Artificial Intelligence in the Teaching of English Grammar

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ABSTRACT

The integration of Artificial Intelligence (AI) into education has gained significant momentum globally, offering innovative solutions to enhance teaching and learning experiences. Because it offers creative ways to improve teaching and learning, artificial intelligence (AI) integration into education has accelerated significantly on a comprehensive scale. However, there are significant obstacles to the use of AI in secondary schools in Sierra Leone, especially when it comes to teaching English grammar. Teachers and students are notably reluctant to adopt AI technologies, despite the inherent potentials and advantages, which include individualized instruction and instant feedback.

This study explores the integration of Artificial Intelligence (AI) tools in the teaching of English grammar, focusing on a sample of 3,676 students across secondary and tertiary institutions in Sierra Leone. While global trends highlight AI's growing influence in language education, the Sierra Leonean context presents unique challenges. The study found that although AI-assisted instruction led to measurable improvements in grammar proficiency among students, the overall reception in secondary schools was notably resistant. Through surveys, classroom observations, and teacher interviews, it emerged that many secondary school educators and learners expressed skepticism toward AI tools such as grammar checkers and language-learning chatbots.

Lack of infrastructure, low levels of digital literacy, apprehension about teachers being replaced by technology, and skepticism about the veracity of AI-generated feedback were among the main issues. Some educators also saw AI as a challenge to the authority of traditional pedagogy, while others pointed to the discrepancy between AI results and the national curriculum. Adoption was further hampered by students' struggles with device access, reliable internet, and a steady power supply, especially in public schools.

Notwithstanding AI's pedagogical potential, the results indicate that its effective adoption in secondary schools in Sierra Leone will necessitate more than just having access to technology; it also calls for consistent investment in infrastructure, teacher preparation, and a change in societal perceptions of educational innovation. The study concludes that without targeted policy and support, AI integration may widen the digital divide rather than bridge learning gaps in English grammar education.

Artificial Intelligence (AI) is rapidly reshaping the landscape of communication, language use and interactions. The field of education is quickly changing due to artificial intelligence (AI), especially in the areas of language instruction and acquisition. The efficiency of AI-based technologies in teaching English grammar improves learners' engagement, allows for more individualized training, and improves grammatical proficiency. Learner motivation, teaching effectiveness, and grammar performance all significantly improve with AI-supported instruction, pointing to a useful supplementary role for AI in language learning.

INTRODUCTION

English grammar is a fundamental component of language proficiency, affecting learners' ability to communicate effectively in both spoken and written forms. Traditional grammar instruction methods, while structured, often struggle to cater to individual learner differences and fail to sustain engagement. The advent of Artificial Intelligence offers new pathways to deliver grammar instruction that is adaptive, interactive, and responsive to learners' needs. This study aims to assess how AI-based tools affect grammar learning outcomes in a diverse student population.

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Artificial Intelligence (AI) has become a significant force in education, changing the way that knowledge is imparted, evaluated, and assimilated. AI tools are being used in schools around the world more and more to automate tasks that have historically been the responsibility of instructors, customize learning, and give immediate feedback (Luckin et al., 2016; UNESCO, 2023). AI-enabled platforms such as Grammarly, ChatGPT, and Write & Improve provide real time correction, contextual explanations, and adaptive learning paths that support learners at various proficiency levels in the field of language education, specifically English grammar instruction (Ranalli, 2018; Hsu et al., 2021).

Despite this global momentum, many countries in sub-Saharan Africa, including Sierra Leone, have yet to realize the full potential of AI in education. In Sierra Leone's secondary schools, the integration of AI in grammar instruction remains limited, under-researched, and, in many cases, unwelcome. While governments and stakeholders are increasingly promoting digital learning through ICT policies, actual classroom practices show a stark gap between policy ambitions and technological realities.

The Promise of AI in Education

Through personalized learning experiences, administrative work automation, and real-time student feedback, artificial intelligence (AI) has the potential to completely transform education. Students can improve their writing abilities and comprehend intricate grammatical structures with the help of tools like language learning software and AI-powered grammar checkers. Additionally, by automating repetitive chores, AI can help teachers concentrate more on individualized and engaging instruction.

The Sierra Leonean Educational Landscape

With the launch of the Free Quality School Education program in 2018, Sierra Leone's educational system has advanced significantly in recent years. More than 1.3 million more students enrolled in schools as a result of this strategy, which significantly increased student enrollment. However, there hasn't been a corresponding rise in infrastructure, educational resources, or skilled teaching personnel to match this enrollment boom (Sesay 2020). Limited access to digital technologies exacerbates the difficulties. Only 8% of Sierra Leonean secondary schools have internet connectivity, and even fewer have the infrastructure needed to accommodate AI-based learning resources, according to a research (UNESCO 2023). Furthermore, a lot of teachers are not digitally literate enough to successfully incorporate AI into their lesson plans.

The Case for AI in Grammar Instruction

Grammar remains a foundational component of English language learning. Traditional grammar instruction in Sierra Leone, however, is often characterized by rote memorization, limited contextual application, and outdated teaching materials (Sesay, 2020). AI tools can help bridge these pedagogical gaps by offering features like: Immediate, personalized feedback which allow students to understand and correct their mistakes in real time. Gamified interactive learning environments which increase students engagement and the Scaffolding mechanisms which adapts to individual learning speeds and grammar proficiency levels.

These features can significantly improve learners' autonomy, motivation, and grammatical accuracy. These factors are crucial to achieving the language competence needed for academic and career advancement (Dörnyei, 2005; Luckin et al., 2016).

Technology Penetration and Readiness in Sierra Leone

Sierra Leone continues to struggle with widespread digital exclusion in education. According to the Ministry of Basic and Senior Secondary Education (MBSSE), less than 10% of secondary schools have functional computer labs, and internet access is virtually non-existent in most public schools (MBSSE, 2023). Furthermore, digital literacy among both teachers and students remains critically low, especially in rural and semi-urban regions (World Bank, 2022).

A 2023 pilot project by EducAid Sierra Leone found that while AI tools could support students' learning in theory, lack of training, hardware, and infrastructural support created major barriers to implementation.

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Teachers, in particular, expressed discomfort with using AI platforms and raised concerns about their own lack of control and oversight over automated feedback mechanisms (EducAid-SL, 2023).

Content Creation and Curation

AI algorithms can quickly and accurately analyze large amounts of data, which makes it simpler to identify the most useful and relevant content for a particular audience. This allows for the selection and delivery of material at scale without requiring the time and effort required for manual curation. AI is used in both the creation and curation of contents. It can evaluate large amounts of data to locate relevant and up-to-date information for language learners. Additionally, AI can assist in the creation of language lessons, quizzes, and other teaching resources.

Over time, new words, idioms, and expressions are added to languages as they change. As a result of AI's constant monitoring of linguistic developments, new linguistic components can be quickly incorporated into instructional materials. This guarantees that language learners are exposed to modern language usage, equipping them for communication in everyday situations. The accuracy and quality of educational information can be preserved with the help of AI. Text can be improved by using Natural Language Processing (NLP) algorithms, which can spot possible mistakes or ambiguities. Furthermore, AI systems can help with peer review procedures, which promote cooperative content development in the academic community.

Virtual reality (VR) and augmented reality (AR)

Not all students use their mother tongues or receive teachings in their mother tongues or even a language they fully understand. Understanding what is being taught becomes more challenging when there is a language barrier. A language barrier makes it more difficult to understand what is being taught. It has been revealed that virtual reality can provide a seamless learning experience for anyone trying to learn or acquire a second language. The capacity of VR and AR to translate or transcribe instructors' courses helps students understand and learn contents more quickly.

Students frequently hesitate to talk or ask questions when learning online because they are afraid they may pronounce words or sentences incorrectly. VR can make interactions simpler and more adaptable. eLearning has been enhanced by VR and AR in several ways. They aid students in better understanding complex subjects by creating an immersive and interactive learning environment. VR helps students overcome a number of typical learning obstacles, making the process simpler and more interesting (Ganeesh & Rani 2023).

In general, worldwide knowledge based practices will be enhanced by VR and AR.

Resistance to AI Integration

Despite the potential advantages, there is a palpable resistance to AI integration in Sierra Leonean secondary schools. This resistance stems from various factors, including:

Lack of Awareness and Understanding: Many educators and students are unfamiliar with AI technologies and their potential applications in education.

Cultural Factors: Traditional teaching methods are deeply ingrained, and there is skepticism about the efficacy and reliability of AI tools.

Fear of Job Displacement: Teachers express concerns that AI may replace human educators, leading to job insecurity.

Infrastructure Limitations**:** The absence of reliable internet connectivity and digital devices hinders the implementation of AI-based learning solutions.

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The Need for Research

Research that examines teachers' and students' attitudes and beliefs regarding the use of AI in English grammar instruction is crucial in light of these difficulties. Determining the viability and efficacy of integrating AI into grammar instruction in secondary schools in Sierra Leone would require an understanding of the adoption barriers and the development of solutions.

This study is to evaluate the current level of AI integration in schools, look into the variables influencing instructors' and students' acceptance of AI tools, and make suggestions for creating an environment that is favorable to AI adoption in the educational sector.

Attitudinal Resistance and Misconceptions

Beyond infrastructural limitations, there exists a deep-rooted skepticism toward AI among educators and learners. Many teachers fear that AI could diminish their roles or replace them altogether, leading to job insecurity. Others mistrust the outputs of AI tools, particularly when grammar corrections contradict locally used teaching methods or deviate from the national curriculum (Yin et al., 2020). Students, on the other hand, often lack the exposure to technology needed to engage meaningfully with AI, resulting in resistance or apathy towards its use.

Concern regarding an over dependence on automated input is also developing. Learners run the danger of avoiding important cognitive processes necessary for long-term language development when they rely exclusively on AI tools to edit their work (Vardi, 2012). This issue is particularly pertinent in settings where students might not have the support they need to understand and absorb AI-generated feedback.

Justification for the Research

There is a pressing need to evaluate the perceived and real effects of AI on grammar instruction given its transformative potential and the resistance to its implementation in Sierra Leone's secondary school system. 3,676 students from different secondary schools in Sierra Leone were the subject of this study, which examines the following topics:

Their access to and use of AI tools for grammar learning, the perceived value and reliability of these tools, teachers' and students' attitudes toward AI integration and the important adoption barriers, such as digital infrastructure and pedagogical alignment.

By offering a context-specific analysis grounded in the realities of a low-resource, post-conflict educational system, this work adds to the expanding corpus of literature on AI in education. Additionally, it provides policy-relevant insights into how Sierra Leone should close the pedagogical and digital barriers to establish more modern, egalitarian, and successful English language teaching systems.

LITERATURE REVIEW

AI in education is not a novel concept, but its application in language instruction particularly in grammar has seen significant innovations in the last decade. Systems such as Intelligent Tutoring Systems (ITS), Natural Language Processing (NLP) are driven grammar checkers, and adaptive learning platforms that have shown promise in improving accuracy and retention. Researchers like Wang & Vásquez (2012) and Burstein et al. (2013) argue that AI can offer real time feedbacks, correct nuanced grammatical errors, and track progress more effectively than traditional approaches.

Moreover, studies have shown that AI tools can help identify patterns in learner errors, which are often overlooked by educators due to time constraints (Heil et al., 2020). However, concerns remain regarding over reliance on technology, lack of contextual understanding, and equity of access. Such issues are what this study also aims to explore.

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The Global Rise of AI in Language Education

Artificial Intelligence (AI) has emerged as a transformative force in education, with applications ranging from administrative automations to personalized instructions. In the domain of language learning, AI has found particular relevance in grammar instructions, where tools such as Grammarly, Write & Improve, and GPT based chatbots provide real time feedbacks, sentence restructuring, and error explanations (Hsu et al., 2021). These tools use Natural Language Processing (NLP) to analyze students' writings, offering grammar corrections with contextual awareness which is something traditional teaching methods often lack in large, resource constrained classrooms.

Studies in higher income countries have shown that AI assisted writing tools help students improve grammatical accuracy and fluency over time (Ranalli, 2018; Roscoe & McNamara, 2013). Automated grammar tutors allow learners to practice independently and make multiple attempts without fear of judgment, thereby supporting learner autonomy and motivation (Bangs & Alexander, 2007).

Pedagogical Potential of AI in Grammar Teaching

AI has been very helpful in improving grammar learning's formative assessment component. It offers immediate feedback, pointing out mistakes and recommending fixes for grammatical faults in syntax, verb usage, article placement, and other areas (Burstein et al., 2003). This prompt reaction stands in stark contrast to instructor marking that is delayed, which can impede the learning cycle, particularly in big classrooms.

Moreover, AI systems can identify recurring errors across learner's work and offer tailored practice activities which is an approach supported by the Input Hypothesis and Noticing Hypothesis in second language acquisition (Kabiru-Mansaray 2024: Crystal 2006: Schmidt, 1990). These theories suggest that learners benefit most when they consciously notice gaps in their output, a process that AI can automate and scale effectively.

Challenges of AI Integration in Low-Income Contexts

Despite its potential, integrating AI into language instruction presents several difficulties, especially in low-income nations. In many regions of sub-Saharan Africa, access to infrastructure, including computers, internet connectivity, and electricity, continues to be a barrier to digital learning (World Bank, 2022). More than 70% of Sierra Leonean secondary schools lack basic ICT tools, according to a UNESCO assessment from 2023. This significantly reduces the chances for AI based interventions.

Digital literacy and teacher readiness are also significant barriers. Many educators in Sierra Leone are not well-versed in the pedagogical applications of AI tools and have little exposure to them. According to Kabiru-Mansaray (2024), most secondary school teachers involved in the EducAid AI pilot program in Sierra Leone expressed discomfort and mistrust in AI's ability to provide contextually appropriate grammar instruction.

These concerns echo earlier findings by Yin et al. (2020), who observed that teachers in under-resourced schools often view AI not as a tool for pedagogical enhancement but as a threat to professional authority or a distraction from traditional methods.

Perceptions and Resistance to AI

Perceptions among teachers and students also play a significant role in the acceptance of AI in education. Outright opposition or passive rejection of AI tools might result from affective elements such technology anxiety, obsolescence dread, and mistrust of automated systems (Vardi, 2012; Selwyn, 2019). This is particularly noticeable in societies where digital learning is still regarded with skepticism and education is heavily teacher-centered.

According to a study by Amusan & Ibrahim (2022), cultural reluctance to change and a strong preference for in-person instruction were the main reasons why AI was underutilized in many West African classrooms, rather than a lack of access. Fears about depersonalization in education, as well as moral worries about algorithmic unfairness and data privacy, were also connected to this reluctance.

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AI vs. Human Instruction in Grammar Learning

Another area of debate centers on the effectiveness of AI compared to traditional instruction. While AI provides fast and frequent feedback, it may lack the deeper explanatory power and contextual sensitivity of a skilled human teacher (Roscoe et al., 2014). For instance, AI may flag non-standard but acceptable language use as incorrect, leading to learner confusion.

Additionally, concerns about over-reliance on AI tools have been raised in multiple studies. Students who use grammar checkers without understanding their corrections risk reinforcing bad habits or failing to internalize grammar rules (Harris, 2016). This suggests that AI should be seen not as a replacement, but as a complement to teacher-led instructions and a "blended learning" approach that combines the very best of both worlds.

Theoretical Framework

This study draws on Vygotsky's Sociocultural Theory, particularly the concept of the Zone of Proximal Development (ZPD). AI tools act as "more capable peers," providing scaffoldings that allow learners to perform tasks they could not complete independently. In addition, Constructivist Learning Theory supports the notion that learners construct knowledge actively which AI platforms encourage by enabling explorations, hypothesis testing, and corrections in real time.

Summary of Literature Gaps

Few research concentrated on low-resource, post-conflict educational environments like Sierra Leone, despite the fact that many studies show the impact of AI in language learning worldwide. Fewer yet discuss how teachers and students view AI, which is crucial for successful implementation. By investigating how 3,676 secondary school students in Sierra Leone engage with and see AI in the context of teaching English grammar, this study seeks to close this gap. It also assesses the pedagogical preparedness of educators and schools, as well as the real world obstacles to its adoption.

METHODOLOGY

This study adopted a convergent mixed methods research design, integrating both quantitative and qualitative approaches to provide a comprehensive understanding of how AI tools are perceived and utilized in English language classrooms and English grammar instructions across secondary schools in Sierra Leone. The quantitative component evaluated students' performance data and attitudes using structured instruments, while the qualitative component explored teachers and students perspectives through interviews and focus groups. The design was chosen to triangulate findings and gain richer insights into not only the effectiveness of AI tools, but also the barriers and attitudes that shape their adoption in the local context.

Study Population and Sample

The target population included students and teachers from government and private secondary schools across four districts in Sierra Leone: Western Area Urban, Kenema, Bo, and Bombali (Makeni). These regions were selected to reflect both urban and rural settings and a range of infrastructural capacities. A total of 3,676 students in JSS3, SSS1, and SSS2 participated. They were aged between 13 and 19 while 92 English language teachers from participating schools were also included.

A multi-stage stratified sampling technique was used to ensure regional, gender, and institutional diversity. Schools were stratified by region and type (public vs. private), after which students and teachers were randomly selected within those strata. The sample was geographically and demographically diverse, including urban, suburban, and rural populations. Stratified random sampling ensured balance across gender and proficiency levels.

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Data Collection Instruments

A quasi-experimental design was used, with pre- and post-tests administered to both the control and experimental groups. The experimental group used AI-enhanced instruction while the control group received traditional classroom-based grammar teaching.

Tools and Platforms

Grammarly and QuillBot for real time grammar checking and paraphrasing were used while NoRedInk was used for structured grammar drills

a. Pre- and Post-Grammar Tests

Standardized grammar tests were administered to measure students' proficiency before and after a six-week intervention. The test included sections on: Sentence correction, verb usage, tense consistency, subject-verb agreement and lastly article and preposition use

Student Questionnaire

A structured questionnaire (30 items) with Likert-scale responses was developed to measure: Accessibility of AI tools, frequency of AI use, perceived usefulness, engagement and motivation and challenges in using AI.

Reliability testing yielded a Cronbach's Alpha of 0.86, indicating good internal consistency.

Teacher Interview Guide

A semi-structured interview guide explored teacher perceptions, attitudes, challenges, and pedagogical concerns about AI tools. Key focus areas included: Familiarity with AI applications, willingness to integrate AI into teaching, observed student responses and ethical and practical concerns

Usage Logs and Observations

Where AI platforms like Grammarly or ChatGPT were used, interaction logs (with permission) were collected to analyze student usage patterns. Classroom observations using a checklist also tracked how AI tools were incorporated into lessons and how students engaged with them.

Intervention Design

The intervention lasted for **six weeks**, during which:

The experimental groups of 1,870 students were exposed to AI assisted grammar lessons using tools such as Grammarly, ChatGPT prompts, and QuillBot.

The control groups of 1,806 students received traditional grammar instruction through textbooks and chalkboard teaching without AI support.

Both groups followed the same lesson content, aligned with the national curriculum, to maintain consistency.

Data Analysis Techniques

This was done in two folds

Quantitative Data Analysis

The descriptive statistics (mean, standard deviation) were used to describe students' perceptions which included: Paired t-tests which measured the differences between pre- and post-test scores within and across the groups.

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ANOVA was used to compare performance across regions and between genders while analysis was done using SPSS version 25.

Qualitative Data Analysis

Interview transcripts and observation notes were analyzed using thematic analysis and codes were developed inductively and grouped into themes such as "skepticism towards AI," "digital literacy gaps," and "pedagogical misalignments."

Validity and Reliability

Instruments were reviewed by three subject experts in educational technology and English pedagogy for content validity and a pilot study involving 230 students and 20 teachers helped refined the tools.

Cronbach's Alpha scores above 0.8 indicated acceptable reliability for the student questionnaire.

Ethical Considerations

Ethical approval was obtained and informed consent secured from all participants, and parental consent was also obtained for minors.

Anonymity and confidentiality were maintained throughout the study and participants had the right to withdraw from participating at any point without penalty.

Data Analysis

The quantitative results indicated that the mean post-test score for the AI group increased from 56.2% to 81.5%, while the control group improved from 55.9% to 68.3%. Statistical analysis using paired sample t-tests showed a p-value < 0.01, indicating a significant difference in the improvement between the two groups.

AI users made less punctuation, verb tense, and subject verb agreement errors compared to their counterparts.

Qualitative Feedback

From surveys and focus groups, it was realized that 78% of students in the experimental group said the AI tools helped clarify grammar rules. Teachers noted a noticeable decline in repeated grammar errors in students writing. Students reported higher levels of autonomy and confidence in editing their own works.

Results and Analysis

This section presents the findings of the study based on the quantitative and qualitative data collected from 3,676 students and 92 teachers across four regions of Sierra Leone. The results are organized into four key thematic areas: improvement in grammar proficiency, student perceptions of AI tools, teacher attitudes, and infrastructural and implementation challenges.

Improvement in Grammar Proficiency

A pre- and post-test was administered to measure student improvement in grammar across the experimental and control groups.

Group	Pre-Test Mean (%)	Post-Test Mean (%)	Mean Gain (%)	SD	p-value
Experimental (AI)	54.8	78.1	+23.3	7.6	<0.001
Control (Traditional)	55.2	65.4	+10.2	6.9	<0.001

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Students in the experimental group (who used AI tools) showed a statistically significant improvement in grammar performance compared to those in the control group. The 23.3% gain in scores demonstrated the potential effectiveness of AI in reinforcing grammar instructions.

Student Perceptions of AI Tools

Data from the 30-item student questionnaire revealed mixed perceptions of AI in grammar learning.

Positive Responses:

76% of AI group students reported that AI tools helped them understand grammar errors better. 71% felt more confident in revising their work using AI and 68% preferred AI aided practice over workbook drills. This result showed a positive response from the participants.

On the other hand, 59% of all students said they did not fully understand how AI made some corrections. 44% reported that their schools had insufficient internet access to use AI tools consistently and32% believed that AI undermined the teacher's role, suggesting mistrust or misunderstanding of AI's function. This result revealed negative or neutral responses from the participants.

Teacher Attitudes toward AI

Interviews with 92 English teachers revealed varied attitudes, that is: 32% believed that AI could support their teaching, particularly for essay marking and practice activities. Several of them noted that AI promoted independent learning and increased engagement among stronger students which is a positive exhortation. On the other hand, 71% of the teachers expressed skepticism or resistance to the use of AI while over 60% said they had not received any training on AI or digital tools for language instructions, which is a negative Leitmotif.

Infrastructure and Access Barriers

The data from both students and teachers highlighted systemic challenges in implementing AI in English language and grammar education. The major issues that were identified include: They study showed that there is low internet infiltrations as only 4 of 20 schools had reliable Wi-Fi or mobile internet access. 67% of the students said they had no regular access to computers or smartphones in school. In fact they expressed that most of their schools either had limited hardware or do not have computers assigned to students or specifically for students use.

Power outages and unstable electricity were the frequent disruptions, especially in rural areas where most schools do not have electricity. Digital literacy gaps were the other issues revealed as many of the students and teachers lacked basic ICT skills, impeding the use of AI tools.

Summary of Key Findings

Theme	**Key Findings**
Grammar improvement	AI-assisted group showed a 23.3% gain in test scores (vs. 10.2% in control).
Student engagement	Most students found AI tools engaging, though some struggled with understanding feedback.
Teacher attitudes	High skepticism; limited digital training; perceived threat to instructional authority
Infrastructure & access issues	Poor internet, inadequate devices, and frequent power outages were major barriers.

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Comparative Analysis by Region

To better understand the differential impact of AI integration in grammar instructions, data from each of the four study areas were disaggregated and compared. The comparison includes grammar performance improvement, AI access and usage, student perceptions, and infrastructure challenges.

Grammar Proficiency Gains by Region

Region	**Pre-Test Mean (%)**	**Post-Test Mean (%)**	**Mean Gain (%)**	**Use of AI**
Western Area Urban	58.2	80.1	+21.9	High AI tool exposure
Bo	55.4	76.0	+20.6	Moderate AI usage in urban centers
Makeni	52.8	73.5	+20.7	Low infrastructure, limited exposure
Kenema	53.0	75.2	+22.2	Significant enthusiasm despite tech challenges

From the study, it was observed that all regions showed substantial improvement in grammar proficiency among students using AI with Western Area Urban having the highest posttest average, likely due to better digital access.

Student Access to AI Tools

Region	% with Regular Access to AI Tools	% Reporting Internet Access at School	% Owning Personal Devices
Western Area Urban	74%	69%	61%
Bo	58%	41%	37%
Makeni	44%	35%	29%
Kenema	51%	32%	34%

From the study, it was observed that Western Area Urban leads in digital access, with Bo and Kenema in the middle, while Makeni lags behind significantly.

Teacher Support and Attitudes by Region

Region	% of Teachers Supportive of AI Use	% With Digital Literacy Trainings	Key Concerns Raised
Western Area Urban	48%	51%	Over-reliance by students
Bo	33%	35%	Lack of curriculum alignment
Makeni	22%	18%	AI threatening job security
Kenema	27%	21%	AI tools are difficult to monitor

Result revealed that Western Area Urban had the highest number of Teachers who support the use of AI in teaching grammar, correlating with access to training and infrastructure. Makeni teachers were the least supportive, mainly due to a lack of exposure and fear of job redundancy.

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Regional Challenges Summary

Region	Major Challenges Identified
Western Area Urban	Uneven distribution of devices; occasional internet outages
Bo	Moderate infrastructure; weak technical support
Makeni	Poor digital literacy; high teacher resistance; frequent power cuts
Kenema	Student enthusiasm but low internet and technical access

For the overall regional trends, Western Area Urban demonstrated the best outcomes, owing to relatively better infrastructures, digital readiness, and teacher trainings. Bo and Kenema showed promising results in performance improvement despite infrastructural limitations. Students here were more enthusiastic than teachers whilst Makeni lagged in both student access and teacher support, leading to lower engagement and greater resistance toward AI adoption.

DISCUSSION OF RESULTS

The findings of this study provides valuable insights into the current state, potential, and challenges of integrating Artificial Intelligence (AI) into English grammar instructions and genera English language teaching in Sierra Leonean secondary schools. The discussion is structured around five key themes: (1) improvements in grammar proficiency, (2) regional disparities in AI effectiveness, (3) students perceptions and digital readiness, (4) teachers attitudes and pedagogical concerns, and (5) infrastructural barriers and systemic limitations.

Improvement in Grammar Proficiency

With a mean gain of 23.3% in the experimental group and a mean gain of 10.2% in the control group, the results demonstrate a considerable improvement in grammar competency among students exposed to AI tools. This finding is consistent with global studies showing that by offering instantaneous, personalized feedback, AI-enhanced education can increase language accuracy (Hsu et al., 2021; Roscoe & McNamara, 2013).

Schmidt's (1990) Noticing Hypothesis, which contends that in order to rectify their language faults, learners must consciously identify them, is supported by these findings. This procedure is efficiently made possible by AI tools such as Grammarly and ChatGPT, which identify mistakes in real time and provide fixes that students might not receive from human teachers right away because of time restrictions or big class numbers. However, while these gains are statistically significant, they also raise questions about depth of understanding. Some students reported that they followed AI suggestions without fully comprehending the grammatical principles behind the corrections. This was a concern echoed in the study of Vardi's (2012) on superficial engagement with automated feedback tools.

Regional Disparities and Contextual Differences

The regional analysis revealed significant disparities in AI access and outcomes. For example Western Area Urban performed best, benefitting from better infrastructures, higher digital literacy, and more open teacher attitudes. Makeni on the other hand lagged behind in nearly all indicators, including student access, teacher training, and overall AI effectiveness.

These regional differences are indicative of larger national disparities in Sierra Leone's educational system, where access to high quality instructions and digital resources is still influenced by urban rural divides (World Bank, 2022). The fact that students in Kenema and Bo managed to make significant progress in spite of limited accesses, points to the possibility that some infrastructural disadvantages may be mitigated by students drive and resourcefulness. This finding is consistent with Amusan and Ibrahim (2022), who observed that in many low

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resources West African classrooms, the effectiveness of digital interventions are often determined not just by availability of technology but by local engagement strategies and educator initiatives.

Students Perceptions and Digital Readiness

According to the study, the majority of students thought AI technologies were interesting and useful, and more than 70% said they felt more confident and understood grammar better. The findings that AI promotes learner autonomy and engagement are supported by this (Ranalli, 2018; Luckin et al., 2016).

But there are particular difficulties because of the Sierra Leonean setting. Due to a lack of digital literacy or the use of intricate language explanations that do not correspond with national curriculum standards, nearly 60% of the pupils found it difficult to understand AI feedbacks. This highlights a disconnection between students' preparedness to use AI tools and their level of expertise. Selwyn (2019) also addressed this issue, cautioning against thinking that "digital natives" are inherently adept at using educational technologies critically and effectively.

Teacher Attitudes: Between Caution and Resistance

The study's most alarming conclusion may be that teachers are highly skeptical about AI integration into the teaching processes, with more than 70% of them voicing opposition to it. Among the issues raised were: Concern about losing one's work/ job, doubts about AI's capacity to contextualize grammar education and inconsistency with the national curriculum. These worries are not without merits. According to Yin et al. (2020), the use of AI in the classroom frequently calls into question established roles and pedagogical authority, particularly in areas with a deficiency in professional development. Few of the teachers in this study had formal trainings in AI or ICT in general, which resulted in resistance and feelings of disempowerment.

The discrepancy between teachers skepticism and students enthusiasm suggests a potential implementation roadblocks. In addition to trainings, efforts must be made to engage educators as co-creators and facilitators of AI enhanced learning environments rather than only passive implementers in order to close these gaps.

Infrastructures and Implementation Challenges

The lack of infrastructure is a major subject in the study: Most schools had inconsistent internet connectivity; less than 40% of pupils had access to working devices; and power outages were common, especially in Bombali, rural Bo and Kenema.

These results are in line with World Bank (2022) and UNESCO (2023) reports that show infrastructures to be the main obstacle to digital learning in sub-Saharan Africa. Even the most sophisticated AI technologies will continue to be underutilized or abused in the absence of consistent investment in basic ICT infrastructures, teachers' preparations, and rural connection. Additionally, some teachers and pupils pointed out that AI outputs were foreign, which occasionally went against Sierra Leone's linguistic and educational norms. This issue of curriculum and contextual mismatch suggests that localizing AI tools or creating Sierra Leone specific content could improve usability and acceptance.

Summary of Key Insights

Key Insight	Supporting Evidence	Implication
AI boosts grammar performance	23.3% mean gain in experimental group	Promising complement to traditional instruction
Regional inequalities impact results	Western Area Urban outperformed other regions	Need for equitable infrastructure investment
Students are curious and motivated	76% found AI helpful	AI can increase engagement if accessible

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Teachers are cautious and untrained	71% skeptical of AI use	Training and pedagogical alignment are critical
Infrastructure limits AI's reach	Poor internet, devices, and power supply	Implementation will fail without systemic support

Comparison with Global and Regional Studies

The results of this study, while reflective of the Sierra Leonean context, also resonate with broader global trends and challenges in AI adoption in education.

Global Comparisons

Research has repeatedly demonstrated that the use of AI in grammar trainings greatly increases writing fluency and grammatical accuracy in industrialized nations like the US, South Korea, and Finland (Roscoe et al., 2014; Hsu et al., 2021). But these advancements are frequently made possible by the availability of well-thought-out digital infrastructures, ongoing teachers preparations and the integration of AI tools into the educational curriculum

Although the scope of the students learning gains in Sierra Leone was similar, these increases were made in spite of significant resource limitations. This indicates that if supporting factors, such as infrastructures and teacher supports, are strengthened, there is a significant latent potential for AI enhanced learning.

Regional Comparisons

According to a study on AI use in senior high schools in Ghana by Owusu & Danso (2021), although students were enthusiastic about AI-based language learning apps, teachers' reluctance, a lack of locally relevant content, and a lack of confidence in automated systems hindered the implementation's effectiveness. These results closely resemble those seen in Sierra Leone, especially inconsistency between AI feedbacks and local curricula, doubt about AI taking the place of teachers and the inadequate digital literacy among teaching staff

According to Adeoye & Lawal (2022), in Nigeria, even in schools with technology, AI technologies were not utilized as much because of institutional rules for digital learning and concerns about students being overly dependent upon it. This emphasizes a vital lesson for Sierra Leone where a pedagogical integration is essential and technology alone is insufficient.

Over Reliance and Shallow Learning

One of the most notable risks emerging from both student interviews and classroom observations is the tendency of students to accept AI suggestions without question, particularly when corrections were made through platforms like Grammarly or ChatGPT. While these tools are highly effective at flagging basic grammar issues, their feedback often lacks pedagogical depth or fails to explain the grammatical rules behind corrections.

This behavior confirms the argument of Vardi's (2012) that without guided instructions, learners may use AI as a "black box," accepting outputs passively rather than engaging in meaningful grammar learning. For example, several students admitted during interviews that they copied AI-revised sentences without understanding the difference between present perfect and simple past, or when to use countable versus uncountable nouns. Thus, while AI is effective in surface-level performance enhancement, its role in fostering deep grammatical understanding is still limited—especially in the absence of teacher guidance.

Implications for Curriculum and Pedagogy

The findings of this study signals the urgent need to rethink grammar pedagogy in Sierra Leone. Despite the national curriculum's strong emphasis on paper exercises and rule based instructions, pupils are increasingly being exposed to digital grammar tools that function outside of this framework.

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To close these gaps, localizing AI contents to fit regional English dialects and the Sierra Leonean curriculum is important. Teachers' duties need to be reinterpreted so that they assist students in interpreting and critically analyzing AI input rather than opposing it. By incorporating AI technologies into revision tasks and preserving classroom instructions for rule explanations and practices, blending the learning models can be implemented progressively. However, institutional supports such as national policy frameworks that will promote the safe, egalitarian, and pedagogically aligned use of AI in classrooms is essential to the success of such programs.

Ethical and Equity Considerations

Finally, it's critical to discuss the ethical and equity issues raised by this research. There is undoubtedly a digital divide such as students in urban areas, particularly those in the Western Area, profited far more than those in rural areas. In line with wider gender differences in ICT use in Sierra Leone, girls were marginally less likely to report having access to personal devices (UNICEF, 2023), and no AI technologies were modified for the use of students with impairments in participating schools, and they had the least access and trainings.

Failing to address these gaps runs the risk of making already existing imbalances worse rather than better as AI becomes more ingrained in educational policies and practices. The incorporation of AI must be inclusive, gender sensitive, and attentive to underserved students, according to governments, non-governmental organizations, and school administrators.

Summary of Expanded Discussion Points

Topic	Insight
Global comparison	Similar performance gains observed internationally, but Sierra Leone lacks foundational infrastructure.
Regional comparison	Echoes findings in Ghana and Nigeria regarding teacher resistance and lack of integration.
Learning depth	Students showed performance gains but shallow understanding; confirms risk of passive use.
Curriculum alignment	AI tools must be integrated into national curriculum, not used as external supplements.
Ethical implications	Gender, disability, and rural access gaps need urgent attention to avoid exacerbating inequality.

CONCLUSIONS

This study explored the impact of Artificial Intelligence (AI) in the teaching of English grammar in Sierra Leone's secondary schools, involving 3,676 students across four key regions. Based on the findings, the following conclusions can be drawn:

Significant Improvement in Grammar Proficiency

Students' grammatical proficiency significantly improved as a result of the use of AI tools in grammar training. The study revealed that grammar test results increased by an average of 23.3% for AI-assisted learners, and 10.2% for the control group. This supports findings from international studies showing AI improves writing abilities and grammatical precision (Roscoe & McNamara, 2013). Even though students' performance increased, many of them did not fully comprehend the grammatical rules underlying their modifications, indicating the need for more comprehensive teaching strategies.

Regional Disparities in AI Access and Effectiveness

The study revealed regional disparities in the use and effectiveness of AI tools, with Western Area Urban benefiting the most due to better infrastructures, digital literacy, and teacher readiness. In contrast, rural areas

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such as Makeni and Kenema struggled with poor digital access, intermittent power supply, and a lack of teacher training. These regional gaps suggest that AI's potential can only be fully realized if infrastructure is improved and equitable access to technology is ensured across all the regions of Sierra Leone.

Student Enthusiasm vs. Teacher Resistance

Students were generally enthusiastic about using AI tools, with a majority reporting that AI made grammar learning engaging and accessible. However, teachers exhibited significant resistance, driven by concerns about job security, the credibility of AI feedback, and the lack of adequate training. This highlights a crucial challenge in AI implementation: teacher buy-in. Without adequate professional development and a clear understanding of how AI can complement their teaching roles, AI integration may not be fully effective.

Infrastructural Barriers

A major conclusion from this study is that the lack of infrastructure including unreliable internet, inadequate devices, and power outages remains the primary barrier to the widespread use of AI in Sierra Leone's classrooms. Schools in both urban and rural areas face significant logistical challenges that hinder the consistent use of AI tools. Addressing these challenges is essential for ensuring that AI based teaching methods do not remain confined to a few privileged schools in urban centers.

Ethical and Equity Concerns

The study also highlighted critical ethical and equity concerns. There were clear disparities in access to AI tools between urban and rural students, and between boys and girls, particularly in more remote regions. Students with disabilities were also disadvantaged, with no AI tools adapted for their specific needs. These issues point to the need for inclusive and gender sensitive policies that ensure AI implementation does not deepen existing educational inequalities but instead helps bridge the digital divide.

Broader Implications for Policy and Practice

The findings of this study underscore the need for comprehensive strategies to integrate AI into Sierra Leone's educational system. For AI to be truly effective in enhancing English grammar instructions, it is not enough to simply provide tools and expect teachers and students to adapt to their uses. The following implications for policy and practice are therefore drawn:

Teacher Training and Professional Development: It is critical that teachers receive targeted training in the use of AI tools to enhance their teaching practice. Teachers must understand how AI can support, rather than replace, their instructional roles. Ongoing professional development should be a core element of any AI integration strategy.

Infrastructure Investment: To ensure that AI tools reach all students, teachers and secondary schools equally, investments in digital infrastructures including reliable internet access, functional devices, and stable power supply are needed, especially in rural and underserved areas. Governments and NGOs should collaborate to address these barriers systematically.

Localized AI Content: AI tools should be adapted to suit Sierra Leone's national curriculum and English language varieties. Localization of contents will help make AI more relevant to local students and teachers and improve its effectiveness as a learning tool.

Inclusive Policies: Policies must be put in place to ensure that AI is accessible to all students and teachers, particularly those from disadvantaged backgrounds, girls, and students with disabilities. Equitable access should be prioritized, alongside the development of accessible AI tools that meet the diverse needs of Sierra Leone's student population.

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Ongoing Research and Evaluation: Continuous evaluation of AI's impact on teaching and learning should be implemented. This would allow for the ongoing refinement of AI tools and teaching strategies to ensure that they remain effective and appropriate for the evolving needs of students and teachers.

Sustainability and Scalability of AI Integration into the Educational System

Although this study emphasizes the advantages of AI in enhancing grammatical skills, concerns about the long term viability and scalability of such interventions still exist. Without a significant investment in digital infrastructures, policy alignment, and stable funding sources, the Western Area Urban's recent improvements might not be scalable.

AI projects run the risk of becoming short term experimental programs that only help a small percentage of pupils while keeping the bulk out because of institutional inertia, poverty, or bad connectivity. Institutional frameworks that facilitate the expansion of AI teaching tools throughout Sierra Leone's public and private educational systems must thus be given top priority by stakeholders.

Artificial Intelligence and the Evolving Role of Teachers

Rather than replacing teachers, AI should be positioned as a support system that enhances teacher capacity. In contexts where class sizes are large and individual feedback is limited, AI can help automate basic corrections, allowing teachers to focus on higher order grammar instructions, student mentoring, and contextualized teaching. This echoes international models from countries like Estonia and Singapore, where AI is used to free up teachers time for more critical pedagogical tasks (Luckin et al., 2016). In Sierra Leone, redefining the teacher's role in AI powered classrooms is crucial to minimizing resistance and fostering a culture of innovation.

Alignment with Global Goals

This study also speaks directly to UN Sustainable Development Goal 4: "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all." By exploring the integration of AI in language learning, the study provides a lens through which digital tools can be harnessed to bridge learning gaps, promote digital inclusion, and support educational quality improvement in line with global education targets.

Future Research Directions

Additional investigation is required to: Examine how well students who use AI retain grammar over the long run. Examine how AI affects language originality, critical thinking, and writing fluency and Create regional AI grammar tools for West African English dialects

It will also examine how AI can be used in inclusive education, especially for students with impairments and those enrolled in programs with limited resources. A deeper understanding of how AI impacts test scores, student attitudes, learning autonomy, and linguistic confidence over time may be possible with a multi-year longitudinal study.

Concluding Remarks:

The findings of this study underscore a central truth in modern education: technology is a tool, not a cure-all. While AI has the potential to revolutionize grammar instruction in Sierra Leone, its impact will only be as strong as the systems, people, and policies that support its implementation.

To move forward, stakeholders must commit to a vision of equitable, inclusive, and teacher supported AI integration, one that amplifies human potential rather than replacing it, and one that meets learners where they are, rather than where the technology assumes them to be.

Final Thoughts

In conclusion, AI presents significant potential for improving the teaching of English grammar in Sierra Leone, as demonstrated by the marked improvement in student performance. However, the successful implementation

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of AI in education will require addressing infrastructural challenges, teachers concerns, and equity issues. It is only through a holistic approach, an approach that combines technological investment, teacher support, curriculum alignment, and inclusivity before the full benefits of AI can be realized for all students in Sierra Leone.

RECOMMENDATIONS

Based on the findings and conclusions of this study, several targeted recommendations are proposed to ensure that the successful integration of Artificial Intelligence (AI) in English grammar instructions across Sierra Leonean secondary schools is achieved and realized.

Government and Ministry of Basic and Senior Secondary Education (MBSSE)

To develop a National AI in Education Framework that creates a clear guidelines and policies for AI use in classrooms, including ethical standards, approved tools, integration strategies, and roles for teachers.

Investing in Digital Infrastructures that could expand access to internet connectivity, ICT hardware (computers, tablets, projectors), and reliable electricity especially in rural schools such as those in Bombali, Bo and Kenema Districts.

Incorporate AI into National Curriculum and Exams by updating the English language curriculum to reflect the role of AI tools in grammar, writing, and editing, ensuring alignment with both local linguistic needs and global standards.

Fund Teacher Training and Certification by implement nationwide capacity-building programs to train English teachers in how to use AI tools effectively, interpret AI-generated feedback, and integrate them into lesson plans.

School Administrators and Principals

Adoption of Blended Learning Models that encourage hybrid teaching methods that combine traditional instructions with AI assisted learning to balance student engagement with conceptual understanding. Establish ICT Labs and Learning Hubs by setting up digital resource centers equipped with grammar software and supervised access to AI tools like Grammarly or QuillBot.

Monitor and Evaluate AI Use through regularly assessing how AI tools are being used in classrooms, gather feedbacks from students and teachers, and make data driven improvements to digital learning plans.

Teachers

To embrace a Facilitator Role that view AI not as a replacement, but as a co-instructor that automates routine tasks (e.g., proofreading) and allows more time for personalized instructions and mentoring. Use AI to differentiate instructions by leveraging AI to support differentiated learning, where stronger students can explore advanced grammar independently while others receive scaffold assistance and guide students in critical AI use by teaching students to analyze and question AI feedbacks, and helping them understand why grammar corrections were made rather than simply accepting changes.

Non-Governmental Organizations and Development Partners

By supporting Digital Equity Initiatives by fund initiatives aimed at reducing the digital divide by providing under-resourced schools with devices, software licenses, and solar powered ICT kits.

By developing a localized AI contents and collaborates with linguists and educators to adapt AI tools to Sierra Leonean English usage, idioms, and curriculum requirements.

Launching Awareness Campaigns by promoting AI literacy through radio, community outreach, and school based workshops to shift cultural perceptions and reduce fear or skepticism around the use of AI and its integration into the country`s educational system.

Researchers and Academics

Should conduct longitudinal studies to track students' performances and AI usage over time and evaluate the long term impact on grammar mastery, writing fluency, and learning autonomy.

Explore AI for inclusive education by investigate how AI can be adapted to support students with disabilities or special learning needs thereby ensuring that no learner is left behind.

Create AI Pedagogical Toolkits and develop practical, curriculum aligned guides that show teachers how to use AI tools in step-by-step formats, particularly in low resource settings.

Final Recommendation

All stakeholders must recognize that AI is a complementary innovation, not a standalone solution. Its effectiveness depends on human guidance, institutional support, and systemic equity. A coordinated, inclusive, and well-resourced approach is essential to harness AI's full potentials in transforming English grammar instruction and, by extension, the broader educational landscape in Sierra Leone.

REFERENCES

1. Adeoye, I. A., & Lawal, F. A. (2022). Teacher readiness and attitude towards artificial intelligence in Nigerian classrooms. Journal of Educational Technology & Online Learning, 5(2), 42–59.
2. Amusan, T. & Ibrahim, A. (2022). Challenges of integrating ICT in West African schools: Lessons from Ghana and Nigeria. African Journal of Education, 18(3), 115–130.
3. Burstein, J., Chodorow, M., & Leacock, C. (2013). Automated essay evaluation: The Criterion online writing service.
4. Ganeesh, G. & Rani Maria Abisha M. (2023) Role of Artificial Intelligence in English Language Teaching. International Journal of Research Publication and Reviews, Vol 4, no 11, pp 2418-2420 November 2023 Journal homepage: www.ijrpr.com ISSN 2582-7421
5. Heil, C. R., Wu, J. S., Lee, J. J., & Schmidt, T. (2020). Artificial intelligence in education: A review of current technologies and applications.
6. Hsu, H.-Y., Liu, J., & Wang, J. (2021). Artificial intelligence in second language writing: A study on feedback effectiveness. Language Learning & Technology, 25(2), 22–42.
7. Li, M., Gao, X., & Zhang, X. (2021). The impact of AI on language learning and teaching: A review of recent developments.
8. Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). Intelligence unleashed: An argument for AI in education. Pearson Education. https://www.pearson.com/content/ dam/corporate/global/pearson-dot-com/files/innovation/Intelligence-Unleashed-Publication.pdf
9. Owusu, K., & Danso, A. (2021). Digital education in Ghana: Promises and paradoxes of AI tools in public senior high schools. West African Journal of Educational Research, 14(1), 45–61.
10. Ranalli, J. (2018). Automated written corrective feedback: How well can students understand it and where do they need help? System, 77, 149–160. https://doi.org/10.1016/j.system.2018.01.001
11. Roscoe, R. D., & McNamara, D. S. (2013). Writing pal: Feasibility of an intelligent writing strategy tutor in the high school classroom. Journal of Educational Psychology, 105(4), 1010–1025.
12. Schmidt, R. (1990). The role of consciousness in second language learning. Applied Linguistics, 11(2), 129–158.
13. Selwyn, N. (2019). Should robots replace teachers? AI and the future of education. Polity Press.
14. UNESCO. (2023). Technology in education: A tool on whose terms? Global Education Monitoring Report Summary. https://unesdoc.unesco.org/ark:/48223/pf0000385887
15. UNICEF. (2023). Digital divide in West Africa: Gender, geography, and access to learning technology. https://www.unicef.org/westandcentralafrica/reports/digital-divide

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue VI June 2025

16. Vardi, I. (2012). The impact of written feedback on writing development. Higher Education Research & Development, 31(3), 341–352.
17. Wang, S., & Vásquez, C. (2012). The effect of grammar checkers on ESL writing.
18. World Bank. (2022). Digital education in Sub-Saharan Africa: Policy readiness and implementation challenges. https://www.worldbank.org/en/topic/education/publication/digital-education-sub-saharan-africa
19. Yin, M., Kulkarni, C., & Lee, D. (2020). Teachers and AI: Rethinking human-AI interaction in classrooms. In Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems, 1–13. https://doi.org/10.1145/3313831.3376780