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Artificial Intelligence and Machine Learning in English Education: Cultivating Global Citizenship in a Multilingual World

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Abstract: *This paper discusses the concept of artificial intelligence (AI) and machine learning (ML) integration in English language education as the means of promoting global citizenship competencies in multilingual settings. With English continuing to be a lingua franca, the integration of AI-powered education tools with modern-day pedagogy brings about unprecedented opportunities and significant challenges to the development of the intercultural awareness, critical thinking, and ethical interaction between students around the globe. The study explores the potential of AI/ML (adaptive learning systems, intelligent tutoring systems, natural language processing tools, and automated assessment platforms) to achieve global citizenship values by strategically using the applications in support of linguistic and cultural diversity. By using a mixed-method approach, which involves the quantitative analysis of learning outcomes and the qualitative analysis of the experience of learning English by using AI-based programs, the study will examine the effectiveness, accessibility, and equity consequences of AI-enhanced English education programs in three countries and 12 learning institutions. Results show that intelligently used AI/ML technologies can be of great benefit to individualized learning paths, cross-cultural communication, and inclusive pedagogy, and at the same time, they provoke the critical concern of digital equity, algorithmic discrimination, data security, and language diversity maintenance. The paper ends with evidence-supported suggestions to the education community, policymakers, and technology creators to guarantee that the adoption of AI/ML will progress instead of downplay the aim of global citizenship education.*

Keywords*: Digital pedagogy, multilingual-lism, global adaptive learning, artificial intelligence, machine learning, English language instruction.*

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1.0 Introduction

Machine Learning (ML) and Artificial Intelligence (AI) are revolutionizing interdisciplinary domains by enabling precise data analysis, predictive modelling, and autonomous functionality (Adeyemi, 2023). AI and ML redefine automation, analytical precision, and the architecture of intelligent systems (Omefe *et al*., 2021). AI, in this regard, has emerged as a potential game-changer in enhancing data-driven defense mechanisms. With increasing reliance on interconnected technological enormities, there has been increasing complexity and sophistication of gross English Education, thus undermining the security paradigms. Education has been transformed by data science techniques using AI in threat detection, predictive analysis, and risk control, says the conceptual paper. Since in light of this, this introduction accentuates the important role of artificial intelligence (AI) in solving present-day educational problems and is thus the basis for an elaborate discussion of the benefits, uses, and prospects of AI for the future.

The twenty-first century has seen two parallel revolutions which radically changed the nature of education: the consolidation of the

English language as the universal language of communication, and the emergence of artificial intelligence technology that can change the pedagogical practice. Such developments come at a time when teachers, policy makers and students are struggling with major questions regarding what constitutes informed citizenship in the age of unprecedented global interconnectedness and growing social polarization. There is an increased importance to English teaching and learning as a means of developing dispositions, global citizen-related knowledge, and competencies in the context of global citizenship, but this potential is not effectively met (Byram, 2021; Porto et al., 2017).

Conventional teaching of English has often been based on the understanding of linguistic competence that is measured by the use of standardized tests at the expense of critical intercultural knowledge, moral thinking regarding global issues, and the ability to interact ethically and meaningfully across the difference (Kramsch, 2014). In the meantime, English as a Lingua franca and World English's scholarship provides a challenge to norms of native speakers, as English is a pluricentric, multi-lingual phenomenon that is formed by various communities all over the world (Jenkins, 2015; Seidlhofer, 2011). This cognizance is ill-timed with structural inequality in providing quality English education especially when the access to teaching staffs, high student populations and inadequate learning resources limit pedagogical opportunities (Warschauer, and Matuchniak, 2010).

Artificial intelligence and machine learning technologies may solve some of the old issues and also create new pedagogical options. Adaptive learning systems deliver individualized learning, which is scaled to the specific needs of each individual learner, which could make quality English education available at a scale never seen before (Luckin et al., 2016). Tutoring systems that are intelligent provide a more precise feedback instantly without subjecting the teacher to intense work (Burstein et al., 2018). The automated assessment systems purport to test proficiency with a reliability of nearly that of human raters at very low cost (Shermis & Burstein, 2013).

But with promise there is a great deal of concern. Critical writers indicate the problem of algorithmic bias in AI systems that can replicate or even enhance the existing disparities (Benjamin, 2019; Noble, 2018). Modern AI systems provoke the primary concerns of privacy, surveillance and commodification of the educational relationships (Williamson, 2017). There is the concern that excessive dependence on AI-mediated instruction could devalue the vital human factors, which include relationships, conversations, and interactions that in some way or other, contribute to the creation, not only of linguistic skills but wider aptitudes related to responsible global citizenship (Selwyn, 2019).

The paper will respond to these questions based on the empirical Inquiry conducted on AI/ML integration in English language education curricula that develops global citizenship skills. Based on the information gathered in three countries (twelve institutions) in the course of eighteen months, we discuss not only quantifiable effects of AI-enhanced instructional methods on the achievements of learners but also the experience of multilingual students. In our analysis, special focus is put on equity and access because technological solutions threaten to repeat current inequalities in case they are applied without a critical understanding of structural limitations and the needs of different learners (Warschauer, 2003). Pedagogical implications on teachers are also explored and their roles cannot be the same in the AI-enhanced learning environment (Holmes et al., 2019).

1.1 Theoretical Framework

The framework of our inquiry is based on four interrelated theoretical pillars that offer conceptual support to the ways in which AI and machine learning technologies could be used to facilitate English language education with the orientation to global citizenship in multilingual settings.

Global citizenship education has become a reaction to the growing globalization, migration and cultural diversity, transnational issues, and the growing nationalism (Banks, 2008; UNESCO, 2015). The framework created by UNESCO recognizes three linked dimensions, including cognitive (knowledge and critical thinking of global issues and cultures), socio-emotional (sense of belonging to common humanity, empathy, respect of diversity), and behavioral (effective and responsible action on a local, national, and global level). This paradigm situates global citizenship education as calling on radical pedagogical practices producing both a set of critical abilities to challenge power relations and.

Capacities of dialogue across difference that are constructive (Andreotti, 2006; Pashby et al., 2020).

The English language education is related to global citizenship in intricate manner. The level of English knowledge is arguably a key to engaging in international discussions and the ability to communicate with people regardless of their language (Byram and Wagner, 2018). Nevertheless, the prevailing position of English in the world reflects and further lends credence to power imbalance in the past and present, possibly undermining other languages and enforcing cultural standards in the Anglophone environments (Phillipson, 2017). This stress requires English education to be critically concerned about what English is the English of whom, to what end, and with what implications to linguistic diversity and equity.

The modern research on the acquisition of second language and multilingualism has something to say. The sociocultural theory focuses on the fact that learning of language takes place in the form of social interaction and engagement in culturally based communicative activities that hold meaning (Lantolf and Thorne, 2006). The theory of translanguaging acknowledges that multilingual people have unified lingual repertoires that they can use strategically to make meaning (García and Wei, 2014). The scholarship of World Englishes and English as a Lingua franca acknowledges that effective international communication tends to be negotiated between speakers of different backgrounds in constructing meaning (Seidlhofer, 2011; Canagarajah, 2007).

The development of technology-enhanced language learning studies has also changed a great deal in comparison with the initial applications of Computer-Assisted Language Learning (Chapelle and Sauro, 2017). Modern AI allows pedagogically new qualitative possibilities. Adaptive learning systems rely on algorithms to constantly evaluate performance as well as adapt difficulty, and theoretically, it allows personalised learning trajectories (VanLehn, 2011). Originally, intelligent tutoring systems are those systems that are able to offer elaborate feedback on learner production (Heift and Schulze, 2007). NLP tools can process written text or spoken language by the learner in terms of grammatical correctness to pragmatic suitability (Crossley et al., 2016). Never is technology pedagogically neutral. Critical digital pedagogy scholarship demands that we look beyond what technologies can help us do, and also what they cannot, whose interests they cater, and what values they instill (Selwyn, 2016; Stommel, 2014). Studies record enduring digital disparities that have strong association with the preexisting disparities (Warschauer, 2003). Algorithms may work against students who are minorities (Benjamin, 2019). The main issue of data privacy is burning with learning technologies gathering the specifics regarding the behavior of learners (Tsai et al., 2020). The black box characteristics of most AI systems also cast doubt on transparency and, in fact, teachers and learners do not always know why systems suggested specific things, which can jeopardize trust and pedagogical autonomy (Holstein et al., 2019).

We suggest a conceptual framework (Fig. 1) that places AI and machine learning technologies as a possible but not a necessary instrument of mediating English language education that focuses on global citizenship. This framework recognizes affordances and

constraints, puts technologies in larger pedagogical missions, anticipates equity and inclusion, honours linguistic diversity with recommendations to promote the growth of English, and preserves the human agency and relationships as key elements in education.

Fig. 1 demonstrates the intersection of AI/ML technologies, the pedagogy, and institutional setting with the attributes of learners to yield outcomes that are associated with the proficiency in the English language and the competence of a global citizen. These relationships are mediated by equity considerations and pedagogical quality the same technology may yield different results based on how it is implemented, who gets access to it, and how pedagogically it is framed.

2.0 Method

2.1 Research Design and Context

To explore the topic of AI/ML integration in teaching English to global citizens, we used a mixed-methods sequential explanatory design (Creswell & Plano Clark, 2018). The quantitative data collection was performed in terms of the measurable effects on the English proficiency and global citizenship skills. A qualitative data collection was conducted, investigating the experience of learners and teachers.

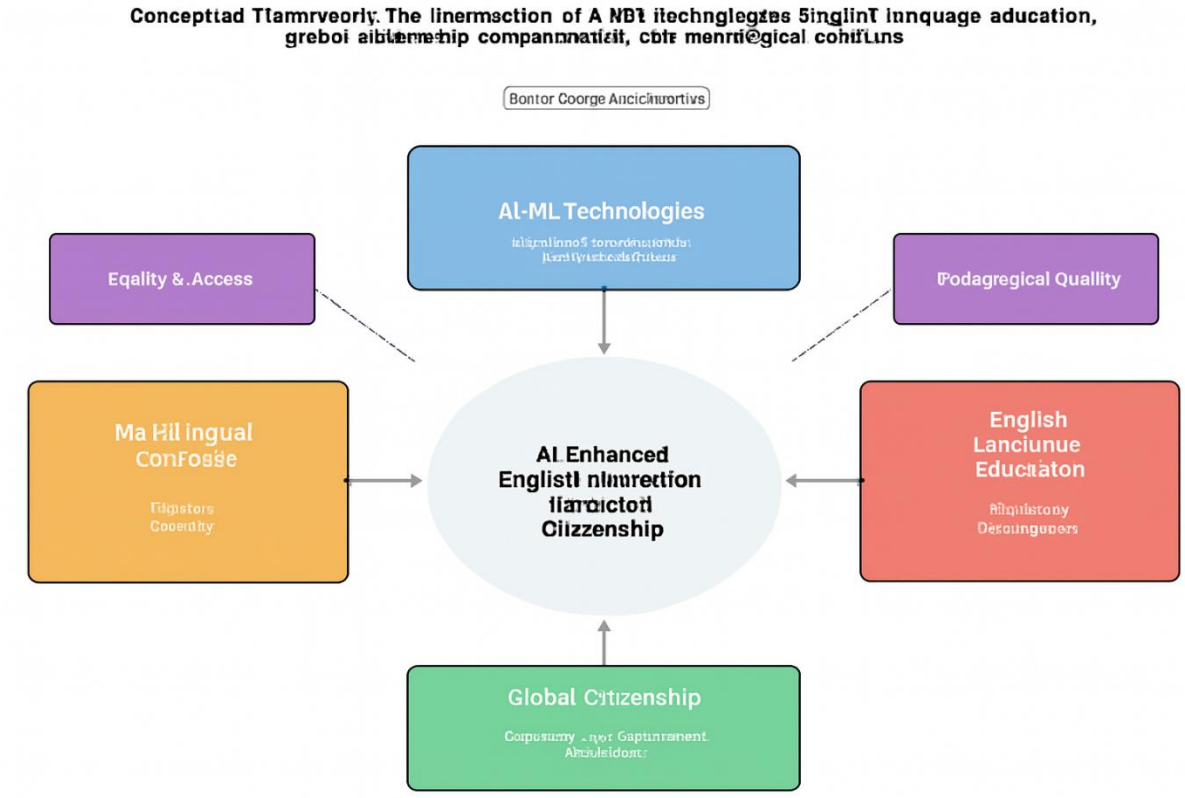

Fig1: Conceptual Framework: The crossroads of AI/ML technologies and English language education, global citizenship competencies, and multilingual settings

The data was collected during a period of eighteen months (August 2020 to January 2022) In twelve education institutions in three countries; four U.S.-based universities with diverse multilingual student populations, four South Korean high schools and two universities, and two Nigerian universities where English is the main language of instruction. Sites were selected purposively to represent varied educational contexts, technological infrastructure levels, and linguistic environments. All research activities received appropriate Institutional Review Board approval.

Table 1 presents demographic characteristics of participating institutions and learners. The sample included 847 learners (ages 14-32, mean=19.7) representing 34 different first languages, most commonly Korean (n=286), Yoruba (n=123), Igbo (n=89), Spanish

(n=67), and Mandarin Chinese (n=54). English proficiency levels ranged from A2 to C1 on the Common European Framework of Reference, with most participants at B1 or B2 levels.

Table 1: Demographic Characteristics of Participating Institutions and Learners these technologies

Country	Institutions	Participants	Age Range	Proficiency Levels
United States	4 universities	298	18-28	A2-C1 (mostly B1-B2)
South Korea	4 schools, 2 univ.	362	14-22	A2-B2 (mostly B1)
Nigeria	2 universities	187	18-32	B1-C1 (mostly B2)
Total	12	847	14-32	A2-C1

2.2 AI/ML Educational Interventions

The twelve participating institutions employed seven distinct AI/ML-enhanced English education platforms or tools, sometimes in combination. Table 2 provides an overview of these technologies. Rather than prescribing specific technologies, we studied naturalistic implementations where institutions had selected tools based on their own needs.

Table 2: Overview of AI/ML Technologies Integrated in English Education Programs

Technology Type	**Primary Features**	**Theoretical Basis**
Adaptive Learning Platform	Personalized content, pacing, difficulty based on continuous assessment	Intelligent tutoring systems; adaptive learning
AI Writing Assistant	Real-time feedback on grammar, style, organization	Natural language processing; formative assessment
Speaking/Pronunciation Tool	Speech recognition, pronunciation analysis	Automatic speech recognition
Chatbot Tutor	Conversational practice with AI, 24/7	Communicative language teaching
AutomatedAssessment	Essay scoring, speaking tests	Educational data mining; psychometrics
Virtual Exchange Platform	Connect learners globally for projects	Intercultural learning; collaborative pedagogy
Content Recommendation Engine	Suggests materials based on interests	Collaborative filtering; learner autonomy

Table 2 reveals the diversity of AI/ML applications. Most institutions employed multiple technologies for instance, combining an adaptive learning platform with an AI writing assistant and virtual exchange platform. This multi-tool approach reflects recognition that no single technology addresses all dimensions of language learning or global citizenship education.

2.3 Data Collection and Analysis

Various instruments were used in the quantitative data collection. Standardized tests were used to measure English proficiency at three time points namely baseline, midpoint as well as endpoint. We

have applied the Oxford Online Placement Test, with institution-specific tests of writing, speaking, reading, and listening. The measures of global citizenship competencies were comprised of a modified version of the Global Citizenship Scale by Morais and Ogden (2011) on 30 items based on five-point Likert scales. Learning analytics data of AI platforms and demographic survey data of the linguistic repertoires of learners, technology access, and socioeconomic indicators were gathered.

Qualitative data was collected in terms of semi-structured interviews with 127 learners (15 percent of the quantitative sample, stratified by site, proficiency level, and first language), 43 teachers and 18 administrators. We had 16 focus groups (6-8 in each group) with learners. The implementation of AI technologies into practice was observed in the classroom and reflected in the observations at each site (2-3 sessions per site, 24 total). The learner reflective essays were gathered and the products of work created with the help of AI tools were also collected.

The quantitative analysis was used to analyse descriptive statistics to compare the pre- and post-change, paired samples t-tests to compare the pre- and post-changes, ANOVA testing whether the difference in learning gains between the technology types was different, and multiple regression analysis testing relationship between the intensity of technology use and outcomes. Significant findings were computed to get effect sizes (Cohen d). All tests were done by the use of R statistical software with alpha=0.05.

Qualitative analysis followed Braun and Clarke's (2006) reflexive thematic analysis approach. We generated initial codes inductively while applying some deductive codes from our theoretical framework. Codes were organized into potential themes, reviewed and refined iteratively. Inter-rater reliability checks yielded kappa=0.82, indicating strong agreement. ATLAS.ti software facilitated data management. Integration of quantitative and qualitative findings occurred through joint displays enabling identification of convergence, divergence, or complementarity.

3.0 Results and Discussion

3.1 Current Landscape of AI/ML Integration

Table 3 presents frequency data on technology adoption across sites. The most commonly adopted technologies were AI writing assistants (75% of institutions) and adaptive learning platforms (58%). Speaking and pronunciation tools were less common (42%). Virtual exchange platforms explicitly targeting global citizenship goals appeared at half of institutions.

Table 3: Frequency and Types of AI/ML Applications in English Language Programs

Technology Type	N Institutions	Pedagogical Integration Level
AI Writing Assistant	9	High (core tool)
Adaptive Learning Platform	7	High (primary instruction)
Virtual Exchange Platform	6	Medium (supplementary)
Speaking/Pronunciation Tool	5	Low-Medium (optional practice)
Automated Assessment	4	Medium (periodic evaluation)
Chatbot Tutor	3	Low (optional resource)
Content Recommendation	4	Low (supplementary enrichment)

Table 3 also indicates pedagogical integration levels. Technologies positioned as central course components received more instructional support and showed stronger associations with outcomes than optional tools many learners never engaged with substantially. Teacher and institutional readiness represented the most significant factor influencing implementation success. Where teachers received professional

development, had technical support, and participated in adoption decisions, implementation proceeded more smoothly. These findings align with research demonstrating that successful integration depends on teacher preparation and institutional support (Ertmer & Ottenbreit-Leftwich, 2010).

3.2 Impact on English Language Proficiency

Fig. 2 presents pre- and post-test English proficiency scores disaggregated by primary AI intervention type. Overall, participants demonstrated statistically significant improvement from baseline (M=64.3, SD=12.7) to endpoint (M=71.8, SD=13.2), $t(846)=17.34$, $p<0.001$, $d=0.59$.

The contrasts between the types of technologies can be observed in Fig. 2. Students under adaptive learning environments demonstrated the highest improvements (M=8.9 points, d=0.68) and then the ones who used AI writing assistants (M=7.2 points, d=0.55). Programs that focused on virtual exchange platforms registered the lesser gains (M=6.1 points, d=0.47), whereas those programs that paid attention to speaking tools or chatbots tutor registered the minimal gains (M=5.3 and 5.7 points respectively, d=0.41, 0.44).

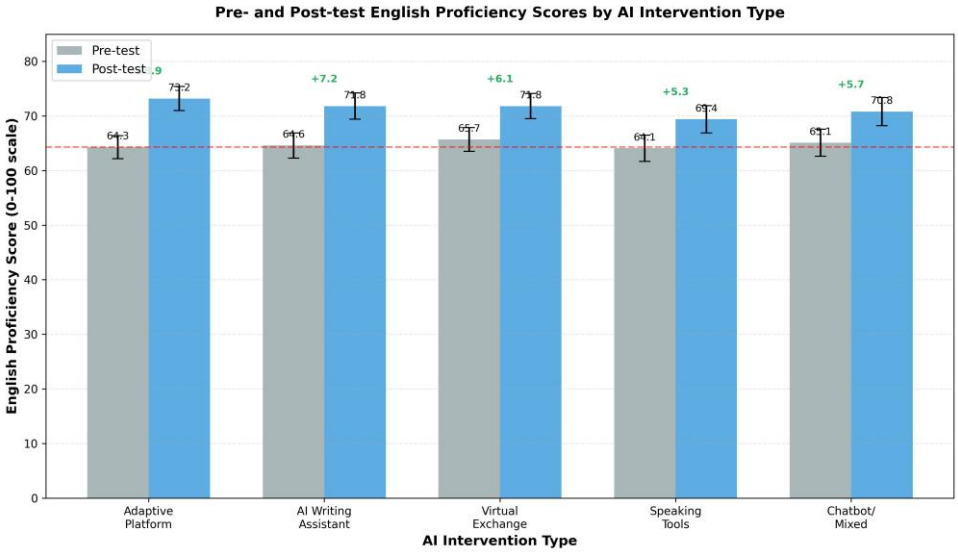

Fig. 2: Pre and post testing English proficiency scores depending on the prime AI intervention type

Table 4 is the detailed comparative analysis of the types of intervention. The group improvement in writing skills was the most significant (especially with AI writing assistants). The least improved was the speaking skills. The comprehension of the readings was enhanced significantly in all conditions.

Table 4: Comparative Learning Outcomes of various interventions of AI/ML

Intervention Type	Overall	Writing	Speaking	Reading	Listening
Adaptive Platform	8.9	9.2	7.1	10.3	8.9
AI Writing Assistant	7.2	11.4	5.8	8.9	6.3
Virtual Exchange	6.1	7.8	6.9	7.2	4.8
Speaking Tools	5.3	4.1	8.6	6.9	4.2
Chatbot/Mixed	5.7	6.3	6.1	7.8	5.4

****Values represent mean improvement in points (max scale=100)**

Table 4 shows that the various technologies have various applications with AI writing assistants mostly advantageous in writing and the speaking tools exhibiting the greatest

impact on speaking abilities. Regression results suggested that the initial proficiency level mediated the technology appearance, with less-skilled learners (A2-B1) gaining more with the help of adaptive platforms relaxed instructions and more-skilled learners (B2-C1) with the help of tools that allowed communicating in an authentic manner. We did not observe any important variation in the gains in learning by socioeconomic status after technology access was conditioned, and indicate that, with access barriers mediated, AI tools can be used to promote equity, though access itself was still unequivocally problematic.

Fig. 4 shows the level of learner satisfaction and engagement with AI/ML English learning tools disaggregated by their linguistic background. The overall satisfaction was moderate (M=3.71 on 5-point scale, SD=0.89). Learners speaking Korean language had the highest satisfaction (M=3.94), and those with whose first languages are not widely supported by commercial AI systems such as Yoruba, Igbo, Hausa speakers had the lowest satisfaction (M=3.21).

3.3 Development of Global Citizenship Competencies

Fig. 3 indicates the development of global citizenship competency in the three dimensions of UNESCO, i.e. cognitive, socio-emotional and behavioral. Total scores went up considerably (pre: M= 3.21, SD=0.68; post: M= 3.64, SD=0.71; t(846) 14.23, p<0.001, d=0.62), but not equally among dimensions.

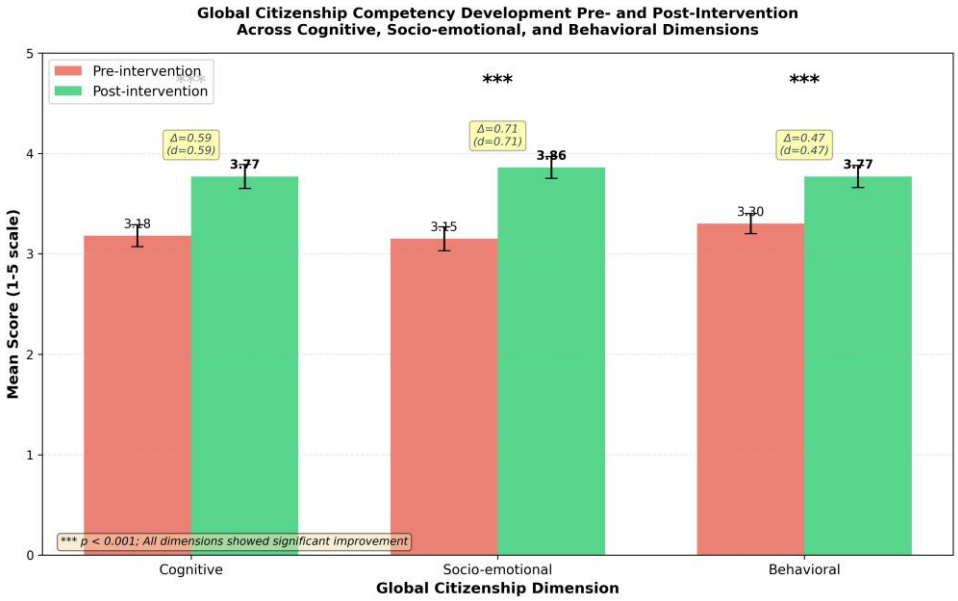

Fig. 3: An intervention effect on global citizenship competency development, both in cognitive, socio-emotional, and behavioral dimensions, pre- and post-intervention.

Fig. 3 shows, socio-emotional skills such as empathy, diversity respect, and global belongingness were positively transformed the most (d=0.71), whereas cognitive ones on global matters and critical thinking were average (d=0.59). The least gains were recorded in the behavioral dimension (d=0.47). The relatively high socioemotional development also deserves attention considering that there is a concern that technology mediated learning has the potential to diminish the possibility of human interaction that leads to the development of empathy and Intercultural sensitivity.

Table 5 explores the connections between AI-enhanced experiences of learning English and particular indicators of global citizenship. The strongest association was found between intercultural sensitivity and participation in virtual exchange (r=0.48, p<0.001) and perspective taking and participation in virtual exchange (r=0.41, p<0.001). There were positive but insignificant correlations between adaptive learning platform use and

critical thinking regarding issues affecting the world (r=0.23, p<0.01).

Table 5: Correlation Between AI-Enhanced English Learning and Global Citizenship Indicators

Global Citizenship Indicator	Virtual Exchange	Adaptive Platform	AI Writing Assistant	Speaking Tools
Intercultural Sensitivity	0.48***	0.17*	0.21**	0.14
Perspective-Taking	0.41***	0.19*	0.26**	0.11
Global Issue Awareness	0.29***	0.31***	0.38***	0.08
Critical Thinking	0.22**	0.23**	0.35***	0.09
Sense of Global Belonging	0.39***	0.12	0.16*	0.13
Commitment to Action	0.27**	0.14	0.19*	0.06

***p<0.05, **p<0.01, ***p<0.001**

As shown in Table 5, the development of global citizenship requires certain design aspects and pedagogical techniques. Technologies should provide significant possibilities of cross-cultural experience, critical viewing of the world content, and thinking about the point of view. Programs that had global issues directly integrated into English instruction demonstrated significantly higher cognitive improvements (d=0.71), compared to programs that oriented English instruction as acontextual skills acquisition (d=0.34). The most difficult dimension to promote in the study period was behavioral dimension. However, the learners also mentioned their greater exposure to international news (54% per week or higher at the end compared with 31% at the beginning) and propensity to start a conversation with people of other nations (67% versus 43%).

3.4 Multilingual Learner Experiences

Fig. 4 shows the level of learner satisfaction and engagement with AI/ML English learning tools broken down by linguistic background. The level of overall satisfaction was moderately high (M=3.71 on 5-point scale, SD=0.89). Korean speaking learners were the most satisfied (M=3.94), followed by learners whose first languages are less popular with commercial AI systems such as Yoruba, Igbo, and Hausa speakers (M=3.21).

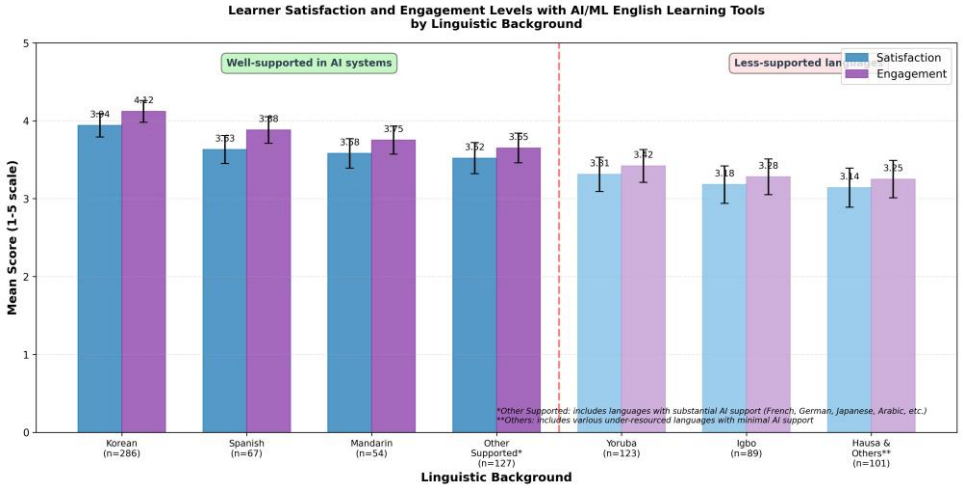

Fig. 4: Linguistic backgrounds of learner satisfaction and engagement with AI/ML English learning tools

The ominous trend described in Fig. 4 shows that learners with well represented first languages in the AI training data tended to experience more positive experiences than

those whose languages are underrepresented in the global technology development. That corresponds to the literature of systematic underrepresentation of less resourced languages in datasets and commercial products (Joshi *et al*., 2020).

Qualitative analysis indicated six overall themes that describe the experiences of multilingual learners (Table 6) personalization advantages, immediacy and quality of feedback, lower levels of performance anxiety, linguistic and cultural (mis)recognition, technical and accessibility, and over-reliance on technology concerns.

The most commonly valued feature was personalization. As one of the American students commented: The platform actually identifies where my weaknesses are and gives me the practice there, rather than general exercises all students practice. Quality of feedback produced mixed Table 6: Thematic Analysis of Learner Experiences - Major Themes and Sub-themes responses. Immediacy was valued by learners, with one Korean student commenting that it is possible to write an essay at midnight and receive feedback immediately, but issues of accuracy appeared quite often. Less performance anxiety was a significant advantage. A Nigerian student said that, when you use the computer does not laugh at your pronunciation

Table 6: Thematic Analysis of Learner Experiences- Major Themes and Sub-themes

Major Theme	Representative Sub-themes and Dimensions
Personalization Benefits	Personalized learning - self-directed pace, interest-aligned content, and adaptive challenge levels
Feedback Quality	Instant access to information - quick, specific responses, though occasionally unreliable
Reduced Anxiety	Safe learning environment - private, judgment-free space for practice and experimentation
(Mis)Recognition	Cultural and linguistic limitations - potential biases in language, culture, and representation
Technical Barriers	Technical and accessibility factors - reliance on internet, device availability, and user digital skills
Over-reliance Concerns	Learning balance challenges - overreliance on automated feedback and reduced human engagement

The concepts of linguistic and cultural (mis)recognition were found to be especially topical among the learners with less-represented background. Some African interviewees claimed that AI systems did not often accept their accents in the English language. A Nigerian Yoruba speaking student wrote that it is frustrating: The system believes that there is only one way to speak English, the American or British one. My English is right as well, but it handles it as though I was wrong.

This is a manifestation of recorded prejudice in systems that have been trained on mostly standard varieties (Tatman, 2017). Many experiences were restricted by technical and accessibility factors especially in situations where resources were limited. Particularly, internet connection was a continuous issue among the Nigerian participants. The issues of over-dependence were raised by both learners and teachers.

3.5 Equity, Accessibility and Digital Divide Issues

The analysis of access and usage based on socioeconomic and geographic factors, provided in Table 7, shows the existence of inequalities. Ownership of devices was also widely differentiated- almost all Americans participants had personal computers (94%)

and smartphones (99%), and Nigerians participants had fewer devices as only 67% reported regular computer usage. Internet connectivity was no exception with Korean participants giving the most reliable answers (97% said good or excellent) and Nigerian participants the least reliable ones (42%).

Table 7: Access and Usage Patterns by Socioeconomic and Geographic Factors

Factor	Device Access	Internet Quality	Weekly Usage Hours	Platform Literacy
USA (High SES)	99%	4.7/5	8.3	4.2/5
USA (Low SES)	87%	3.8/5	6.1	3.7/5
S. Korea (High SES)	98%	4.8/5	9.1	4.1/5
S. Korea (Low SES)	94%	4.3/5	7.8	3.9/5
Nigeria (High SES)	91%	3.9/5	6.8	3.8/5
Nigeria (Low SES)	58%	2.7/5	3.9	3.1/5

As it can be shown in Table 7, technology access and usage is influenced by both national and socioeconomic disparities. In both countries, the more socioeconomically a person was, the more access, quality of internet, intensive use, and digital literacy. Nevertheless, the issue of geographic location was more significant as lower-SES Korean students were more advantaged than higher-SES Nigerian students. The intensity of usage was significantly correlated with learning gains ($r=0.34$, $p<0.001$) which is a cause of concern that access barriers can directly be converted into learning disadvantages. There were distressing inequalities in platform literacy. Parental digital literacy was also less correlated with the learner digital literacy ($r=-0.28$, $p<0.01$). Another equity issue in AI systems was language diversity. The majority of commercial AI platforms offered interfaces on a small number of languages and did not provide Yoruba, Igbo, Hausa, or many other languages in our sample, so users had to use tools with all features available in the English language. The language shortcomings of the existing AI systems reproduce and manifest the inequities in power in the world (Cieri et al., 2016).

3.6 Pedagogical Implications

Fig. 5 summarizes the teacher attitude towards AI/ML integration. Personalization capacity (91%), immediate feedback availability (86%), were the most important opportunities mentioned by teachers and their most significant concerns were reduced human interaction (79%), technical challenges (74%), and insufficient preparation (67%).

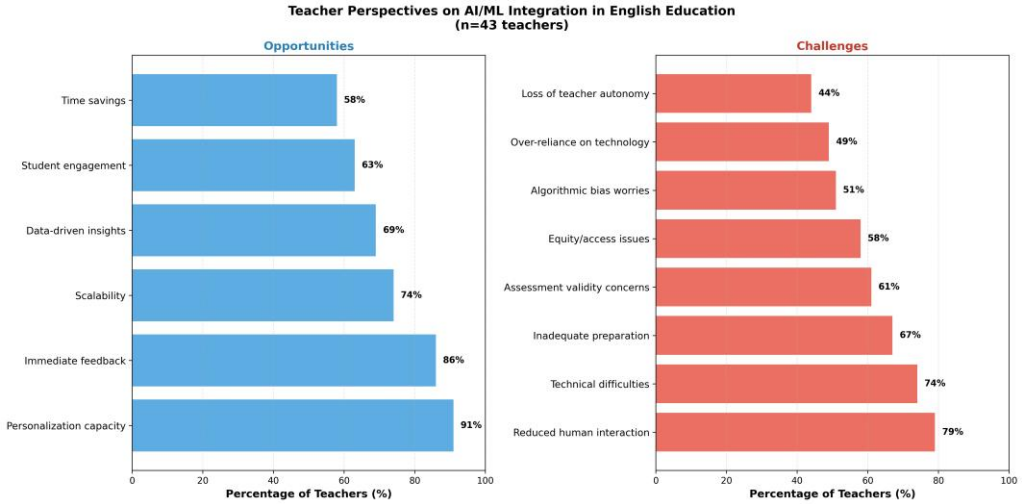

Fig. 5: Teacher views on the integration of AI/ML with opportunities and challenges

Fig. 5 sheds light on an underlying contradiction: educators saw the potential of AI and were concerned with its effects on their jobs and principles of education. This was captured by a Korean teacher: "AI is capable of doing things that I am incapable of, namely, providing all students with instant feedback, practicing at 2am, but it also has a chance of eroding the relationships that build in our interactions, and these I believe are most valuable of all. Roles of a teacher changed in AI-enhanced classrooms. Most of them said they shifted to a primary provider of information to a facilitator who helped students to effectively use AI tools, decoded automated feedback, and offered emotional support. The development of professionals turned out to be the key to integrating AI. Teachers that were well prepared in terms of high preparation levels expressed more confidence and detailed implementation. The most effective implementations made complementary roles and meant AI to do the job that it did best, and teachers to do the work that they did best, high-level thinking, cross-cultural communication and socio-emotional intervention. One of the Nigerian educators explained her practice: I will leave AI to learn grammar and vocabulary- it is patient and systematic- but myself to teach students to think critically about what is happening in the world and speak up.

3.7 Ethical Considerations

Table 8 summarizes ethical issues identified in AI/ML English education implementation. Data privacy and algorithmic bias emerged as the most frequently raised concerns, mentioned by more than half of participants across groups.

Table 8: Ethical Issues Identified in AI/ML English Education Implementation

Ethical Issue	Frequency Mentioned	Severity Rating (1-5 scale)	Stakeholder Concern
Data Privacy/Security	68%	4.2	Learners, Teachers
Algorithmic Bias	54%	4.1	All groups
Cultural Insensitivity	47%	3.8	Learners, Admin
Over-reliance/Dependency	43%	3.6	Teachers
Lack of Transparency	39%	3.9	Teachers, Admin
Linguistic Hegemony	31%	3.7	Teachers, Learners
Commercialization of Ed	28%	3.4	Teachers, Admin

Reduced Human Contact	52%	3.3	Teachers, Learners

Data Privacy issues revolved around large amounts of information that AI platforms gather regarding the performance and behavior of learners. A lot of learners did not get to know the collected data and how this data was utilized. There are research reports about educational data being sold to commercial organizations or accessed by unacceptable individuals (Tsai et al., 2020). The most obvious form of algorithmic bias is the speech recognition and assessment systems. Students who had non standard accents would often complain that their English was marked wrong although it was understood. These biases are based on the training data that is biased towards certain varieties of the English language and can underpin the systematic disadvantage of some groups of learners (Tatman, 2017). The lack of cultural sensitivity was observed in content suggestions. A Nigerian student reported having experienced platform-generated information on culture about Nigeria that portrayed us as primitive and backward. Issues of transparency and explainability were also raised especially in the area of automated assessment. Educators were interested to know why AI systems rated papers in a certain manner yet most of the sites were black boxes, giving out marks without the reasons. Such a lack of transparency weakens trust and does not allow teachers to act professionally (Holstein et al., 2019).

3.8 Best Practices and Framework on implementation

In accordance with our results, we created a model of the successful application of AI/ML in English as a global citizenship (Fig. 6). With this framework, the pedagogical purpose and equity should be at the forefront as a way of determining all the implementation decisions.

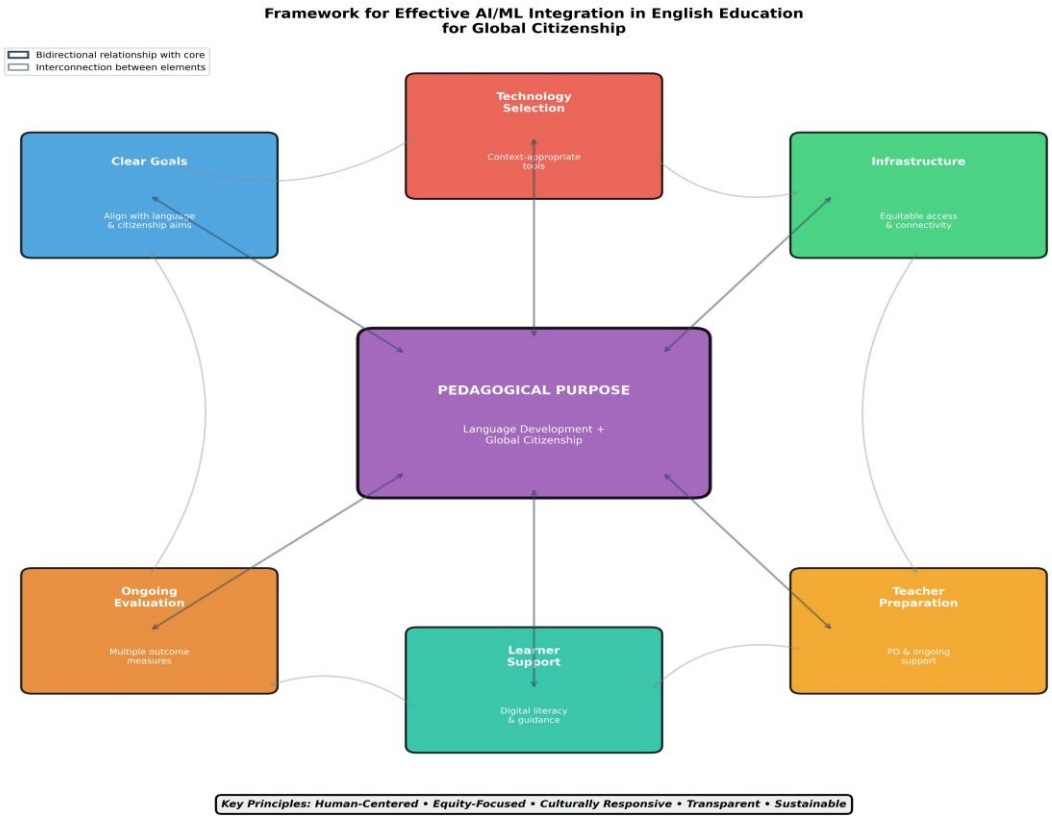

Fig. 6: The model of successful AI/ML application in English teaching to become a global citizen.

Fig. 6 depicts six interdependent components of successful AI integration: clear pedagogical goals aligned with language development and global citizenship; careful choice of technology depending on the objective and the needs of the learners; sufficient infrastructure that would help to create equal opportunities; teacher training; support of digital literacy growth in the learner; and continuous assessment of the results that would consider a variety of outcome dimensions. All these aspects should be considered at the same time because the deficiency in one field destroys the overall efficiency. A number of important success factors were identified: a clear statement of how AI tools align to larger learning objectives; balanced strategies that integrate AI-mediated and human facilitated learning; consideration of equity in the planning phase; long-term professional growth; feedback collection strategies; and ethical principles that govern the use of data. The principles of AI/ML educational tools design are multilingual support (awareness of World Englishes), cultural responsiveness, transparency with the ability to see AI reasoning, flexibility (ability to use the tools in different ways), device-independence, privacy-protective data practices, and human-centered design with the focus on pedagogical effectiveness.

4.0 Conclusion

The paper discussed the potential of applying AI and machine learning technologies to English language education to promote global citizenship skills in multilingual settings and found that there is a great potential and serious challenges to them. We find evidence that intelligently designed AI-enhanced learning can positively affect English proficiency, especially writing, and contribute to the growth of global citizenship skills such as intercultural sensitivity, critical thinking on world problems, and the global sense of belonging. Adaptive learning platforms, intelligent writing feedback systems, and virtual exchange tools all have unique affordances that when applied strategically help to use as a complement to personalized learning, instant detailed feedback, and make cross-cultural connections on scales hard to support by conventional instruction alone. These advantages are however not automatic and universal. The quality of pedagogical integration, teacher preparation, institutional support and intentional focus on equity is very essential to success. Critical obstacles remain in the sphere of access to infrastructure, platform features that discriminate against less-commonly-serviced languages and non-standard forms of English, and a lack of concern regarding the cultural diversity and algorithmic bias, as well as a lack of transparency in the processes of AI-driven decisions. Probably, most importantly, our study highlights that no technology is sufficient to foster global citizenship human relations, critical discourse, moral inquiry, and real-world work with difference are still critical. The most useful AIs are those that complement and not substitute these human aspects and allow teachers to concentrate on higher-order thinking and socio-emotional learning by processing routine instructional tasks more effectively. To make AI a reality in English education, it is impossible to maintain AI potential in English education without technical innovation and continued dedication to equity, linguistic justice, cultural humility, and ensuring that human flourishing, and not technological potential, remains the primary focus of educational effort.

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Declaration

Data availability

Ethical Considerations

Not applicable

All data used in this study will be readily available to the public.

Consent for publication

Not Applicable.

Availability of data and materials

The publisher has the right to make the data public.

Competing interests

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Authors' Contributions

Dr. Itoro Ukpe conceptualized the study, led the theoretical framework, and coordinated data interpretation. Oluwatosin Atala conducted data collection, managed the AI/ML intervention analysis, and supported statistical evaluation. Olu Smith facilitated field implementation across institutions, contributed to qualitative analysis, and assisted in refining the manuscript for publication.