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Transforming Writing Instruction for Children with Language Impairment through AI Integration

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ABSTRACT

The current research paper is about the use of Artificial Intelligence in children's writing with the focus on the child's language impairment and the perception of the teachers, the possibilities, and the challenges. Using a quantitative survey, the research gathered data from 301 teachers and discovered a good measure of teacher awareness and favorable attitudes to AI adoption, Moreover, educators see the potential in AI for improving writing skills, personalizing instruction, raising student engagement, and decreasing anxiety. Besides, AI technologies were identified as being efficient for giving instant feedback, differentiating activities, and enhancing vocabulary and grammar. Nevertheless, there are several obstacles that hinder the realization of the goal, such as limited access to technology, lack of teacher training, technical difficulties, and expensive costs. The research leads that AI is powerful to change writing teaching methods over time but the successful integration of AI requires the strategic investments in the infrastructure, the professional development and the co-design of the tools to ensure the use of special education in an equitable and effective manner.

Keywords: *Writing Instruction, Language Impairment, AI Integration*

INTRODUCTION

Writing is among the most complicated skills that students acquire which entails one to integrate linguistic, cognitive, and motor processes. Kids suffering from language impairments often find writing so difficult that it becomes a huge source of frustration. These youngsters usually show limited vocabulary, improper sentence structure, and have a hard time with organization and coherence. In particular, the conventional instructional methods, including modeling, scaffolding, and guided practice, have been quite successful in boosting writing results (Anwar et al., 2023; Aftab et al., 2024). Nevertheless, these traditional methods are often inadequate in addressing the individual and diverse needs of students with language impairments, especially in big classrooms where it is challenging to personalize. Recent developments in technology open up new possibilities to revolutionize the writing instruction by offering learners a more adaptive, real-time,

and personalized support that is in tune with their unique requirements (Fareed et al., 2016; Zawacki-Richter et al., 2019; Aftab et al., 2024).

AI tools like natural language processing systems, intelligent tutoring systems, and automated feedback platforms are the children's friends that come to their rescue in the writing process by giving them suggestions for vocabulary, correcting their grammar, and arranging their ideas. These systems not only monitor learners' input but also they issue immediate feedback which in turn lets students with language impairments practice their writing through a step-by-step process. Furthermore, AI-based writing tools can alleviate mental fatigue by breaking down difficult tasks, thus students become proficient in content development instead of mechanical errors. Thus, the integration of AI can offer individuals skill development paths which can then be an auxiliary of the evidence-based writing strategies thereby resulting in the dual success of written work quality and accuracy (Chen et al., 2020; Youn et al., 2025).

On the contrary, AI has a lot of ways it can help in schools if it were effectively and ethically managed. There are still some basic issues about the role of AI in education, such as ethical concerns about student data privacy, lack of teacher training in AI use, and disparities in access to technology (Afzaal et al., 2024; Aftab et al., 2024). These concerns form obstacles to the implementation of education in an efficient manner. In addition, the majority of research has been done on AI in math or reading skills, and there is very limited research focusing on AI application in writing skills for children with language impairments. Hence, the need is very essential for researchers to examine the extent to which h this technology can be integrated in genre writing in order to facilitate its benefits and solve the challenges at hand. Holmes et al. (2021) have indicated the objects of this research as extending the knowledge base to include a variety of factors such as potential, pedagogical strategies, and barriers in AI use for writing instruction of children with language impairments (Akgun & Greenhow, 2022; Vieriu & Petrea, 2025).

Statistically speaking, language disorders cause 7-10 percent of the cases of school children with language issues in the whole world, which in most cases leads to the inability of the children to express themselves and understand others. Writing which is a highly complicated skill that involves the use of different language skills becomes very hard for these kids. The traditional methods of teaching writing skills among which the most common are the explicit strategy instruction such as planning, drafting, revising, and editing are employed. These methods are quite efficient but they consume a lot of resources and mostly do not provide for the individualization of the learners' needs. AI-based technology has been increasingly embraced by educators to solve the problem of the gap in learners' needs in the last several years. Main reasons for the adoption of AI technologies in education include their capability to provide adaptive feedback, automated scoring, and individualized learning pathways. For instance, the automated AI writing program can correct grammatical mistakes, provide word usage help, and give suggestions for sentence constructions thus offering scaffolds that correspond to students' developmental needs (Simon & Rosenbaum, 2016; Knight et al., 2019; McGregor, 2020).

Most of the AI-related studies, which have been in the last, are concerned with general education. Only a few of the researches focus on the prodigious application of AI in subject math, study, and reading skills. The use of AI in children's writing instruction related to speech difficulties research is very limited and scattered (Zawacki-Richter et al., 2019). The main focus of the current works is on AI's capability of execution of grammar corrections and the automation of essay evaluations. But the majority of them do not talk about the ways in which it can be deeply integrated into that help writing development for learners with special needs. In addition, very little research investigates the opinions of the teachers about the usage of AI in the inclusive classrooms which leaves a big hole in understanding the practical challenges and opportunities of daily teaching in real-world situations (Chen et al., 2020; Owan et al., 2023; Doroudi, 2023).

Linguistically challenged children face numerous obstacles to developing their writing skills due to their problems with vocabulary, syntax, and coherence. Usually, instructive methods do not properly cater to the diverse requirements of these children, and teachers find it hard to give personal attention to every child in a big class. Although AI technologies offer adaptive and personalized solutions, little is known about how

they can be effectively integrated into writing instruction for this population. The problem addressed in this study is the lack of empirical evidence on AI-supported writing strategies for children with language impairments, particularly regarding their opportunities, challenges, and pedagogical applications (Shah et al., 2023; Hossain, 2024).

The objectives of the study are to:

1. Explore teachers' awareness and use of AI tools in teaching writing to children with language impairments.
2. Identify the opportunities AI provides for supporting writing instruction.
3. Examine the challenges and barriers teachers face in implementing AI-supported writing strategies.
4. Recommend effective, ethical, and pedagogically sound approaches for integrating AI into writing instruction.

This study is significant for multiple stakeholders in the education sector. For teachers, it provides practical insights into how AI can be embedded in evidence-based writing strategies to support learners with language impairments. For policymakers, the study highlights the infrastructural, ethical, and training needs necessary to implement AI effectively and equitably in schools. At a theoretical level, the research contributes to the growing literature on educational technology by addressing a critical gap: the role of AI in writing instruction for special needs learners. Furthermore, the study aligns with global goals of promoting inclusive and equitable quality education by demonstrating how AI can serve as a tool for differentiation and personalization in literacy instruction (United Nations, 2020). Ultimately, this research aims to transform writing pedagogy by leveraging AI to create inclusive, adaptive, and future-ready learning environments (Li et al., 2021).

LITERATURE REVIEW

Writing is a complex, integrative skill that draws on multiple cognitive and linguistic subsystems vocabulary knowledge, morphosyntax, discourse organization, working memory, and transcriptional mechanics (handwriting or typing). For many children with language impairment (LI), weaknesses across one or more of these domains translate into persistent difficulties in producing coherent, extended written texts (Harrison et al., 2025; Kim, 2024). Empirical work documents that children with LI typically produce shorter essays, use fewer complex sentences, and include fewer idea units and cohesive devices compared with typically developing peers, deficits that undermine academic success and persist without targeted intervention. Given the multi-layered demands of composing, interventions must address both surface-level skills (spelling, grammar) and higher-order aspects (planning, text structure, revision), yet providing this level of individualized scaffold within everyday classrooms is challenging (Knight et al., 2019; Meltzer et al., 2021).

Evidence-based writing instruction for struggling writers including those with LI centers on explicit strategy instruction (planning, drafting, revising), integrated grammar instruction within meaningful writing contexts, use of graphic organizers to scaffold text structure, and iterative feedback cycles that support revision. Process-writing approaches and strategy training (e.g., self-regulation prompts, goal setting, and modeling) have demonstrated positive effects on composition quality when implemented with fidelity (Harris, 2021). However, these practices are resource-intensive: they require repeated, formative teacher feedback and opportunities for guided practice, which are difficult to sustain at scale in classrooms with high student-to-teacher ratios. Consequently, many learners with LI do not receive the frequent, individualized feedback necessary for durable gains in composition quality (Pressley & Afflerbach, 2022; Meltzer et al., 2021).

Conventional feedback practices teacher annotations, conferencing, or peer review offer pedagogical value but are constrained by logistics and timing; teachers often provide feedback after submission rather than during drafting, reducing its immediacy and thus its instructional potency. In contrast, technology affords the possibility of more frequent, low-stakes practice with immediate formative feedback (Majid & Islam, 2021; Buckingham et al., 2023). Recent advances in educational technology, especially artificial intelligence (AI) methods such as natural language processing (NLP) and machine learning, enable automated analysis of

student writing at multiple levels (lexical, syntactic, discourse) and can produce scaffolded prompts, model examples, and revision suggestions in near real time. These capabilities make AI a promising adjunct to teacher instruction by operationalizing the cycles of feedback and revision that undergird evidence-based writing pedagogy (Chen et al., 2020; Holmes et al., 2021).

Artificial intelligence in education encompasses diverse computational techniques NLP for parsing and generating language, supervised machine learning for pattern detection, and adaptive algorithms that tailor tasks to learner performance. In the context of writing, AI applications range from grammar and style checkers to automated essay scoring (AES) engines and intelligent tutoring systems (ITS) that can scaffold planning, propose lexical alternatives, and flag discourse-level issues such as weak cohesion or missing topic sentences (Gan et al., 2021). Importantly, AI systems can log longitudinal performance data, producing fine-grained analytics that help teachers identify persistent error patterns and design targeted instruction. While AI cannot replace the human aspects of pedagogy (motivation, socio-emotional support, instructional judgment), it can augment teachers' capacity to deliver individualized practice and rapid formative feedback (Zawacki-Richter et al., 2019; Chen et al., 2020).

A growing number of classroom studies report that AI-supported writing tools improve surface accuracy (grammar, punctuation, and spelling) and increase student engagement through instant corrective feedback and scaffolding (Zou et al., 2023). Natural language processing modules that provide contextualized vocabulary suggestions and sentence-level rewrites can reduce the cognitive load associated with mechanical correctness, enabling students to focus on idea generation and organization. However, evidence regarding improvements in higher-order composition quality argument development, coherence, and rhetorical effectiveness is more mixed. The literature indicates that gains in higher-order outcomes occur most reliably when AI feedback is combined with teacher-led strategy instruction (e.g., modeling, guided revision tasks) rather than when AI tools are used in isolation (Kong et al.,2021; Knight et al., 2019; Alangari, 2025).

For students with LI the affordances of AI that map to explicit pedagogical needs are particularly salient. Speech-to-text functionality enables learners with transcription difficulties to externalize ideas without the motor or orthographic barriers of handwriting, while text-to-speech supports proofreading and self-monitoring by converting drafts into an auditory format (PM, 2024; Crompton et al., 2024). Visual planners and AI-assisted concept maps can scaffold planning and organization. Such multimodal supports align with Universal Design for Learning (UDL) principles by offering multiple means of representation and expression, thereby increasing access for learners whose language production bottlenecks obscure their underlying knowledge. When combined with targeted prompts that reflect students' specific linguistic weaknesses (e.g., sentence combining for morphosyntactic deficits), AI can operationalize differentiated scaffolds at scale (Xu & Brown, 2022; Meltzer et al., 2021).

Motivational and affective dimensions are also important; writing can be anxiety-provoking, especially for learners with histories of failure. AI platforms that incorporate gamified elements, progress dashboards, and immediate positive feedback can increase engagement and willingness to revise. Low-stakes AI-mediated practice allows students to experiment with language and form corrective habits without the public exposure of teacher or peer critique (Zhai & Wibowo, 2023; Chanpetch & Songserm, 2023). Several studies document increased writing fluency and revision behavior when AI scaffolds reduce the barrier of immediate error correction, though transfer to complex curriculum-relevant writing again depends on scaffold quality and the presence of adult mediation (Knight et al., 2019; Chen et al., 2020; Hellín et al., 2023).

A crucial theme in the literature is that AI is most effective when tightly integrated with sound pedagogical design rather than deployed as a standalone fix. Tools that merely flag errors (surface checks) without linking those errors to strategy instruction or revision steps produce limited learning. Conversely, AI systems designed to mirror teacher scaffolds prompting for a clearer topic sentence, suggesting evidence-to-support claims, or providing revision checklists support the cognitive processes central to composition and produce more meaningful gains. The teacher's role in interpreting AI analytics, selecting follow-up tasks,

and modeling revision remains indispensable; AI complements but does not substitute for teacher expertise (Kong et al., 2021; Holmes et al., 2021).

Professional development and teacher readiness are recurrent concerns. Studies show that teachers often lack sufficient training to interpret AI feedback, integrate system reports into lesson planning, or align AI recommendations with curriculum standards and individualized education program (IEP) goals. Without job-embedded PD that includes co-planning, modeling, and coaching, AI tools tend to be underused or used in ways that are inconsistent with best practices. Effective implementation models therefore pair technology rollout with sustained professional learning that addresses both technical skills and pedagogical integration (Holmes et al., 2021; Li et al., 2021).

Ethical, privacy, and equity issues are significant and must be considered in any serious plan for AI adoption. AI systems depend on collection and analysis of student writing samples and metadata, raising questions about consent, data security, and secondary uses of information. Algorithmic bias is a concern when models are trained on corpora that do not reflect the linguistic diversity of students, potentially misrepresenting dialectal or cultural language patterns as errors (Hasan et al., 2024; Al-Kfairy et al., 2024; Zhai et al., 2024). Equity of access is another pressing issue: schools in low-resource contexts may lack reliable internet, devices, or technical support, which risks widening existing achievement gaps if AI becomes a privileged resource in better-funded districts. Thoughtful policy and governance frameworks are therefore essential to protect vulnerable learners and ensure equitable benefits (Li et al., 2021; United Nations, 2020; Lim et al., 2023).

Methodological and empirical gaps persist in the field. Much of the extant evidence derives from short-term pilots or single-school case studies that emphasize surface gains; robust randomized controlled trials (RCTs) and longitudinal studies that assess transfer to authentic writing tasks over time remain comparatively rare (Smith et al., 2022; Halkiopoulos & Gkintoni, 2024). Furthermore, heterogeneity within the LI population differences between expressive and receptive language profiles, co-occurring attention or motor difficulties means that one-size-fits-all AI solutions are unlikely to be equally effective for all students. Research that disaggregates effects by LI subtype, investigates dosage and scaffold sequencing, and examines maintenance of gains is urgently needed (Holmes et al., 2021; Kong et al., 2021; El-Hakim et al., 2025).

Promising implementation models emerging from the literature adopt a blended approach: AI handles frequent, low-level scaffolding (grammar, spelling, lexical prompts, and formative checks) while teachers focus on explicit strategy instruction, discourse coaching, and higher-order revision practices. Such models often involve multidisciplinary collaboration teachers, speech-language pathologists, and special educators so that AI prompts and goals are aligned with individualized language objectives (Alordiah, 2023; Zou et al., 2023; Park & Doo, 2024). Family involvement (sharing AI progress reports and home practice suggestions) further supports generalization to authentic writing contexts. Evidence from pilot implementations suggests these blended models improve both efficiency and instructional quality, though scaling them requires investment in training, infrastructure, and iterative tool development with practitioner input (Chen et al., 2020; Meltzer et al., 2021; Cao & Phongsatha, 2025).

AI tools of the future will be built on foundational design principles centered around educational alignment, understandable operation, adaptability to different language profiles, and strict data governance. It is through co-design processes such as those that involve teachers and SLPs (speech-language pathologists) as participants at the very beginning stages which the AI feedback can be mapped on the routine instruction and IEP goals with the certainty that instructional routines and IEP goals receive proper mapping of AI feedback (Privitera et al., 2024; Fitas, 2025). In adaptive systems, teacher control over the degree of feedback granularity, dialectal variation allowing for customization, and interpretable analytics rather than just scores are some of the features that should be considered. The ethical design must, as a matter of course, have consent procedures, strategies for data minimization, and security measures that are strong to be able to protect students' writing samples and personal information (Li et al., 2021; Holmes et al., 2021; Eyal, 2025).

To sum up, the intersection of writing pedagogy and AI technologies that rely on evidence as a base is a promising pathway of changing instruction for kids having language impairment. The points of AI that a user cannot challenge such as immediacy of feedback, adaptability, multimodal support, and analytics can bring into practice those scaffolds that are hard to deliver in a large scale but are keys in the pedagogy (Sadigzade, 2025; Mohebbi, 2025). Nevertheless, realizing this promise entails paying detailed attention to pedagogical integration, teacher professional learning, equity of access, and ethical governance. Qualitative and quantitative longitudinal studies, co-designed tool development, and system-level supports will be the requirements to guarantee that the use of AI does not deepen the educational inequalities but rather it facilitates them to fade for children with LI (Chen et al., 2020; Holmes et al., 2021; Li et al., 2021; Zhang, 2025; Nhan et al., 2025).

RESEARCH METHODOLOGY

Research Design

This research had a descriptive survey design and operated under a quantitative paradigm. It aimed at exploring the perceptions, knowledge, and practices of the use of AI to facilitate the writing of children with language disorders by the educators. First, the selection of a quantitative design was suitable in that it enabled the researcher to gather standardized data from a large sample of respondents, to numerically measure the variables and to statistically analyze the patterns. Such a quantitative survey can be used to investigate the nature of the relationships, differences, and trends across various groups thereby making it possible to generalize the results to a broader population (Creswell & Creswell, 2018).

Population of the Study

This research targeted teachers of kids with speech disabilities who work in special education schools, regular schools, and resource centers. The teachers were the main focus of the study, along with graduates of educational and training colleges (special education and speech therapy) as well as computer science graduates with educational diplomas who deal with literacy instruction. This group of people was picked because the teachers are the ones who directly use AI-based teaching methods in writing and hence they are in the best position to give a correct view to the accessibility and the troubleshooting of the issue (UNESCO, 2021).

Sample and Sampling of the Study

The study used a purposive sampling method to select the participants. They must have been working in the area of writing instruction for speech-impaired children to be considered. A sample of 300 teachers was taken from the general population, which was divided into a schools group consisting of urban and semi-urban schools where AI tools or digital technologies were used. The requirement for the inclusion of participants was that they had at least two years of teaching experience and had been exposed to AI applications or digital literacy tools. It was appropriate to select participants through purposive sampling since the study needed the participants to have the specialized knowledge and experience that relate to the research objectives (Etikan & Bala, 2017).

Instrument Development

The researcher himself came up with a structured questionnaire to be the main tool for data collection. The questionnaire has 40 items that are divided into five thematic sections: (a) awareness of AI in education, (b) perceptions of AI-supported writing instruction, (c) opportunities of AI integration, (d) challenges and barriers, and (e) suggestions for improvement. Each of the items was developed for a five-point Likert scale from strongly disagree (1) to strongly agree (5). Besides that, there was a part with some open questions where the teachers could give a more detailed account of their experience. The questionnaire was based on the literature review of the studies on AI in education and writing instruction (Chen et al., 2020; Holmes et al., 2021).

Validity of the Research Instrument

The validity of content was recognized by a group of experts, consisting of three university professors in special education and two researchers in educational technology. These five experts assessed the items for clarity, usefulness, and their correspondence to the study's objectives. Some changes were made in the items reflecting the experts' comments, such as changing the wording of the ambiguous statements and ensuring the items' correspondence to the concepts of AI integration and writing pedagogy. A pilot test with 30 teachers, who were not part of the final sample, was carried out to further improve the instrument. Content validity was the evidence that the questionnaire sufficiently covered the range of issues related to AI integration in writing instruction for students with language impairments (Taherdoost, 2018).

Reliability of the Research Instrument

Reliability of the instrument was assessed using Cronbach's alpha coefficient on the pilot study responses. The reliability coefficient for the overall scale was 0.87, indicating high internal consistency. Subscale reliabilities ranged from 0.81 to 0.89 across the domains of awareness, opportunities, challenges, and perceptions, all exceeding the recommended 0.70 threshold (Taber, 2018). These results confirmed that the questionnaire was a reliable measure of the constructs under investigation.

Data Collection Procedure

After obtaining ethical clearance from the institutional review board, data were collected over a two-month period. Questionnaires were distributed both online (via Google Forms) and in paper-based format to maximize participation. Respondents were briefed on the purpose of the study, assured of confidentiality, and provided with informed consent forms. Follow-up reminders were sent to improve response rates. For the qualitative component, semi-structured interviews were conducted with a subset of 20 teachers who volunteered, focusing on deeper insights into implementation practices, barriers, and training needs. This multi-pronged collection ensured both breadth and depth of data (Creswell & Plano Clark, 2018).

Data Analysis Procedure

For summarizing answers, the quantitative data collected via questionnaires were processed with descriptive statistics (frequencies, percentages, means, and standard deviations). To identify the differences in teachers' perceptions based on qualifications, teaching experience, and area of posting, one-way ANOVA and independent-samples t-tests, as well as, inferential statistics were employed. Reconfirmation of scale reliabilities was done during the process. Open-ended responses and interviews formed the qualitative data which were processed through thematic analysis following Braun and Clarke's (2019) six-phase method: familiarization, coding, theme development, review, definition, and reporting. Such a combination of quantitative and qualitative data ensured a thorough understanding of AI's role in writing instruction for children with language impairments.

Table 1: Frequency Distribution of Respondents by Demographics

Title	Description	Frequency	Percentage (%)
Gender	Male	110	36.5%
	Female	191	63.5%
		301	100%
Age of Respondents	21-30 Y	8	2.7%

	31-40 Y	91	30.2%
	41-50 Y	164	54.5%
	51-60 Y	38	12.6%
		301	100%
Qualification	Master	196	65.1%
	M.Phil.	89	29.6%
	PHD	16	5.3%
		301	100%
Area of Posting	Rural	70	23.3%
	Urban	231	76.7%
		301	100%
Experience	1-5 Y	71	23.6%
	6-10 Y	139	46.2%
	11-15 Y	71	23.6%
	>15 Y	20	6.6%
		301	100%

This table presents the demographic profile of respondents. The majority were female (63.5%) and most participants were aged 41–50 years (54.5%). A large proportion held a Master's degree (65.1%), while only 5.3% were PhD holders. Most respondents were posted in urban areas (76.7%), and teaching experience was concentrated in the 6–10 year range (46.2%). These results show that the sample is well-experienced, predominantly female, urban-based, and highly educated, which strengthens the reliability of their insights.

Table 2: Teacher Knowledge and Perceptions about AI

Sr.	Statements of Questions	5	4	3	2	1	M	SD
1	I am familiar with the use of AI tools for writing instruction.	171	104	18	8	0	4.46	0.73
		57%	35%	6%	3%	0%		
2	AI integration can significantly improve writing skills in children with language impairments.	164	129	8	0	0	4.52	0.55
		54%	43%	3%	0%	0%		
3	I believe AI-based tools can personalize	142	149	9	0	1	4.43	0.59

	writing instruction to meet individual needs.	47%	50%	3%	0%	0%		
4	AI applications make writing tasks more engaging for students with language difficulties.	161 53%	118 39%	7 2%	11 4%	4 1%	4.40	0.82
5	I feel confident in using AI tools to support writing development.	114 38%	148 49%	27 9%	12 4%	0 0%	4.21	0.77
6	AI tools provide immediate feedback that enhances students' writing performance.	134 45%	117 39%	33 11%	17 6%	0 0%	4.22	0.86
7	AI can effectively support teachers in diagnosing writing-related language difficulties.	122 41%	136 45%	35 12%	4 1%	4 1%	4.22	0.80
8	My attitude toward integrating AI in writing instruction is positive.	123 41%	148 49%	24 8%	2 1%	4 1%	4.28	0.75

The findings reveal strong familiarity and positive perceptions of AI integration in writing instruction. Respondents agreed that AI tools improve writing skills, personalize instruction, and make tasks more engaging. Mean scores ranged from 4.21 to 4.52, reflecting high levels of agreement. Teachers also expressed confidence in using AI and acknowledged its role in diagnosing writing difficulties, indicating readiness for AI-supported instruction.

Table 3: Instructional Strategies and Practices

Sr.	Statements of Questions	5	4	3	2	1	M	SD
9	I adapt my writing instruction methods when teaching students with language impairments.	114 38%	146 49%	29 10%	0 0%	12 4%	4.16	0.90
10	AI tools help me differentiate writing tasks based on students' abilities.	141 47%	120 40%	16 5%	16 5%	8 3%	4.23	0.96
11	AI-based platforms allow for continuous writing assessment and progress tracking.	122 41%	135 45%	34 11%	4 1%	6 2%	4.21	0.84
12	AI tools support collaborative writing activities and peer feedback.	116 39%	129 43%	42 14%	12 4%	2 1%	4.15	0.85
13	AI integration encourages students to write more frequently.	106 35%	156 52%	25 8%	12 4%	2 1%	4.17	0.79

14	I use AI-generated prompts to stimulate writing ideas for students.	129	141	21	10	0	4.29	0.74
		43%	47%	7%	3%	0%		
15	AI tools help break down complex writing tasks into manageable steps.	136	131	26	8	0	4.31	0.74
		45%	44%	9%	3%	0%		
16	AI applications help students organize their thoughts and structure their writing.	111	154	25	11	0	4.21	0.74
		37%	51%	8%	4%	0%		

Teachers reported actively adapting instructional methods with AI support. High means (4.15–4.31) show that AI tools help differentiate tasks, track progress, and encourage collaborative and frequent writing. The use of AI-generated prompts and tools for organizing ideas received particularly strong support, highlighting teachers' belief in AI's role in scaffolding complex writing processes.

Table 4: Student Engagement and Outcomes

Sr.	Statements of Questions	5	4	3	2	1	M	SD
17	Students with language impairments show more interest in writing when using AI tools.	123	143	26	9	0	4.26	0.74
		41%	48%	9%	3%	0%		
18	AI-assisted writing instruction improves students' vocabulary and sentence formation.	126	143	24	8	0	4.29	0.72
		42%	48%	8%	3%	0%		
19	Students demonstrate greater confidence in writing with AI support.	120	140	26	15	0	4.21	0.80
		40%	47%	9%	5%	0%		
20	AI helps reduce students' anxiety related to writing tasks.	109	150	27	11	4	4.16	0.83
		36%	50%	9%	4%	1%		
21	Students learn grammar and syntax more effectively through AI-based exercises.	123	142	31	5	0	4.27	0.71
		41%	47%	10%	2%	0%		
22	AI tools enhance students' creativity in writing.	132	125	34	10	0	4.26	0.79
		44%	42%	11%	3%	0%		
23	Students' overall writing fluency improves through AI-assisted instruction.	133	145	21	2	0	4.36	0.64
		44%	48%	7%	1%	0%		
24	Students show improved comprehension of	155	111	26	3	6	4.35	0.84

	writing tasks when supported by AI.	51%	37%	9%	1%	2%		

Teachers observed that AI significantly enhances student engagement and learning outcomes. High agreement levels (means between 4.16 and 4.36) suggest that AI fosters interest, confidence, fluency, and creativity while reducing writing anxiety. Respondents emphasized improvements in grammar, vocabulary, and comprehension, showing that AI contributes meaningfully to language development among students with impairments.

Table 5: Barriers and Challenges

Sr.	Statements of Questions	5	4	3	2	1	M	SD
25	Limited access to AI technology hinders its integration into writing instruction.	150	127	16	4	4	4.38	0.76
		50%	42%	5%	1%	1%		
26	Lack of teacher training is a major barrier to effective AI use.	144	149	8	0	0	4.45	0.55
		48%	50%	3%	0%	0%		
27	Technical issues frequently disrupt AI-based writing lessons.	154	134	13	0	0	4.47	0.58
		51%	45%	4%	0%	0%		
28	High costs of AI tools limit their adoption in schools.	125	136	36	4	0	4.27	0.72
		42%	45%	12%	1%	0%		
29	Teachers require additional time to prepare AI-assisted writing lessons.	134	147	18	2	0	4.37	0.63
		45%	49%	6%	1%	0%		
30	Students with severe language impairments may not fully benefit from AI tools.	151	125	21	0	4	4.39	0.73
		50%	42%	7%	0%	1%		
31	Curriculum constraints limit the integration of AI in writing instruction.	145	121	18	13	4	4.30	0.87
		48%	40%	6%	4%	1%		
32	There is insufficient institutional support for implementing AI-based teaching.	147	120	26	8	0	4.35	0.75
		49%	40%	9%	3%	0%		

Despite positive perceptions, several barriers emerged. Teachers identified technical issues, lack of training, and limited access as major constraints, with very high agreement (means above 4.30). Cost, time requirements, curriculum rigidity, and inadequate institutional support were also concerns. These findings suggest that while teachers value AI, systemic and infrastructural issues limit its effective integration.

Table 6: Future Potential and Recommendations

Sr.	Statements of Questions	5	4	3	2	1	M	SD
33	AI should be incorporated into teacher training programs.	127	146	18	8	2	4.29	0.75
		42%	49%	6%	3%	1%		
34	Schools should invest more in AI infrastructure to support writing instruction.	113	160	11	17	0	4.23	0.77
		38%	53%	4%	6%	0%		
35	Collaboration between educators and AI developers can improve tool effectiveness.	126	125	28	18	4	4.17	0.92
		42%	42%	9%	6%	1%		
36	AI tools should be customized to address specific language impairment needs.	131	126	24	20	0	4.22	0.86
		44%	42%	8%	7%	0%		
37	Continuous professional development is necessary for successful AI integration.	139	116	38	8	0	4.28	0.79
		46%	39%	13%	3%	0%		
38	Government policies should promote AI adoption in special education.	135	121	22	21	2	4.22	0.90
		45%	40%	7%	7%	1%		
39	Future writing curricula should integrate AI-based strategies and tools.	138	118	26	12	7	4.22	0.93
		46%	39%	9%	4%	2%		
40	AI has the potential to transform writing instruction for students with language impairments.	140	132	15	6	8	4.30	0.87
		47%	44%	5%	2%	3%		

Respondents strongly supported AI's future role in education. They emphasized incorporating AI into training programs, investing in infrastructure, and customizing tools for specific impairments. Collaboration between educators and developers, supportive government policies, and curriculum integration were also highlighted. With mean scores ranging from 4.17 to 4.30, teachers clearly viewed AI as a transformative tool for writing instruction.

Table 7: Comparison of Gender

Gender	**N**	**Mean**	**Std. Deviation**	**df**	**t**	**Sig. (2-tailed)**
Male	110	216.75	15.39	299	2.37	0.019
Female	191	212.64	13.98			

The results show a significant gender difference ($p = 0.019$), with male teachers reporting a slightly higher mean score (216.75) compared to females (212.64). This suggests male teachers may hold somewhat more favorable views or confidence toward AI in writing instruction, though the difference is modest.

Table 8: Comparison of Area

Area	N	Mean	Std. Deviation	df	t	Sig. (2-tailed)
Rural	70	224.80	15.94	299	7.60	0
Urban	231	210.91	12.54			

A highly significant difference ($p < 0.001$) was found between rural and urban teachers. Rural respondents scored higher ($M = 224.80$) compared to urban teachers ($M = 210.91$). This indicates that rural teachers may perceive greater potential or impact of AI in addressing student needs, possibly due to fewer alternative resources in rural schools.

Table 9: Comparison of Age

Age	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4919.32	3	1639.77	8.23	0.00
Within Groups	59170.82	297	199.23		
Total	64090.14	300			

The ANOVA results show a significant difference across age groups ($p < 0.001$). This suggests that perceptions and practices related to AI vary meaningfully with teachers' age, with younger or mid-career teachers likely being more adaptive and open to AI integration compared to older colleagues.

Table 10: Comparison of Qualification

Qualification	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8851.98	2	4425.99	23.88	0.00
Within Groups	55238.16	298	185.36		
Total	64090.14	300			

Qualification was found to significantly influence teachers' perceptions ($p < 0.001$). Higher-qualified teachers particularly are those with M.Phil. or PhDs, likely reported greater awareness and more positive attitudes toward AI tools, indicating that advanced academic training enhances openness to technology use in instruction.

Table 11: Comparison of Experience

Area of Posting	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8420.03	3	2806.68	14.97	0.00
Within Groups	55670.11	297	187.44		
Total	64090.14	300			

Teaching experience also showed a significant effect ($p < 0.001$). The results imply that mid-career teachers may be more receptive to AI than either novices or very experienced teachers. This reflects the balance between sufficient professional exposure and adaptability to technological innovations among teachers with moderate years of experience.

Findings

FINDINGS

The analysis of survey data from 301 teachers revealed clear insights into the integration of AI in writing instruction for children with language impairments. Teachers demonstrated a high level of awareness and positive perceptions, with strong agreement that AI can improve writing skills (M=4.52, SD=0.55), personalize instruction (M=4.43, SD=0.59), and increase student engagement (M=4.40, SD=0.82) (see Table 2). Furthermore, teachers reported that AI tools effectively support instructional strategies by helping to differentiate tasks (M=4.23, SD=0.96), track student progress (M=4.21, SD=0.84), and break down complex writing processes (M=4.31, SD=0.74) (see Table 3). Positive student outcomes were also noted, including improved writing fluency (M=4.36, SD=0.64), enhanced vocabulary (M=4.29, SD=0.72), and greater student confidence (M=4.21, SD=0.80) (see Table 4).

Despite these opportunities, significant barriers were identified. The most prominent challenges included frequent technical issues (M=4.47, SD=0.58), a critical lack of teacher training (M=4.45, SD=0.55), and limited access to AI technology (M=4.38, SD=0.76) (see Table 5). Inferential analyses revealed that perceptions were significantly influenced by demographic variables. Male teachers held slightly more favorable views than female teachers (t-299) =2.37, p=.019), and teachers in rural areas reported a significantly higher perceived potential of AI than their urban counterparts (t-299) =7.60, p<.001) (see Tables 7 & 8). Qualifications (F-2,298) =23.88, p<.001) and teaching experience (F-3,297) =14.97, p<.001) also significantly influenced responses, with higher-qualified and mid-career teachers showing greater openness (see Tables 10 & 11).

DISCUSSION

The findings align with existing literature that champions AI's potential to provide the individualized and immediate feedback that is crucial for students with language impairments (Zawacki-Richter et al., 2019). The strong teacher belief that AI enhances personalization and engagement supports the concept of AI as a scaffold that reduces cognitive load, allowing students to focus on higher-order writing tasks (Chen et al., 2020; Sajjad et al., 2025). The positive outcomes related to vocabulary and fluency suggest that AI tools can effectively operationalize evidence-based writing strategies, such as repeated practice and formative feedback, which are often difficult to sustain at scale (Meltzer et al., 2021; Aftab et al., 2025).

However, the identified barriers underscore a significant implementation gap. The lack of training and technical support resonates with global concerns that teacher readiness is a linchpin for successful educational technology integration (Tourón et al., 2018; Alahmari et al., 2024). The higher enthusiasm in rural areas may reflect a "leapfrog" effect, where underserved communities perceive technology as a powerful tool to bridge resource gaps, a phenomenon noted in studies of EdTech in developing contexts (Trucano, 2021; Ashfaq et al., 2024). The influence of qualification and experience highlights that a foundational understanding of both pedagogy and technology is essential for teachers to leverage AI effectively, supporting calls for more sophisticated professional development (PD) that moves beyond basic digital literacy to pedagogical fusion (Ertmer & Ottenbreit-Leftwich, 2020; Aftab et al., 2024).

CONCLUSION

This study concludes that Artificial Intelligence holds substantial transformative potential for writing instruction for children with language impairments. Teachers are largely aware of this potential and are positively disposed toward its use, recognizing benefits for student engagement, personalized learning, and

specific writing outcomes. However, this promise is currently constrained by a triad of critical barriers: infrastructural limitations (access, cost), a pronounced deficit in teacher preparedness (training, time), and systemic challenges (technical support, curriculum rigidity). The significant demographic variations suggest that a one-size-fits-all approach to implementation will be ineffective. Therefore, realizing the benefits of AI in this specialized pedagogical domain is not merely a technological challenge but a systemic one, requiring coordinated investment in infrastructure, capacity building, and policy support to create an ecosystem where AI can truly augment the expertise of special education teachers.

RECOMMENDATIONS

Based on the findings, the following recommendations are proposed:

1. Prioritize funding for reliable AI tools and internet connectivity in schools, particularly in rural areas, to ensure equitable access (UNESCO, 2021).
2. Develop sustained, job-embedded PD programs that focus on the pedagogical integration of AI, moving beyond buttonology to include co-planning sessions and coaching support (Ertmer & Ottenbreit-Leftwich, 2020).
3. Incorporate modules on AI-based instructional strategies and assistive technologies into pre-service and in-service teacher training programs for special educators.
4. Collaborate directly with teachers and speech-language pathologists to ensure AI tools are pedagogically sound, customizable for diverse language profiles, and aligned with IEP goals (Holmes et al., 2021).

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