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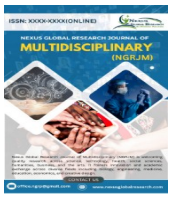

Review Article

Exploring Artificial Intelligence in ESL Classroom: The Known, Emerging Issues and Policy Imperatives

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ABSTRACT

Artificial Intelligence (AI) is significantly transforming second language (L2), particularly English (ESL), education. This paper examines AI's current applications, potential benefits, and emerging challenges within ESL classrooms. Core AI technologies like Natural Language Processing (NLP), Machine Learning (ML), and Deep Learning (DL) power tools such as machine translation, AI writing assistants (e.g., Grammarly), chatbots, intelligent tutoring systems, and platforms like Duolingo. These tools facilitate personalized and adaptive learning experiences, providing immediate feedback, enhancing learner autonomy, and supporting skill development in grammar, writing, pronunciation, and conversation. Key established benefits include increased student engagement, motivation, accessibility, individualized pacing, and real-time analytics for progress tracking. However, the integration of AI presents substantial challenges. These encompass ethical concerns regarding data privacy, risks of student over-reliance on technology, potential misalignment with sound pedagogical practices, and teacher resistance stemming from fears of displacement or reduced control. Systemic barriers like high costs, infrastructure limitations, and insufficient teacher training also hinder adoption. The paper concludes by emphasizing the critical need for robust educational policies grounded in the OECD's "Trustworthy AI" principles (lawful, ethical, robust). It provides targeted recommendations for legislators, AI developers, researchers, schools, and teachers to ensure AI is integrated into ESL education equitably, effectively, and in a human-centered manner, maximizing its benefits while mitigating associated risks.

Keywords: Artificial Intelligence (AI) in Education, English as a Second Language, Educational Technology, Language Pedagogy, Personalized Language Learning

Introduction

Digitalization has been one of the main drivers of change in education generally and instructional practices in the classroom, in particular in the past decade. While most innovations in the past decade related to an increased use of computers and the internet in the classroom, the next wave will be based on artificial intelligence (AI), or on combinations of AI and other technologies (Tobing et al., 2023). For the purposes of this review, AI encompasses systems demonstrating capabilities in Natural Language Processing (NLP), Machine Learning (ML), and Deep Learning (DL) to simulate aspects of human cognition relevant to language tasks (e.g., pattern recognition, adaptive feedback). Specific definitions and applications are elaborated in subsequent sections. In education, artificial intelligence is embedded in many technological transformations that provide learning analytics, recommendations and diagnosis tools in various ways and for various purposes. In many cases, Pokrivcakova (2019) assures that AI applications are still budding and used in experimental and local contexts rather than at scale at the system level. There are, however, many examples of promising uses that foreshadow how AI might transform education in the next decades, both in the classroom and at the systemlevels, and address different stakeholders: students, teachers, administrators, parents, as well as policy makersBased on existing reviews related to AI in language learning, there has been a focus on developing tutoring systems, writing assistants, virtual reality environments, chatbots, and other types of adaptive learning systems/software (Akintunde, & Abdullah, 2024).

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The main intent of these tools has been to generate personalized and customizable learning experiences for the purposes of optimizing language learning by increasing autonomy, motivation, engagement, and effectiveness (Akintunde, 2024) For instance, NLP-based tutoring systems are designed to provide tailored feedback, recommendations, and materials. Recently, with the rapid development of AI, these tools can meticulously adapt content in real-time to the learning pace, preferences, and needs (e.g., cognitive, affective, social) of each user (Jackson, 2021). For instance, NLP-based tutoring systems are designed to provide tailored feedback, recommendations, and materials. Recently, with the rapid development of AI, these tools can meticulously adapt content in real-time to the learning pace, preferences, and needs (e.g., cognitive, affective, social) of each user (Jackson, 2021).

This paper adopts a critical review methodology, synthesizing current literature to map the landscape of AI in ESL education. Its primary contribution lies in systematically analyzing the relationship between established benefits, often highlighted in promotional discourse, and the significant, under-analyzed systemic and pedagogical challenges hindering equitable and effective implementation. This analysis is implicitly guided by sociocultural theory (Vygotsky, 1978), emphasizing the social and collaborative nature of language learning. A critical question explored is how AI tools can be designed and integrated to genuinely scaffold learning within the Zone of Proximal Development (ZPD) and support meaningful social interaction, rather than merely providing isolated, transactional practice.

Artificial Intelligence Defined

The origin of Artificial Intelligence (AI) can be traced to John McCarthy's research in 1955. Various scholars have defined the concept of Artificial Intelligence (AI). According to Wang (2018), AI refers to devices' or systems' ability to think as human beings, having the power and skills to learn, perceive, and decide rationally and intelligently. Benhamou and Janin (2018) state that AI includes a collection of technologies that enable machines to act with a very high level of intelligence similar to humans. Tredinnick (2017) describes AI as a cluster of technologies, and various computing science approaches to make flexible rational decisions that align with unpredictable environmental conditions. One group of definitions see AI as machines, computers or computer systems that imitate cognitive functions that are normally associated with the human mind, such as learning and problem solving (Akintunde, 2024). Another group of definitions consider AI as a specific set of skills of computers, e. g. Baker and Tredinnick (2017, p. 10) define AI as "computers which perform cognitive tasks, usually associated with human minds, particularly learning and problem-solving". Other group of definitions see AI in a much broader context, as a science, e. g. Benhamou and Janin (2018) say that "Artificial Intelligence (AI) is a science and a set of computational technologies that are inspired by—but typically operate quite differently from—the ways people use their nervous systems and bodies to sense, learn, reason, and take action" (Akintunde, & Abdullah, 2024). Artificial intelligence (AI) is therefore, the imitation of human intelligence processes such as speech and visual recognition, translation of the languages and virtual decision- making by machines and robots (Akintunde, 2024). The ability of machine to think and behave like human beings, has given AI a special place in all fields. AI is present everywhere in various aspects of our lives starting from intelligent sensors to personal assistants.

Trans-formative Impact of AI on English as a Second Language Teaching and Learning

In educational context during the outbreak of COVID-19 pandemic, especially in learning/ teaching of English in Higher Schools, lecturers use the software facility of artificial intelligence application to carry out the English learning process. This application helps students improve English language skills and is important to students developing their skills in writing English. Artificial intelligence is "a simulation of human intelligence on machine programmed to think like a human and imitate its actions" (Vasiljeva, Kreituss, & Lulle, 2021). Students learn grammar, spelling, word matching, and sentences construction by artificial intelligence application. It can detect students' mistakes in writing and give them feedback (Dodigovic, 2007). According to Benhamou and Janin (2018) grammar examination is important in text writing and language learning. Artificial intelligence provides feedback on students' assignments that they can make improvements. This can affect student learning activities. They will be motivated to learn if the mistakes they made in grammar, diction, or sentence construction are corrected and the corrections are returned to students. Mistakes in writing can also be traced by the application of artificial intelligence. Vasiljeva, Kreituss, and Lulle (2021) said that students get feedback from artificial intelligence, then reread and improve their writing and practice to become independent learners (Miller, 2019).

According to Akintunde, Okechalu and Chukwuem-eka, (2025) it seems to be of relevance to specify the following general AI key concepts in terms of AI-powered language learning:

Natural Language Processing (NLP) is an area that combines AI and linguistics in general and is concerned with the automated processing of human language. It addresses the generation and analysis of written and spoken language, though speech processing is often regarded as a separate subfield. NLP can be seen as the applied side of computational linguistics, the interdisciplinary field of research concerned with formal analysis and modeling of language and its applications at the intersection

of linguistics, computer science, and psychology (Miller, 2019)

Machine Learning (ML) a type of AI that allows software applications to become more accurate at predicting outcomes without being explicitly programmed to do so. Machine learning "helps us find solutions to many problems in vision, speech, recognition, and robotics" (Tredinnick 2017, p. 3). Furthermore, it can be claimed that ML refers to "programming computers [and their corresponding applications & software] to optimize a performance criterion using example data or past experience" (p. 3). Most of the data used in education is generally personal data (such as individual achievement data, class grades, test grades, etc.) that requires particularly high levels of data privacy and data security**.** Hence, example data must be categorized in order to use it for NLP purposes.

Deep Learning (DL) is a subfield of AI that uses Artificial Neural Networks (computing systems resembling specific neural networks of a human's brain) to learn from extensive data sets (Schmidhuber, 2015). Deep Learning mainly focuses on vision-based categories (e.g. distinction of images), but can also be used for NLP purposes. AI based systems provide language learners with the environment where they can choose their own path and pace of learning, and where learners can take more control over their own learning. This aligns with recent findings in the Nigerian context, where AI-driven assessment tools demonstrate significant potential for personalizing feedback while requiring careful implementation to address resource constraints (Akintunde, Okechalu & Chukwuemeka, 2025). AI powered systems facilitate development of learner's decision-making skills and lead to their learning autonomy. Students can digitally connect with native speakers around the world or to use IA-powered conversational tools (e. g. chatbots) to intensify their learning without a teacher's personal involvement. Language learners have more opportunities to be more active participants in the learning process rather than passive recipients of knowledge. Teaching becomes more learner-centered, since learners are expected to be able to make their own decisions and become responsible for their work more independently. The teacher, on the other hand, abandons his/her previous position of the only authority and decision-maker, to become rather a facilitator and supporter of learners (Miller, 2019).

AI has provided unprecedented help to the ESL/EFL field (Sharma, 2021). Following are some computer programs, platforms, and applications that have greatly enhanced the teaching and learning of ESL:

Machine translation (MT) is the process when computer software is employed to translate a text (written or spoken) from one natural language to another. For a long time, using MT tools for language learning purposes has been limited due to a questionable quality of their outputs. Artificial intelligence technologies like neural machine translation have improved the quality of machine translation considerably and free-access web-based MT services resulted in millions of users using services such as Google Translator, Translator Online, Foreign Word, Web Trance for their work or study every day. MT can be a useful aid to language learning (Sharma, 2021); however, foreign language teachers tend to regard the use of MT as a learner's failure, disruption or even breakage of academic honesty (Miller, 2019).

AI writing assistants (based on NLP and machine learning) help users through various steps of the writing process (augmented writing). Using AI systems, they correct grammatical errors within a written text (via conducting a continual error analysis), provide recommendations for later improvements and provide additional resources for further study. In foreign language classrooms, these systems help learners to go through the writing process individually, correct themselves, and think about the process itself. Using AI in this way facilitates learner's self-regulation and autonomy. The examples of AI writing assistants are Grammarly, ProWriting Aid, Textio, AI Writer, Textly AI and Essaybot.

Chatting robots (chatbots) Chatbots are communication tools that represent one example of human-machine interaction. A human user and a computer (robot) are engaged in informal chat (in a written or spoken form) using a natural language. Chatbots are most frequently utilized in marketing communication; however, they may be used effectively in foreign language classrooms as well (Miller, 2019). Learners can learn through the process of direct communication with a robot. In addition, chatbots can provide customized answers in response to learners' messages, grade their performance, and provide tips on what learners need to improve. The research conducted by Sharma (2021) showed that most students enjoyed using the chatbots and they generally felt more comfortable conversing with the bots than a student partner or teacher, which might seem a surprising finding. Sharma, (2021) in their study investigated how a chatbot could be used to motivate learners to practice English. Results revealed that students felt comfortable and believed that the approach could help them with language learning. However, as Lotze (2018) argues, AI dialogic systems still need to meet some key criteria (especially spontaneity, creativity and shared knowledge) before they can serve as substitutes for a real-life language teacher.

AI-powered language learning software (platforms and apps***)*** When it comes to language learning, online platforms are increasingly becoming the norm. Cloud-based online platforms incorporating NLP, crowdsourcing, gamification elements, automatic speech recognition, automatic speech generation and AI writing assistant applications belong to the most popular learning aids used by young users. Examples: Duolingo, Busuu, Speexx, Babbel, Memrise, Magiclingua and many others. In addition, AI provides with several resources to people who speak different languages or have hearing or visual difficulties. Presentation Translator provides subtitles in real-time mode, which is an AI based system application. For example, with the

help of google translator students can read and hear in their national language.

Intelligent tutoring systems (ITS) have enormous potential, especially in large-scale distance teaching institutions, which run modules with thousands of students, where human one-to-one tutoring is impossible" (Lotze, 2018, p. 5; Akintunde, Okechalu, & Chukwuemeka, 2025). It is one of the sophisticated ways of information presented to the students. Like a teacher, it teaches each student according to his or her knowledge level and priorities ITS initially, teaches and presents theory, etc. with examples. IT then asks questions from the students. It has the ability to understand the answers provided by the students and to determine their knowledge, which affects what should be presented and asked from the student. The student can also ask questions and the system has the ability to answer or solve the problems in the specific knowledge domain. (Schmid, Blanc & Toepel 2021). More specifically, AI applications and tools have been enhancing ESL/EFL learners' language skills.

Established Benefits of AI integration in ESL Learning

Nobody can deny the benefits that Artificial Intelligence in Education (AIEd) "offers the possibility of learning in more personalized, flexible, inclusive, and engaging environment. It can provide teachers and learners with the tools that allow them to respond not only to what is being learnt, but also to how it is being learnt, and how the student feels. It can help learners develop the knowledge and skills that employers are seeking, and it can help teachers create more sophisticated learning environments than would otherwise be possible. For example, AIEd that can enable collaborative learning, a difficult task for one teacher to do alone, by making sure that the right group is formed for the task-at-hand, or by providing targeted support at just the right time" (Lotze, 2018, p. 11). Sharma, (2021) indicates that AI can be used to overcome many of the difficulties of teaching/learning English, such as: using Information Retrieval techniques to build the ability to comprehend reading passages, employing Machine Translation to develop students' translation skills, using Automatic Speech Recognition techniques to learn correct pronunciation (Bello et al., 2024), using Text-to-Speech techniques for blind and visually impaired students, using open digital language dictionaries to enrich the student's vocabulary, using intelligent programs to augment speaking skills for English learners, employing a writing evaluation technique to teach paragraph and essay writing.

Applying AI in foreign language education provides learners with immediate and highly individualized support, which is a fundamental building stone for personalized learning as one of the ideal standards of contemporary pedagogy. In this aspect, AI-powered tools are ahead of human teachers who simply do not have capacity to continually analyze each and every learner's outputs, diagnose their individual learning needs, adapt the learning content accordingly and give learners well-grounded feedback in the span of several seconds-and that all in the class of twelve or more students (Akintunde, Okechalu & Chukwuemeka, 2025). Al-powered tools are, on the other hand, able to collect massive amounts of data on learner's learning progress, on their basis to model their personal learning curves and to adapt learning content accordingly. Moreover, they enhance learners' progress through the functionality of small consequential steps and immediate feedback. Therefore, these programs and applications can be used by teachers as very effective supporting tools because they are able to free teachers from tiring, energy- and time-consuming activities such as grammar or pronunciation drills. Teachers who use Intelligent Computer-Assisted Language Learning (ICALL) enjoys benefits which include: learner's own pace of progress; instant feedback as a strong motivational factor; individualized repetition of topics and emphasizing activities where a learner has had weaker output; quick and objective assessment of learner's progress; better understanding of learner's learning preferences and strategies; predicting learner's future performance with a high probability; quick and objective assessment of teaching tools (texts, lectures, assignments, tests, etc.) (Akintunde, 2024).

Artificial intelligence provides a good learning environment for interactive second language learning. Through the connection and logical analysis of information such as graphics, sound and text in intelligent system, second language learning becomes more stereoscopic and visual. Students communicate with AI through man-machine interface, which not only increases the authenticity of the language environment, but also corrects the errors in the dialogue in time, so that students can learn English in a relaxed and pleasant atmosphere. AI can provide a real simulation dialogue platform for second language teaching and learning. Let students' better use and improve the comprehensive abilities of English words, spoken English and English writing. Not only that, the cultural and customs knowledge of different English-speaking countries collected in AI can be used to communicate and interact with students, but also can greatly enhance students' interest in English learning (Wang, 2019; Akintunde & Ohiare-Udebu, 2021). Lehlou and Brigui (2021) explain that Chatterbots or Artificial Conversational Ethics is one example of AI in that human are able to communicate through a machine. It holds intelligent conversation using a keyword matching technique. For instance, if a human asks the Chatterbots, 'What is your name?' the AI then will reply accordingly to the question based on the records of answers in its database. Hence, the assessment of speech can be made possible with the use of AI.

Moreover, such new technologies have been applied in the Digital Game Based Language Learning and Teaching (DGBLLT). Digital games are considered as primary components within the field of Computer Assisted Language Learning (CALL) (Lotze, 2018), just like the traditional games are regarded as part of Second Language Acquisition (SLA) (Sharma, 2021). CALL software packages have

so far provided small digital games such as hangman, puzzle and sentence production device to teach vocabulary and grammar in addition to various materials and activities to develop language skills. Furthermore, web and mobile versions of these kinds of stand-alone games are developed and some of them are integrated into foreign language learning process (Lehlou & Brigui, 2021).

Emerging Issues and Challenges

While the potential benefits are well-documented, a critical examination reveals persistent and emerging challenges that demand greater scholarly and practical attention, particularly concerning equity, pedagogical integration and ethical implementation barriers which extend beyond technical functionality. On the other hand, the AI implementation in education in general and ESL/EFL in particular, has encountered a number of challenges that should be taken into consideration.

Systemic and Resource Barriers pose significant implementation hurdles. Along with external factors including lack of material equipment, insufficient technical support, inflexible curriculum, and time constraints, AI adoption faces substantial cost barriers. When compared to installation, maintenance, and repair expenses, AI remains prohibitively expensive for many institutions, exacerbating existing digital divides. This potentially creates a "two-tier system" where access to advanced AI-enhanced language learning becomes contingent on institutional wealth, thereby widening educational inequities rather than bridging them (Warschauer, 2003). Only heavily funded organizations can afford such technology, leaving under-resourced schools further marginalized.

Data Privacy and Ethical Concerns emerge as critical limitations. AI systems require massive amounts of confidential student and staff data, creating serious privacy vulnerabilities. As data collection is essential to AI development, there is an urgent need to reinforce privacy policies and informed consent practices. The OECD (2022) identifies creating trust through transparency and accountability as paramount, especially given education's impact on life opportunities. Kengam (2020) cautions that despite AI's opportunities, it risks becoming "the worst thing to happen to humanity" if ethical implications are ignored. Faculty fears about replacement by Intelligent Tutoring Systems are not unfounded, while increased AI usage risks diminishing personal interactions and fostering technology dependency that may ultimately harm learners.

Algorithmic Bias and Equity Threats further complicate implementation. AI algorithms trained on potentially biased datasets risk perpetuating or even amplifying societal inequalities within learning environments. Issues like dialect discrimination in speech recognition or cultural insensitivity in feedback pose significant, under-researched threats to equitable outcomes (Noble, 2018). The OECD (2022) emphasizes that ensuring AI serves human-centered values in data protection remains a fundamental challenge, particularly for vulnerable populations.

Pedagogical Limitations reveal critical gaps in AI's educational value. Current tools often excel at discrete skill practice (grammar drills, vocabulary) but struggle to facilitate higher-order competencies crucial for real-world communication: pragmatic competence, nuanced cultural understanding, collaborative discourse construction, and creative language use (Kern, 2015). Over-reliance risks reducing language learning to transactional interactions rather than fostering holistic communicative competence. This efficacy gap is compounded by insufficient evidence verifying AI's language learning impact, underscoring the need for rigorous research on pedagogical effectiveness and learner perceptions. These limitations are compounded for vulnerable learners, as evidenced by Nigerian special education teachers reporting 84% confidence gaps in adapting AI for diverse needs (Babatunde et al., 2020).

Human and Institutional Resistance stems from these compounded challenges. Alongside logistical barriers, reluctance to adopt AI-enhanced learning is fueled by internal factors including: lack of technological pedagogical content knowledge (TPACK), with only 32% of Nigerian secondary teachers demonstrating proficiency in context-appropriate tech integration (Chukwuemeka & Aregbesola, 2025), limited experience with technology as learners, low motivation, difficulties integrating AI with existing teaching practices, discomfort with shifting roles, fear of diminished classroom authority, and concerns about eroded student respect. These concerns are exacerbated when teachers perceive AI as pedagogically reductive or misaligned with communicative language teaching principles.

Educational Policy Frameworks for AI Integration in ESL Institutions

Robust policies are essential to harness AI's potential while mitigating the ethical, pedagogical, and systemic challenges identified in this review. Drawing on OECD's Trustworthy AI principles (lawful, ethical, robust) and EU guidelines (European Commission, 2019; Madiega, 2019.

These policies must be structured around three core dimensions. First is **legal compliance and data governance**, which necessitates the establishment of regulatory bodies to monitor algorithmic transparency and uphold data protection standards (Congressional Research Service, 2021). Institutions should enforce strict protocols to secure the storage of sensitive learner data, such as performance metrics and interaction logs. Moreover, mandatory impact assessments should be conducted to detect and mitigate biases in Natural Language Processing (NLP) training datasets. Consent mechanisms must also be clearly articulated, following frameworks similar to the General Data Protection Regulation (GDPR), ensuring that learners retain agency over their data.

Secondly, **ethical implementation guidelines** must go beyond

legal compliance by embedding human-centered values into AI deployment. For instance, AI tools should demonstrate theoretical compatibility with second language acquisition (SLA) principles particularly sociocultural approaches before being adopted. Furthermore, a minimum of 30% of institutional AI budgets should be allocated to developing accessibility features that support underrepresented learners. Teachers must be empowered to audit and interpret AI-generated outcomes, such as automated grading, to maintain pedagogical transparency and fairness.

The third dimension involves ensuring **technical-social robustness**. Institutions should form interdisciplinary AI ethics committees comprising educators, technologists, and students to oversee deployment and governance. Controlled pilot testing through "AI sandboxes" should be implemented prior to system-wide adoption, allowing potential risks to be identified and managed in a safe environment. In addition, continuity plans must be developed to prevent disruptions in learning due to system failures, particularly for students heavily dependent on AI technologies.

To operationalize these frameworks effectively, institutions must demonstrate a firm commitment across three critical areas. The first is **teacher agency**, which requires embedding a minimum of 40 hours per year of paid professional development (PD) focused on AI literacy. These sessions should include modules on evaluating algorithmic bias in language tools, understanding data privacy rights, and designing pedagogically sound strategies for human-AI collaboration.

Secondly, **stakeholder co-design** must be prioritized by mandating active participation from both teachers and students in AI procurement and development processes. This can be achieved through structured feedback mechanisms such as design sprints and equity audits, ensuring that tools are not only effective but equitable. Lastly, **resource equity** should be addressed through tiered subscription models, whereby vendors subsidize access to AI tools for under-resourced schools, thereby preventing further entrenchment of educational inequalities.

In the absence of such complex and inclusive policies, AI risks deepening existing digital divides and perpetuating ethical blind spots. Rather than serving as a catalyst for empowerment, poorly governed AI could evolve into a source of pedagogical disruption and inequality, undermining the very foundations of equitable and inclusive education.

Conclusion

Artificial Intelligence has profoundly reshaped educational traditions, processes, and practices, emerging as a transformative force in teaching and learning. Its capabilities in automating administrative tasks (e.g., grading), enabling adaptive learning, and serving as a dynamic tutor offer unprecedented opportunities to personalize education, enhance feedback efficiency, and empower student autonomy particularly in second language acquisition, where engagement and individualized support are critical. AI's real-time insights into student comprehension and performance further redefine teachers as facilitators of interactive, technology-enhanced experiences, while its role as a persistent learning companion encourages risk-taking through trial-and-error learning.

However, this potential extends beyond augmentation into ethically complex terrain. As AI systems increasingly inform how schools teach, assess, and support students; and may even redefine or replace traditional instructional roles in certain contexts. Thus, their limitations demand rigorous scrutiny. For second language education specifically, realizing AI's promise necessitates moving beyond technical feasibility studies to confront critical gaps: pedagogical misalignment, risks of over-reliance, inequitable access, and algorithmic biases that could exacerbate disparities in diverse ESL classrooms. Urgent research priorities include longitudinal research on learning outcomes, equity audits of AI tools, and pedagogical frameworks guiding human-AI collaboration to ensure teachers remain central facilitators of inclusive, critically engaged learning environments. As observed in Nigeria's smart education transition, successful AI adoption requires parallel investments in grid infrastructure and digital literacy not just software procurement (Chukwuemeka et al., 2025). Such initiatives must address Nigeria-specific barriers identified in recent research, including limited access to devices and unstable electricity in 78% of schools (Chukwuemeka & Aregbesola, 2025).

Therefore, stakeholders must anchor AI integration in robust ethical frameworks like the OECD's Trustworthy AI principles (lawful, ethical, robust), ensuring policy efforts prioritize equity and human agency. Ultimately, AI's enduring impact in ESL and education broadly will depend not on replacing human interaction, but on strategically empowering educators to cultivate richer, more responsive, and democratized learning experiences.

Recommendations

Recommendations based on identification of different stakeholders, their responsibilities, and the actions they can take as a part of the policy-making process are briefly discussed. The following policies and recommendations are meant to encourage various stakeholders to enhance AI Implementation in ESL to improve equity and student outcomes.

Legislators and regulatory bodies bear primary responsibility for establishing enforceable guardrails. This necessitates creating dedicated AI oversight agencies empowered to mandate algorithmic transparency audits—particularly for dialect discrimination in speech recognition and bias in automated scoring—while enforcing GDPR/COPPA-compliant data protection protocols that guarantee student opt-out rights for non-essential data collection. Concurrently, targeted funding must be allocated to subsidize AI access for Title I schools and rural institutions, directly addressing the digital divides exacerbated by current cost

barriers.

AI developers and EdTech companies must prio ethical co-creation and equitable access. This requires embedding diverse teams (ESL teachers, linguists, bias auditors) throughout the development lifecycle to preempt algorithmic harms, alongside publishing documentation detailing NLP training datasets and pedagogical alignment with SLA theories (e.g., sociocultural scaffolding). Tools should integrate bias-detection dashboards enabling teacher-led audits, while tiered pricing models where premium licenses fund free access for under-resourced districts must become industry standards to ensure commodification does not deepen educational inequities.

Educational institutions must institutionalize critical AI literacy and participatory governance. Central to this is implementing mandatory professional development programs (40+ annual paid hours) that equip teachers to evaluate algorithmic outputs, manage ethical data practices, and design human-AI collaborative pedagogies (e.g., using chatbots as rehearsal scaffolds). Schools should further establish teacher-student ethics committees with procurement veto power and adopt student data sovereignty policies granting learners rights to access/edit AI-generated profiles and opt out of invasive analytics (e.g., emotion tracking).

ESL teachers should leverage their frontline expertise to demand accountability and pedagogical alignment. Practitioners must insist vendors disclose training data sources and bias mitigation steps while negotiating free pilot periods for classroom validation. When integrating tools, teachers must position AI as mediating scaffolds—not replacements—for human interaction; for instance, deploying writing assistants to prepare drafts for peer workshops or chatbots to simulate dialogues preceding authentic communication.

Researchers play a pivotal role in bridging efficacy gaps through rigorous, equity-centered evaluation. Longitudinal studies tracking learning outcome disparities across socioeconomic groups and algorithmic audits of automated scoring biases (e.g., penalties against non-native accents) are urgently needed. Findings should be disseminated through teacher partnerships and open repositories like ERIC, translating complex data into actionable insights for practitioners.

Finally, students and families require formalized channels to exercise agency. Schools must embed student representation in AI oversight committees and create anonymous grievance portals to report biased or harmful tool interactions, ensuring those most impacted by these technologies shape their evolution.

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