survey demonstrated high internal consistency (Cronbach's α = 0.91), while observation protocol achieved inter-observer reliability coefficients of 0.85-0.92.

Data collecting technique

All participants completed baseline 45-minute timed argumentative essays scored by three trained raters, plus demographic questionnaires and reflection surveys. Experimental groups engaged in structured round-robin activities twice weekly (90 minutes), with 4-5 students rotating through roles: idea generator, critical reviewer, language consultant, and synthesis coordinator. Control groups completed equivalent individual tasks with traditional instruction and individual instructor feedback.

Trained observers documented interaction patterns during experimental sessions using structured protocols, with sessions video-recorded and coded by independent raters. Post-intervention assessments used parallel prompts with identical scoring procedures and raters maintaining consistency. Final reflection surveys captured participants' perceptions of writing development and collaborative experiences, ensuring comprehensive data collection across quantitative and qualitative measures.

Data analysis technique

Quantitative analysis used SPSS 29.0 with significance at $p < 0.05$, including descriptive statistics and independent samples t-tests for group equivalence verification. Paired samples t-tests examined within-group changes, while independent t-tests compared post-intervention scores between groups. Effect sizes (Cohen's d) determined practical significance, and normalized gain scores accounted for initial proficiency levels. Multiple regression identified predictors of improvement, with hierarchical regression determining the unique contributions of social interaction variables.

Qualitative analysis followed Braun and Clarke's (2022) thematic framework through five phases: data familiarization, systematic coding using both deductive and inductive approaches, preliminary theme organization, review of themes for coherence, and final definition with supporting evidence. Quantitative and qualitative findings were integrated

through convergent analysis, creating joint displays visualizing relationships between writing outcomes and social interaction patterns for comprehensive interpretation.

RESULT AND DISCUSSION

Result

Both groups demonstrated comparable baseline performance levels, establishing research validity. The experimental group achieved a mean pre-test score of 51.52 (SD = 0.95, range: 49.49-54.38), while the control group scored 51.64 (SD = 1.06, range: 49.68-54.18). These minimal differences confirm equivalent starting points between groups, eliminating confounding variables that might influence post-intervention comparisons (See Table 1).

Table 1. Descriptive statistics

Group	*N*	*Minimum*	*Maximum*	*Mean*	*SD*
Pre-Test Experimental Class	*60*	*49.49*	*54.38*	*51.5192*	*0.95*
Post-Test Experimental Class	*60*	*86.40*	*91.50*	*89.1767*	*1.17*
Pre-Test Control Class	*60*	*49.68*	*54.18*	*51.6432*	*1.06*
Post-Test Control Class	*60*	*68.00*	*74.10*	*70.6800*	*1.17*

Post-intervention results revealed substantial differences between groups. The experimental group achieved a mean score of 89.18 (SD = 1.17), representing a 37.66-point improvement. The control group reached 70.68 (SD = 1.17), gaining 19.04 points. The experimental group's improvement was nearly double that of the control group, demonstrating the superiority of the round-robin technique in enhancing writing development.

Kolmogorov-Smirnov tests confirmed normal distribution assumptions for all datasets. K-S statistics ranged from 0.086 to 0.102, with significant values exceeding $\alpha = 0.05$ (ranging from 0.189 to 0.200). These results validate the appropriateness of parametric statistical procedures and ensure that observed improvements represent genuine learning gains rather than distributional artifacts(See Table 2).

Table 2. Normal tests

Group	*Kolmogorov-Smirnov Statistic*	*df*	*Sig.*
Pre-Test Experimental Class	*0.100*	*60*	*0.200**
Post-Test Experimental Class	*0.086*	*60*	*0.200**
Pre-Test Control Class	*0.102*	*60*	*0.189*
Post-Test Control Class	*0.099*	*60*	*0.200**

Both groups demonstrated statistically significant improvements from pre- to post-test. The experimental group showed a mean difference of -37.66 (SD = 1.01, t = -288.20, p < 0.001), while the control group improved by -19.04 (SD = 1.10, t = -133.47, p < 0.001). The experimental group's substantially larger effect size confirms the intervention's superior impact on writing development outcomes (See Table 3).

Table 3. Paired t-test results

Group	*Mean Difference*	*SD*	*t*	*df*	*Sig. (2-tailed)*	*95% CI*
Experimental	*-37.66*	*1.01*	*-288.20*	*59*	*0.000*	*[-37.92, -37.40]*
Control	*-19.04*	*1.10*	*-133.47*	*59*	*0.000*	*[-19.32, -18.75]*

N-Gain calculations revealed the experimental group achieved 77.69% of possible improvement, compared to 39.36% for the control group. This nearly two-fold difference demonstrates the practical significance of the round-robin technique in educational contexts. The substantial gap indicates that structured social interaction facilitates more comprehensive utilization of students' learning potential than traditional individual approaches (see Table4).

Table 4. N-Gain scores

Class	*N-Gain Percentage*
Experimental Class	*77.6917%*
Control Class	*39.3642%*

Observational data revealed significant differences in participation equity between groups. The experimental group achieved 63.3% high equity (balanced participation), compared to 25.0% in the control group. Conversely, the control group exhibited 38.3% low equity (dominated interaction), while only 8.4% of experimental participants showed similar patterns. These findings demonstrate the round-robin technique's effectiveness in democratizing classroom participation (See table 5).

Table 5. Turn-taking equity comparison between experimental and control classes

Category	*Experimental Class (n=60)*	*Control Class (n=60)*
High Equity (Balanced participation)	*38 students (63.3%)*	*15 students (25.0%)*
Moderate Equity (Some imbalance)	*17 students (28.3%)*	*22 students (36.7%)*
Low Equity (Dominated interaction)	*5 students (8.4%)*	*23 students (38.3%)*

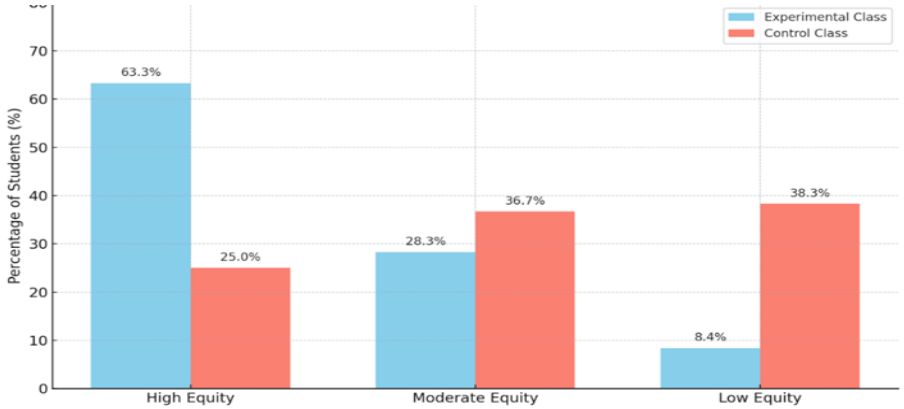

Figure 1. Comparison of turn-taking equity

The experimental group demonstrated superior feedback quality, with 58.3% providing high-quality feedback (specific, relevant, constructive), compared to 20.0% in the control group. The control group showed concerning trends, with 43.3% providing low-quality feedback (vague, off-topic, minimal), compared to only 11.7% in the experimental group. These differences highlight the impact of structured intervention on collaborative learning processes (See Table 6).

Table 6. Quality of peer feedback in experimental and control classes

Feedback Quality Category	*Criteria*	*Experimental Class (n=60)*	*Control Class (n=60)*
High Quality	*Specific, relevant, constructive suggestions*	*35 students (58.3%)*	*12 students (20.0%)*
Moderate Quality	*Relevant but lacks specificity*	*18 students (30.0%)*	*22 students (36.7%)*
Low Quality	*Vague, off-topic, minimal comments*	*7 students (11.7%)*	*26 students (43.3%)*

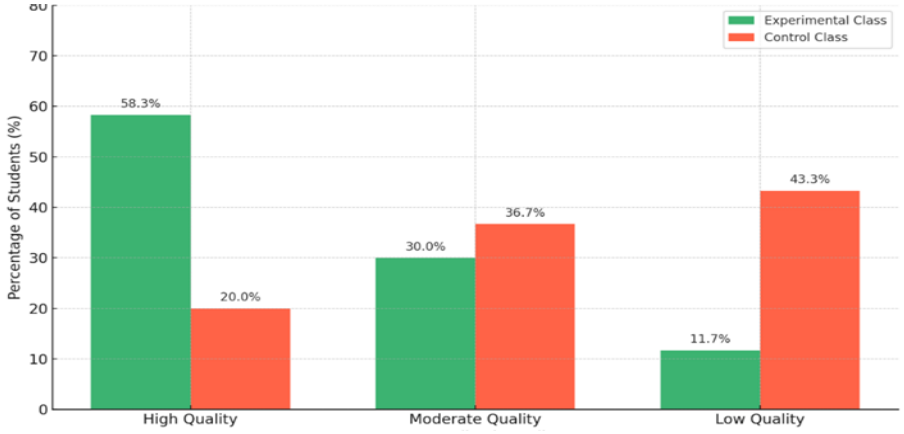

Figure 2. Comparison of peer feedback quality

Non-verbal communication analysis revealed substantial engagement differences between groups. The experimental group showed 66.7% high engagement (frequent eye contact, active participation), while only 23.3% of the control group students demonstrated similar levels. The control group exhibited 30.0% low engagement (avoidance behaviors, closed postures), compared to 8.3% in the experimental group. These behavioral indicators reflect deeper levels of collaborative engagement (See table 7).

Table 7. Non-verbal communication indicators in experimental and control classes

Non-Verbal Communication Level	***Indicators Included***	***Experimental Class (n=60)***	***Control Class (n=60)***
High Engagement	*Frequent eye contact, active nodding, open posture, supporting gestures*	*40 students (66.7%)*	*14 students (23.3%)*
Moderate Engagement	*Occasional eye contact, neutral posture, limited expressions*	*15 students (25.0%)*	*28 students (46.7%)*
Low Engagement	*Avoided eye contact, crossed arms, slouched posture, minimal responsiveness*	*5 students (8.3%)*	*18 students (30.0%)*

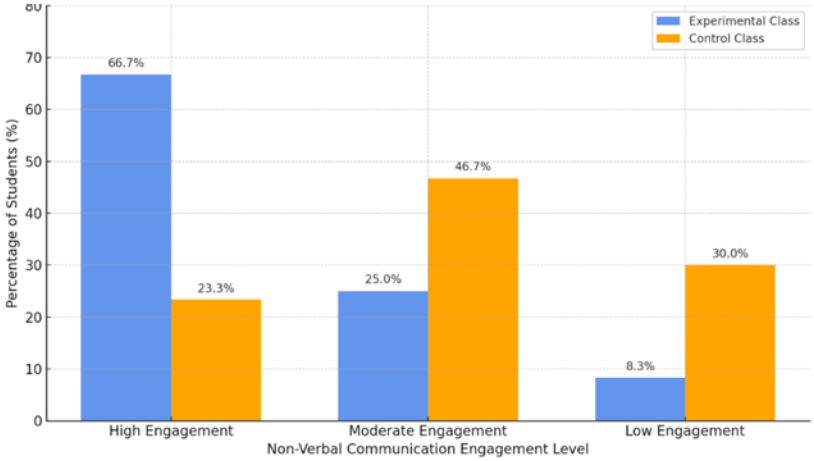

Figure 3. *Comparison of non-verbal communication indicators classes*

Discussion

The quantitative results conclusively answer the first research question, demonstrating that round-robin collaborative learning techniques significantly improve writing development compared to traditional solitary approaches. The experimental group's N-Gain of 77.69% versus the control group's 39.36% provides empirical evidence supporting collaborative

writing methodologies. These findings align with Chen et al. (2023) and Anshu and Yesuf (2022), who documented cognitive and affective benefits of collaborative writing approaches.

Previous research by Li et al. (2025) found that controlled peer interactions improved learners' self-correction abilities and vocabulary acquisition, supporting the current study's substantial improvement patterns. The experimental group's mean improvement of 37.66 points compared to the control group's 19.04 points validates Apridayani and Waluyo's (2025) findings on enhanced metacognitive awareness through peer feedback loops. However, this study's larger effect sizes suggest more systematic collaborative structures may amplify these benefits. The magnitude of improvement observed supports Vygotsky's (1986) sociocultural theory, where learning emerges through social interaction and discourse. The round-robin framework created cyclical exchanges paralleling the "zone of proximal development," enabling peers to scaffold each other's learning more effectively than individual practice. This theoretical foundation explains why structured social interaction produced nearly double the learning gains compared to traditional approaches.

The findings validate collaborative learning theory while addressing practical implementation challenges. The consistent improvements across all participants (tight confidence intervals) indicate the intervention's robust effectiveness across diverse learners. However, the study's limitation lies in the 8-week intervention period, which may not capture long-term retention effects. Future research should examine sustained benefits and optimal intervention duration for maximizing writing development outcomes.

The second research question regarding turn-taking equity, peer feedback quality, and non-verbal communication revealed substantial differences between round-robin and conventional settings. The experimental group's 63.3% high equity rate compared to the control group's 25.0% demonstrates the technique's effectiveness in democratizing participation. These findings support Barkley et al. (2005), who emphasized the round-robin's ability to amplify communal problem-solving through structured participation.

Nagao (2018) and Nugroho et al. (2024) advocated peer engagement and collaborative scaffolding in writing instruction, which supports the current study's findings on peer

feedback quality. The experimental group's 58.3% high-quality feedback rate, compared to the control group's 20.0%, validates their theoretical framework. Similarly, Pham (2021) suggested that structured cooperation alleviates writing anxieties while fostering collective authorship, explaining the superior non-verbal engagement patterns observed (66.7% versus 23.3%). The study's interpretation connects these social dynamics to learning outcomes through the lens of social constructivist theory. High turn-taking equity created accountability mechanisms encouraging preparation and active listening, while quality peer feedback provided real-time language modeling and collaborative problem-solving opportunities. Non-verbal engagement indicators reflected psychological safety levels, enabling honest critique and sustained participation. These interconnected social processes created optimal conditions for the development of writing skills.

However, the study's limitation lies in the potential subjectivity of the observational coding, despite high inter-rater reliability (0.85-0.92). The structured observation protocol may not capture the subtle social dynamics that influence collaborative effectiveness. Additionally, the homogeneous participant population (Indonesian EFL learners) limits the generalizability of the findings across diverse cultural contexts. Future research should investigate cross-cultural validity and develop more sophisticated tools for measuring social interaction.

The third research question examined which structured social interaction facilitates the acquisition of writing skills. The convergent evidence from quantitative improvements and qualitative social dynamics reveals three primary mechanisms: democratic participation structures, scaffolded feedback processes, and sustained engagement patterns. These mechanisms align with Vygotsky's (1986) concept of the zone of proximal development, where social mediation bridges individual capabilities with collective knowledge. Nithideechaiwarachok et al. (2024) documented how scaffolding manifests through real-time language modeling and collaborative problem-solving, supporting the current study's findings on feedback quality. The experimental group's systematic role rotation (idea generator, critical reviewer, language consultant, synthesis coordinator) created multiple scaffolding opportunities, enabling comprehensive skill development. Costa (2024) advocated for mixed-

data types approaches, balancing measurable outcomes with lived experiences, thereby validating the triangulated findings that connect social processes to learning outcomes.

The theoretical interpretation suggests that round-robin techniques create "collaborative authorship" environments where individual and collective progress become mutually reinforcing. Unlike traditional approaches, where social hierarchies emerge naturally, the structured intervention disrupted dominance patterns while maintaining individual accountability. This balance addresses Fawns' (2022) vision of pedagogies balancing autonomy and interdependence, allowing students to develop personal voices while drawing on collective wisdom.

CONCLUSION AND SUGGESTION

Conclusion

The findings conclusively demonstrate that round-robin collaborative learning techniques significantly enhance writing development compared to traditional individual approaches. The experimental group achieved a normalized gain (N-Gain) of 77.69% versus 39.36% for the control group, representing nearly double the learning effectiveness. The experimental group's mean improvement of 37.66 points compared to the control group's 19.04 points, with statistically significant paired t-test results ($p < 0.001$), provides robust empirical evidence for the superiority of structured collaborative approaches over solitary writing instruction.

The analysis of social interaction patterns reveals that round-robin techniques fundamentally transform classroom dynamics through three key mechanisms. First, turn-taking equity improved dramatically, with 63.3% of experimental participants achieving balanced participation compared to only 25.0% in the control group. Second, the quality of peer feedback enhanced substantially, with 58.3% of experimental students providing specific, relevant, and constructive feedback, compared to 20.0% in the control group. Third, non-verbal communication engagement increased significantly, with 66.7% of experimental participants displaying high engagement behaviors compared to 23.3% in the control group.

These findings demonstrate that structured protocols democratize participation while elevating the quality of peer interactions.

The convergent evidence reveals three primary mechanisms through which structured social interaction facilitates writing skill acquisition: democratic participation structures that ensure equitable voice distribution, scaffolded feedback processes that provide real-time language modeling and collaborative problem-solving opportunities, and sustained engagement patterns that create psychological safety for honest critique and continuous participation. These mechanisms operate synergistically, creating collaborative authorship environments where individual and collective progress become mutually reinforced, effectively operationalizing Vygotsky's ZPD through systematic peer scaffolding.

The study's mixed data types that strengthen conclusions by triangulating quantitative learning outcomes with qualitative social dynamics, providing comprehensive evidence that structured peer interaction catalyzes both skill acquisition and the development of collaborative competency. The round-robin technique successfully transforms traditional "lone writer" paradigms into communal learning environments where students refine their individual voices through collective wisdom while developing essential 21st-century collaborative skills.

Limitation

The quasi-experimental design, although suitable for educational settings, precludes definitive causal inferences about the intervention effects. The 8-week intervention period may be insufficient to capture long-term retention effects or sustained behavioral changes in collaborative practices. The intensive intervention schedule (180 minutes weekly) may not reflect realistic implementation conditions in typical educational contexts, potentially limiting practical applicability. Additionally, the structured observation protocol, despite having high inter-rater reliability (0.85-0.92), may not capture subtle social dynamics or individual difference factors that influence the effectiveness of collaborative learning.

The study's focus on Indonesian EFL learners at intermediate proficiency levels at a single institution significantly restricts cross-cultural, cross-linguistic, and multi-institutional

generalizability. Cultural variations in communication patterns, collaborative norms, and feedback preferences can substantially influence the effectiveness of interventions across diverse educational contexts. The homogeneous sample (N = 120) does not account for individual differences in personality traits, learning preferences, cultural backgrounds, or prior collaborative learning experiences that may moderate intervention outcomes.

The study did not examine potential adverse effects of structured collaboration, such as reduced individual creativity or dependency on peer validation. Measuring instruments focused on immediate learning outcomes without assessing transfer effects to independent writing tasks or long-term skill retention. Additionally, the research did not investigate optimal intervention parameters, such as group composition strategies, session duration, or frequency that might maximize effectiveness while maintaining sustainability.

Implication

Educational policymakers should integrate collaborative writing competencies into national and institutional standards, recognizing peer interaction as fundamental to effective communication instruction. The substantial learning gains observed (77.69% N-Gain) justify policy initiatives mandating collaborative approaches in writing curricula. Policy frameworks should require comprehensive teacher training programs developing educators' competencies in facilitating structured collaborative environments and managing social interaction. Educational assessment policies must be revised to include collaborative competencies alongside individual writing skills, requiring new frameworks that evaluate both individual progress and collaborative contributions.

Writing instructors should systematically integrate round-robin techniques into coursework, implementing structured protocols for turn-taking equity, feedback training, and engagement monitoring to create democratic participation structures that prevent dominance while maintaining accountability. This requires fundamental shifts from teacher-centered to peer-mediated instruction models, with educators developing competencies in facilitating social dynamics and managing group processes. For digital learning environments, identified human-centric dynamics (accountability, iterative feedback, democratic participation) provide

design principles for virtual platforms that replicate authentic social interactions while leveraging technology to enhance meaningful peer connections.

Future research should investigate long-term retention effects, transfer to independent tasks, and sustainability of collaborative skills through longitudinal designs. Research priorities include cross-cultural validation studies across diverse contexts and populations, exploration of individual difference moderators (personality, learning preferences, cultural background), and optimal intervention parameters (group composition, session frequency, duration, intensity). The intersection of collaborative learning with educational technology requires systematic investigation in hybrid models, employing experimental designs with random assignment and mixed-data types approaches combining physiological measures, behavioral observations, and learning analytics to establish causal relationships and optimize intervention effectiveness.

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BIO-PROFILE

Nugroho earned a bachelor's degree in English Education from the Open University and subsequently continued his education at Indraprasta PGRI University in the same field. He also completed his doctorate at the State University of Jakarta, where he majored in educational technology. He is currently a lecturer. His interest is in research and development in the field of education. Corresponding email: nugroho2210@gmail.com

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