Effectiveness of AI Integration into Computer-Assisted Language Learning (CALL) on Student Writing Skills Based on Gender

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ABSTRACT

This research has evaluated the efficacy of AI in CALL to improve writing among students by gender. The analysis involved a literature review on how AI and processing have made an impact on writing and it's utilized to augment writing of the English language learners. It has reviewed an inspection of how educational technology affects men and women disparately. The result proved that integrating AI in technology enhances writing quality of language learners, regardless of their sex. It has exposed the nitty-gritty of gender, technology use and its effectiveness. It stipulates that in the imbuing of CALL on the basis of student demographics, gender-tailored approaches are essential. Moreover, policies and interventions in CALL, need to accommodate gender discrepancies to allow for maximum effectiveness. It is also crucial to delve more deeply into the after-effects of AI infused CALL over time, such as constructing intervention tools attuned with genders. Also, inspecting the fine-tuned effects of integrating AI on student writing, over longer periods would yield insights, into fashioning optimal CALL strategies, suited to learner populations.

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1.   Introduction

As the world around us becomes more and more digital, universities and schools have been quick to change their teaching methods and incorporate technology to manage the language skills of their students. An important development in this area is Computer Aided Language Learning (CALL) (Shortt, Tilak, Kuznetcova, Martens, & Akinkuolie, 2023) which aims to find effective ways to have students build on their writing ability. Therefore, this work will focus on a comparision of demonstrations on how CALL (Computer-assisted language learning) publications give rise to writing capacity in a different way, evaluating the effects of CALL on students' writing ability as well as assessing if such effects are different across male and female students. The search of alternate routes to authorship skill, as technology becomes more prolific in classrooms, characterized by digital tools such as software applications, has led to a shift in instructional design. CALL is a major demonstration person who has opened new paths to his development so that he can understand the written language. These interactive and personal learning environments are facilitated by digital tools, which are not available to the CALL technique and therefore allow the written language to be more readily understood and to be written more quickly. However, studies show that gender may influence reception of CALL, with its implications being a vital aspect of digital learning which needs further exploration. The ways boys and girls adopt technology and the practices they have in it differ so does their learning outcome. At the same time, it is equally important to examine how these differences related to gender affect second language acquisition in computer assisted environments (Rahimi & Fathi, 2022).

1.1.   Problem Statement

Numerous studies have focused on CALL; however, there is a significant lack of knowledge pertaining to gender disparities in the use of CALL to improve their written competence. Nonetheless, little has been done on the impact of gender-related AI trends on writing styles among male and female students in CALL settings (Bashori, van Hout, Strik, & Cucchiarini, 2022). Gender, technology and language learning do not have any connection.

1.2.   Significance of the Study

This paper makes a theoretical contribution by examining how male and female differences mediate the integration of AI in Computer Assisted Language Learning (CALL) for the improvement of writing ability. With the growing integration of digital technologies that include AI driven CALL, an understanding of gender nuances for optimal language learning outcomes is important. We examine the interplay of gender, technology and language acquisition within the CALL framework. Our findings are of interest to educators, policy makers and researchers as they develop interventions and policies aimed at enhancing CALL effectiveness for both genders. It is essential to acknowledge and address gender behaviors in technology use to create educational settings. Moreover focusing on writing skills adds value to existing research on CALL by examining how AI influences language proficiency in ways. Enhanced writing abilities are crucial not for achievement but also for effective communication across various contexts. By pinpointing gender related trends this study offers insights for designing tailored and inclusive language learning initiatives that benefit students, from backgrounds.

1.3.   Research Objectives
•   To explore how AI can be integrated into Computer-Assisted Language Learning (CALL) to enhance writing skill development.
•   To investigate what gender-specific patterns can be used for effectiveness of AI-enhanced CALL for language learning.
•   To offer recommendations to educators and policymakers to bridge gender gaps in CALL effectiveness for improving writing skills.

1.4.   Research Questions
1)   How AI can be integrated into Computer-Assisted Language Learning (CALL) to enhance writing skill development?
2)   What gender-specific patterns can be used for effectiveness of AI-enhanced CALL for language learning?
3)   What possible recommendations can be offered to educators and policymakers to bridge gender gaps in CALL effectiveness for improving writing skills?

2.   Literature Review
2.1.   Computer-Assisted Language Learning

In the 1960s, CALL emerged as a drill-and practice computer system for language instruction. CALL's growth has been closely tied to the advancement of digital technology, and language learning has become an important part of it. CALL's development can be divided into three stages: behavioristic CALL, communicative CALL, and integrative CALL. These stages reflect changing theories of learning and technological advancements. CALL has become an integral part of language teaching in general. It utilizes diverse technologies including social media websites, mobile-based games online and VR as well as machine learning based platforms to facilitate contextualized interactive education. The participatory nature of CALL plays an important role in language acquisition especially when it comes to writing skills. It offers continuous practice, immediate response to feedbacks from peers and self-directed mode of learning (Bashori et al., 2022).   They can be responsible for enormous jumps in the correctness, fluency and sophistication of writing. Various empirical researches have been conducted to prove the validity of CALL in improving students' writing abilities. According to Awada, Burston, and Ghannage (2020), the development of Write about as online support lending apparatus improved writing skill in learners readily. Scientific research should be conducted to establish the level of applicability for CALL in different cases such as gender inequality among others.

2.2.   Gender Differences in CALL

Researches show that gender gap in technological application and learning can be minimally large. It is reported in previous literatures that technology set into use for learning may have various self-efficacy beliefs and behaviors among men different than females

(Alghamdi, 2022). Males are usually more confident in the use of technology, and their opinions about technology exceed those female's views (Ahmed et al., 2020). Gender inequality also seen in CALL context. At least studies have shown that computer-assisted language learning differs for male and female students. Communication and cooperative learning by female learners is possible through the use of CALL, while males may employ it in competitive activities (Alghamdi, 2022). A number of variables might explain the gender gaps in CALL. These factors involve cultural divide, cognitive styles variations; motivational variables or access to technological tools. For example, cultural norms could encourage females to use CALL for communication and collaboration but for males the same form of learning would be competitive or problem-based (Salom, 2023). These possible causes need to be investigated more in order to understand and address gender issues fully that took place during CALL.

3.   Theoretical Framework

This study's theoretical approach is based on two key theories: The Technology Acceptance Model and Social Constructivism.

3.1.   Technology Acceptance Model

The TAM is one of the most popular models for describing users' adoption and utilization process about technology (Rahimi & Fathi, 2022). Technology perceived by users as beneficial (usefulness) and how easy it is to use, are the two most important aspects that influence technology acceptance. Since gender as a moderating factor can be used to improve students' acceptance and utilization of CALL technologies within the structure set by this research, TAM may also provide help.

Figure 1: TAM Source: Rahimi and Fathi, (2022)
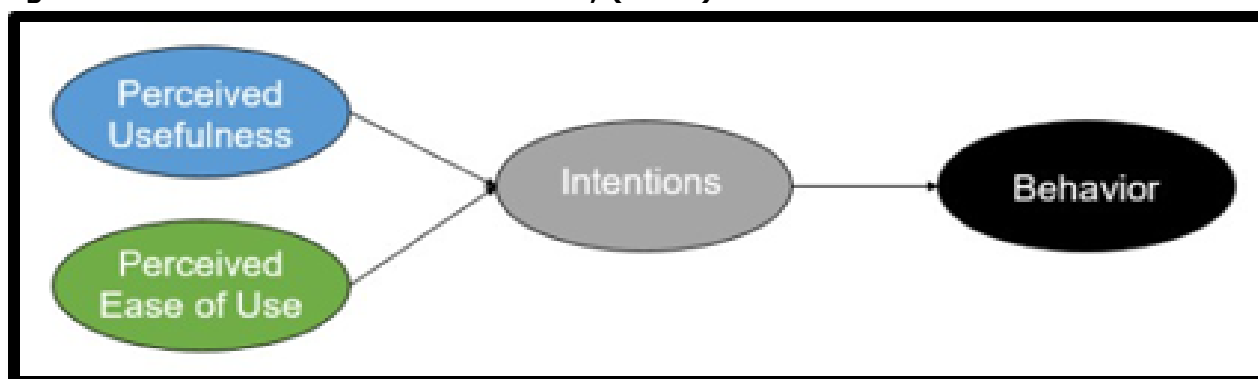
3.2.   Social Constructivism

Social constructivism posits that learning is a process that produces knowledge as negotiated and collaborative interaction. This construct is important because students in the CALL environments can acquire more knowledge and writing skills when undertaking specific activities (Olowoyeye, Deji-Afuye, & Aladesusi, 2023). It also emphasizes the social elements of d educational process such as feedback, interaction between peers and live communication that can be performed through CALL technologies. The fusion of these two concepts offers a broad theoretical foundation for the study. While TAM can justify why students adopt and use CALL technologies, social constructivism could clarify how these instruments promote better writing. The integrated framework may guide the investigation of gender differences in technology adoption and learning processes within CALL settings.

3.3.   Impact of AI Trends on CALL and Writing Skills

The impact of AI on education is that the teaching and learning processes have changed. It provides customization, adaptation and analytics for CALL which makes it a great instrument in enhancing writing skills. AI techniques that help writing education include computerized systems for the evaluation of essays and intelligent tutoring. These technologies provide instant, personalized feedback that helps students' writing to evolve over time (Gràcia et al., 2023). However, the role of AI in language acquisition is not gender neutral as it opens up new opportunities for learning a foreign tongue. The exploration of these potential differences is an integral part of this study.

4. Research Methodology

4.1. Research Design

This is because this study employs a secondary content analysis using qualitative approach. This strategy is chosen in accordance with the goals that this study sets. The secondary content analysis provides for searching the hidden insights in already prepared documents, data and assets (Gràcia et al., 2023). This method is also very beneficial in the case of researches involving such complicated phenomena as, for example, research on Computer Assisted Language Learning; gender issues concerning student writing skills. This research offers precise information about the particular issue through recent data over diverse sources and give an overview of women versus men interventions.

4.2. Population and Sample

Sources can be any research resources including academic publication, reports or case studies that are related to the relationship between Computer Assisted Language Learning and gender difference concerning student writing skills (Alghamdi, 2022). This heterogeneous group was selected to obtain an all-round analysis of literature on this topic. Since there are the some distinctive features of secondary qualitative content analysis, its sampling process is non- random and purpose.

4.3. Data Collection Methods

Considering the secondary qualitative content analysis technique, data on comprehensive review of recent publications and resources were collected about CALL impact on writing skills by gender difference students (Rahimi & Fathi, 2022). The sources of literature review encompass academic journals, published conference proceedings, dissertation and credible reports. They were included according to its relevance with the objectives and questions of our study.

4.4. Data Analysis Methods

To interpret the data, a secondary qualitative content analysis was conducted, reviewing and coding data systematically for identifying patterns or themes that fall in line with the goals and questions (Pawlak & Kruk, 2022). MS Excel was utilized for organization and interpretation. It underscores the need for a methodical and exhaustive review of the current literature. The process includes identification of gaps in the literature, patterns and trends are identified, and research questions are formulated that follow from the goals of the study. Using this type of analysis allows for the comprehensive answering of research inquiries, as the researcher delves deeply into the existing body of knowledge, therefore, enriching the area of study.

5. Results

5.1. Overview

This section reviews the computational research on the gender differences in writing. The review was designed to explore research on the ways in which men and women learn to write differently by studying the uses of teaching system based on CALL (Computer-Assisted Language Learning). This section begins by providing a brief review of the body of research on CALL and then offers a review of that literature from the vantage point of the goals and the research questions and the rigor of the research. The objective of the study is to examine the degree of change produced in the development of aggregations and the differences produced according to the presence or absence of the process of causal processes of articulate linguistic effect in writing. This research is interesting because it shows that the development of writing abilities by CALL programs is greater in programs with more human involvement. It seems as though it would be a very easy step to extend this research to artificial intelligence to advocate for its use in writing enhancements derived from CALL.

5.2. Presentation of Data/Results

Table 1: Summary of Studies Investigating the Effects of AI in CALL Programs

Study	Key findings
Zaini and Mazdayasna (2014)	CALL improves writing skills, with computer-based instruction outperforming traditional methods.
Amirsheibani and Iraji (2014)	Positive attitude of language teachers towards computer-assisted writing instruction.
Kocaman (2022)	Word processing tools like Microsoft Word and Grammarly positively influence students' textual representation skills.
El-Ghonaimy (2015)	CALL significantly contributes to writing subskills improvement, particularly in grammar and punctuation.

Theme 1: AI's Role in Enhancing CALL's Efficacy for Writing Skill Development
Subtheme 1.1: Aca Writer's Impact
This guided process is a very integral part of an aca writer's feedback to students in enhancing their writing proficiency.
Subtheme 1.2: Automated Writing Evaluation Systems
Perception of AWE tool as efficient and easy to use plays a preeminent role in high level of its use. (Li et al., 2019). Therefore the usability and applicability of AI products play a role of a deciding factor in efficiency of AI in enhancing writing skills.
Theme 2: Gender Inequalities in the Usage and Effects of AI-Infused CALL
Subtheme 2.1: Attitudes Towards Technology
Males, in general, have more positive attitudes toward technology use. On the other hand, the gender gap that characterizes involvement in technology, an essential factor in determining instructional use in CALL settings, may also be affecting student participation, as was unearthed in an inquiry carried out by Lodhi et al.
Subtheme 2.2: Learning Outcomes
AI-enhanced CALL guarantees non-existence of significant gender disparities in scores obtained by the users over various indicators of language proficiency. The CALL method is very effective in eliminating gender-based discrepancies in language acquisition and skill level.
Theme 3: Technological Platforms' Impact on Writing Abilities
Subtheme 3.1: Grammarly and Writing Proficiency
Xu, Banerjee, Ramirez, Zhu, and Wijekumar (2019) conducted a meta-analysis demonstrating that technology, such as AI-based tools, vastly improves writing skills. Both male and female students had notable improvements. The addition of technology to writing training improved the main effect of individual writing while enhancing collaborative learning opportunities.
Subtheme 3.2: Peer Collaboration
Williams and Beam (2019) conducted a study which emphasized the ways in which technology can effectively enhance the social connectedness and cooperation the male and female authors. The participants' responses suggest that technological assistance has the power to improve both collaborative efforts and writing ability.

6.   Discussion
6.1. Synthesis of Thematic Findings
The results have been thematically compiled in order to illustrate the multi-faceted influence that Computer-Assisted Language Learning (CALL) has on the participants' writing. This manuscript concludes with a discussion as to a few of the most salient insights uncovered in this research for educational policy and practice.

Theme 1: AI's Role in Enhancing CALL's Efficacy for Writing Skill Development

The research suggests Aca Writer and automated writing evaluation systems, as AI tools, are highly valuable for developing writing skills. The tailored feedback from these tools aids more insight into writing moves and structures nuances in the process of putting words on paper. This shows how AI has potential to complement some CALL approaches which can improve the quality of teaching writing.

Theme 2: Gender Inequalities in the Usage and Effects of AI-Infused CALL

The study of how boys and girls engage with technology shows that the situation is complex. Male students often have more positive views of technology, but this doesn't seem to make a big difference in their learning. Both boys and girls seem to do just as well in AI-powered CALL programs, which help them improve their writing skills. However, girls often face unique challenges when using technology, so we need to provide them with extra support so that they have the same chances as boys.

Theme 3: Technological Platforms' Impact on Writing Abilities

Technological platforms, such as AI-based programs like Grammarly, have effects that go beyond enhancing individual writing skills. Xu et al.'s (2018) The meta-analysis underscores a substantial improvement in male and female students' writing abilities and the fact that the use

of technology in educational settings sharpens the skills that are embedded in social interaction and collaborative learning, with social interaction and collaborative learning improving writing proficiency.

6.2. Implications of the Results

The study's results have important implications for educational policy, instructional practice and for future research.

6.3. Educational Policy

The results emphasize the importance of developing inclusive learning settings that take into account gender disparities in technology use. Policies might work to ensure that there is equitable access to educational materials created by technology so that AI in CALL-based programs can be taken advantage of for all students, regardless of gender. Investments in infrastructure might be needed, such as computers, internet connections, and software tools with artificial intelligence capabilities.

6.4. Pedagogical Practices

For a CALL program, designers should consider various learning styles, preferences, and the particular technological requirements of female students. To enhance self-esteem and increase technical capability holding specialized training sessions for this group could enhance their capacity to use technology in language study. These preferences need to be considered to ensure the fair participation of women in the development of CALL programs.

7. Conclusion

The thematic analysis conducted in this study offers meaningful conclusions regarding the CALL and AI effects on writing skills, especially with respect to gender differences and technological influences. The results from the themes reveal that AI-infused educational technologies, especially writing tools greatly enhance quality in language learners. This development is visible in both genders, although the level of impact and type of interaction with technology may differ. Technology-enhanced language learning can be useful for both male and female students, but their engagement with these technologies may vary. This highlights the need for developing and deploying technology-supported language learning tools that are available, easy to use, and responsive to learners' needs. Moreover, the results point to a need for educators and curriculum designers being informed about gender differences in technology use so that all students can benefit equally from language learning through technologies.

7.1. Recommendations

To ensure that all students are able to learn effectively, it is essential for educators and curriculum designers to consider the creation of inclusive learning environments that cater to both male and female needs. Policy makers can identify as they help in the implementation of policies aimed at promoting gender equality through technology-based language learning which will include both genders to equal access to relevant resources and training opportunities. Computer-Assisted language learning (CALL) outcomes for trainers of genders are very relevant research topics to plans towards the future. In addition, one need to research what type of Ai tools or products are being produced bearing in mind the differences regarding learning images that male as well as female students have. However, as is known to the researchers like (Reardon, Fahle, Kalogrides, Podolsky, & Zárate, 2019), there are still many insights about gaps in academic achievement attributing from different backgrounds on gender differences which may shed light upon understanding variation related to AI powered language study lessons. Additionally, as a rule; such an efficient advancement is highly dependent upon the development of valid gender-sensitive artificial intelligence tools that are flexible enough toward adjusting to preferences in those students who will achieve individualized instruction resulting into better outcomes among youngsters learning foreign languages throughout every country!

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