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Artificial Intelligence integration in secondary school English writing instruction in Sudan: A survey of teachers' readiness, perceptions, and implementation challenges

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Abstract

This study examined Sudanese secondary school English teachers' readiness, perceptions, and challenges in integrating artificial intelligence into writing instruction. Findings showed moderate digital competence and implementation readiness but strong positive perceptions of AI's pedagogical usefulness. Perceived usefulness and positive attitudes toward AI were significant predictors of readiness, explaining substantial variance in adoption, whereas digital competence showed only a weak association. This indicates that technical skills alone are insufficient without supportive attitudes and awareness of AI benefits.

These results underscore the need for interventions beyond basic technical training. Policymakers and teachers should prioritize professional development programs that enhance digital skills and cultivate positive attitudes by demonstrating AI's practical pedagogical value. Addressing infrastructural gaps and ensuring institutional support are crucial to translate perceptions into classroom practice and build sustainable AI integration in resource-constrained settings.

Keywords: Artificial Intelligence; Writing Instruction; Teacher Readiness; Perceived Usefulness; Attitude Toward Ai; Implementation Challenges

1. Introduction

The use of artificial intelligence (AI) technologies in English language teaching is accelerating around the world [1]. For example, in writing instruction, AI-based tools offer automated feedback, linguistics correction, and structuring for drafting [2]. The implementation of AI-based tools in developing countries such as Sudan, has received very little attention [3]. This study is one of the first to investigate teachers' willingness and perceptions regarding AI tool implementation with an aim of informing both policies and implementation procedures. As there is currently limited empirical research on the acceptance of AI-based tools in educational institutions in which there are infrastructure limitations and traditional pedagogical practices may limit the ability to effectively utilize intelligent writing tools [4], [5] this study will address this gap by examining the specific factors that may affect the acceptance of AI-based writing tools in Sudanese classrooms [6], [7]. This section provides a review of the global context of the integration of AI-based technologies into English writing instruction; with a focus on the movement from automated assessment tools to generative AI-based tools such as ChatGPT that can be used to support the teaching of writing and act as writing assistants for students [8]. There is evidence that generative AI-based tools, such as ChatGPT, have the potential to increase student interest and allow students to experience individualized learning [9]. There are concerns about the accuracy of the responses generated by these types of tools, the ethics of using them, and whether students will become

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too reliant upon them [9]. Therefore, it is essential to examine how teachers view the usefulness of these technologies and how they will address the obstacles they face when utilizing these tools in various educational settings [9], [10].

2. Literature review

The use of AI-based systems for writing assessment in the language teaching has emerged as an innovative method. It also has been shown to improve the grammar of students and to increase their capacity for self-assessment and revision. The Technology Acceptance Model (TAM) suggests that both perceived utility and attitude have a significant impact on the acceptance of new educational technology by teachers. Although there are many barriers to the widespread implementation of these systems in developing countries, the most significant barriers are lack of infrastructure and inadequate training for teachers. Additionally, the recent development of "generative" AI tools, like ChatGPT, will require a review of current pedagogy and educator's ability to utilize these new technologies for interactive writing assistance in addition to automated assessment [11], [12]. Teachers are increasingly recognizing AI as a valuable resource for enhancing instructional delivery, providing personalized instruction, and improving assessment processes [4]. Despite the demonstrated value of utilizing AI in education, studies have indicated that there are numerous barriers to the successful adoption of this technology including educators' level of digital literacy and the extent of institutional support for integrating these technologies into existing instructional practices [3], [9]. In fact, while AI has the potential to improve instructional delivery and provide greater flexibility through personalized instruction, it is necessary for educators to have high levels of digital literacy and for institutions to provide support for the integration of these technologies into instructional practices or educators may find themselves unable to effectively implement them in the classroom [3], [13]. In particular, research has demonstrated that without sufficient training and/or access to reliable technical resources, even educators who hold a favorable view of AI may be challenged in their ability to successfully incorporate these technologies into their instructional practices [14], [15].

3. Methodology

We used a quantitative cross sectional survey research design. The sample size for the research was 180 secondary school English teachers in Sudan. A structured Likert scale questionnaire measured (a) Digital Competence, (b) Perceived Usefulness, (c) Attitude toward AI, and (d) Readiness for Implementation of AI. We used SPSS software to analyze their data by calculating Descriptive Statistics to provide an overview of the demographic characteristics of the participants and the distribution of the variables; Pearson Correlation Coefficients to assess the strength and direction of the relationship between digital competence, perceived usefulness, attitude toward AI, and readiness for AI; and Multiple Regression Analysis to assess how well each of the three independent variables (digital competence, perceived usefulness, and attitudes toward AI) can predict teachers' readiness to implement AI into their classrooms [4] [17]. This analysis will allow the researchers to find out what is the total and individual contribution of digital competence, perceived usefulness, and attitude toward AI to teachers' willingness to use AI in their classroom teaching [18].

4. Results

4.1. Descriptive Statistics

Table 1 lists the mean scores and the Standard Deviation (SD) for the measures in this study: digital competence, perceived usefulness, attitude toward artificial AI, and readiness to implement AI. It is evident from these statistics, that, although, on average, teachers feel that AI will be useful, they have relatively neutral attitudes toward using AI in the classroom and moderate levels of readiness to use AI in the classroom. The mean for perceived usefulness, was the highest of the three measures listed; the means for both Attitude Toward AI and Readiness to Implement AI were the lowest of the three measures listed, which indicates a disconnect between believing that the benefits of AI can be achieved and the willingness to use AI in teaching [19][20].

Table 1 Presents the mean scores and standard deviations of the study variables

Variable	Mean	SD
Digital Competence	3.387	0.57
Perceived Usefulness	3.809	0.462
Attitude Toward AI	2.525	0.399
Implementation Readiness	2.407	0.468

According to the findings shown in Figure 1, perceived usefulness was found to be the variable with the greatest mean value among the variables. This indicates that, although they may have limited actual preparedness and/or negative affective disposition toward AI as a tool, many teachers are aware of the potential benefits associated with using AI as an educational tool [21], [22]. The attitudes toward AI and preparedness to implement AI both demonstrated smaller mean values; this indicates that teachers have identified the benefits (usefulness) of using AI in instructional settings, but remain uncertain (reservations), or lack the needed self-confidence to successfully use it [18], [19]. As illustrated in Figure 1, perceived usefulness recorded the highest mean score among the variables.

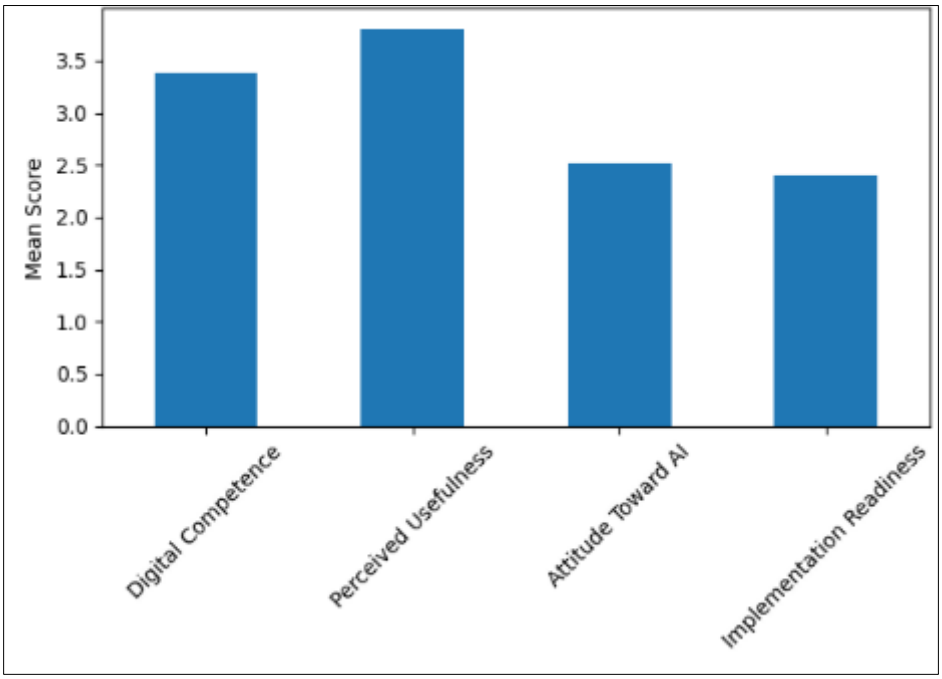

Figure 1 Mean Scores of the study variables

4.2. Correlation Analysis

Pearson correlation coefficients were calculated to determine how strong and in what direction each of the above relationships (digital competence, perceived usefulness, attitude toward AI, and implementation readiness) would be [18], [19]. Analysis showed a statistically significant positive relationship between perceived usefulness and attitudes toward AI, as well as between attitudes toward AI and implementation readiness [18], [23]. More specifically, the positive correlation between perceived usefulness and attitudes toward AI was determined to be 0.498; and similarly, the positive correlation between attitudes toward AI and implementation readiness was 0.463; thus, it can be inferred from these findings that teachers who perceive AI as useful tend to have a more positive outlook toward AI and are more likely to indicate their willingness to use AI in the classroom [18], [24].

Table 2 Presents Pearson correlation coefficients among the variables

	Digital Competence	**Perceived Usefulness**	**Attitude Toward AI**	**Implementation Readiness**
Digital Competence	1.0	-0.034	0.385	0.161
Perceived Usefulness	-0.034	1.0	0.498	0.395
Attitude Toward AI	0.385	0.498	1.0	0.463
Implementation Readiness	0.161	0.395	0.463	1.0

A correlation coefficient value of .161 exists between digital competency and implementation readiness, which is indicative of a low strength positive relationship in nature between the two constructs. The low correlation coefficient suggests that having technological competencies (technical) is only a part of what will ultimately lead to the successful application of new technologies as additional moderating (affective and context based) factors must also be considered for successful technology applications; this is consistent with previous research demonstrating that high literacy and preparation does not always equate to an individual's motivation to use technology [25], [26]. Figure 2 provides a visual representation of the correlation matrix, showing the various strengths of relationships existing between all of the study variables.

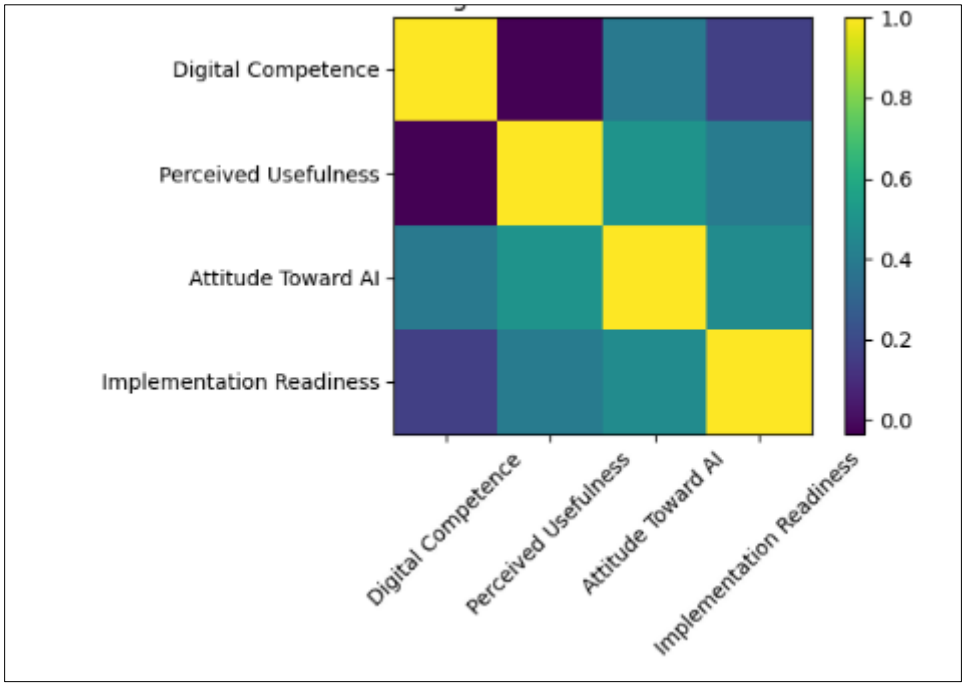

Figure 2 Visually represents the correlation matrix

4.3. Multiple Regression Analysis

Multiple regression analysis was conducted to examine the predictive power of digital competence, perceived usefulness, and attitude toward AI on teachers' implementation readiness, with results indicating that perceived usefulness and attitude toward AI serve as significant predictors of adoption intention [27], [28]. table 3 presents the regression coefficients and significance levels for the independent variables, showing that attitude toward AI ($\beta = 0.39$, $p < 0.001$) and perceived usefulness ($\beta = 0.234$, p 0.05) did not reach significance [28]. However, the model summary reveals that the overall regression equation was statistically significant, explaining a substantial portion of the variance in implementation readiness [28].

Table 3 Regression results predicting implementation readiness

Variable	Beta	p-value
const	0.418	0.1888
Digital Competence	0.034	0.5762
Perceived Usefulness	0.234	0.0036
Attitude Toward AI	0.39	0.0001

Regression analysis indicates that perceived usefulness and attitude toward AI significantly predict implementation readiness. figure 3 illustrates the standardized regression coefficients, highlighting that attitude toward AI exerts the strongest influence on implementation readiness, followed by perceived usefulness [28], [29]. These results underscore that while technical proficiency is a prerequisite, the primary drivers of adoption are the cognitive and affective evaluations of the technology's value and the user's disposition toward it [30], [31].

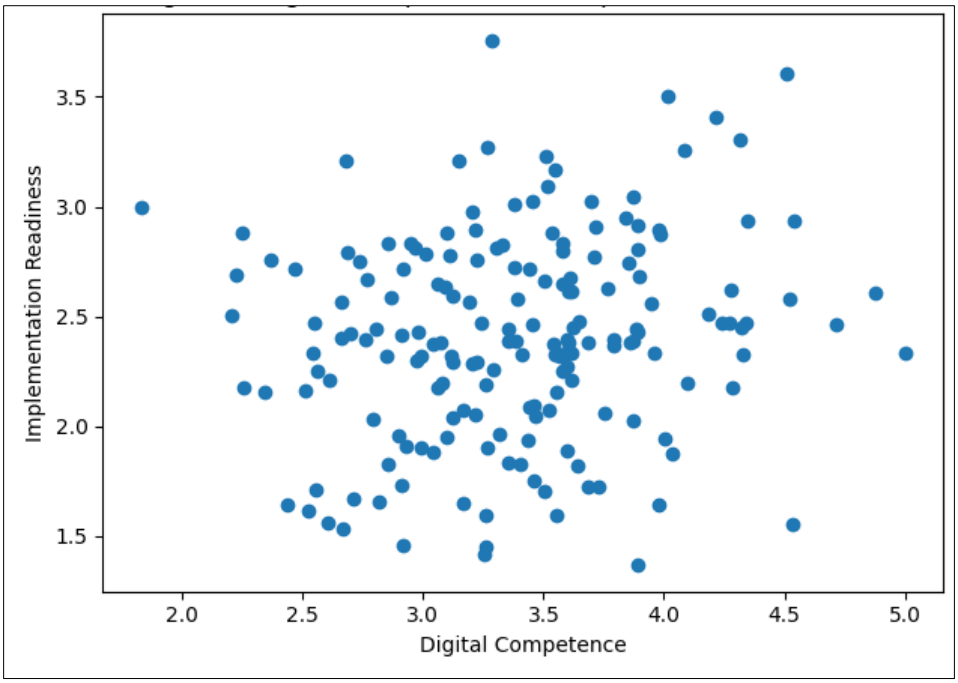

Figure 3 The relationship between digital competence and implementation readiness

5. Discussion

The findings suggest that Sudanese secondary school teachers recognize the pedagogical potential of AI-assisted writing tools. However, moderate readiness levels indicate the necessity of targeted training and infrastructure development. This discrepancy between perceived utility and actual preparedness aligns with previous research indicating that educators often maintain neutral attitudes toward AI despite possessing intermediate digital skills, suggesting that technical proficiency alone does not guarantee adoption intention [32]. Consistent with these observations, studies have shown that while digital fluency supports AI-related competencies, gaps remain in applying technology for innovation and critically evaluating content, implying that cognitive and affective factors play a crucial role in pedagogical readiness [33], [34]. For instance, regression analyses in similar educational contexts have demonstrated that perceived usefulness and attitude toward AI are significant predictors of implementation readiness, accounting for substantial variance in adoption behavior [35], [36]. Specifically, the positive influence of perceived usefulness on implementation readiness corroborates findings that teachers place greater emphasis on the practical benefits and accessibility of technology rather than merely its performance capabilities [19], [37].

6. Conclusion

The purpose of this study was to examine how ready Sudanese secondary school English teachers were to use AI tools in their English writing classes. We found that teachers have moderate levels of technological capability and readiness to implement AI tools. The teachers also reported they believe AI tools would be very useful for their teaching purposes. However, we found two important predictors of teachers' readiness to use AI tools: the degree to which teachers believed AI tools would be useful (perceived usefulness) and the degree to which teachers held positive or negative views about using AI tools (attitude). Together, these two variables accounted for a large amount of variation in teachers' willingness to adopt AI tools into their classrooms. By contrast, the relationship between teachers' level of technological capability (digital competence) and readiness to use AI tools was small and positive; while having the technical ability to use AI is necessary, it will not lead to successful implementation without teachers being favorable to adopting technology in the classroom and perceiving the value of AI as being beneficial. Therefore, our study emphasizes the importance of going beyond simply training teachers on the technical aspects of using AI. To successfully integrate AI tools into the secondary schools in Sudan, policymakers and other educational stakeholders should provide professional development opportunities that emphasize the potential benefits of using AI (i.e., perceived usefulness), create positive attitudes toward the use of AI, and address any technical disparities (e.g., infrastructure issues) and institutional barriers (e.g., administrative support) that may hinder teachers from implementing AI tools in the classroom. These efforts would help to establish an ethical and scalable foundation for AI-assisted learning in resource-poor environments.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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