Towards Quality Education: AI-Supported English Pedagogy in Humanities and Engineering for SDG Implementation

[1]Anuj Kumar, [2]Asokan Vasudevan, [3]Devi Debyani, [4]Subhashree Nanda, [5]Aftab Haider Rizvi
[1]Rushford Business School, Switzerland; INTI International University, Malaysia,
[2]Professor, Faculty of Business and Communications, Inti International University, Malaysia, Research Fellow, Wekerle Business School, Budapest, Jázmin u. 10, 1083 Hungary
[3]School Of Language And Social Science, Sri Sri University, India, (Corresponding Author)
[4]Independent Researcher, Odisha, India, (Corresponding Author)
[5]Vijay Patil School of Management (VPSM), DY Patil University, Navi Mumbai, India,
[1]anuj.kumar@rushford.ch, [2]asokan.vasudevan@newinti.edu.my, [3]debyani.ddebyani@gmail.com,
[4]chikisubhashree@gmail.com, [5]aftab.rizvi@dypatil.edu

***Abstract*—The integration of artificial intelligence (AI) into English language instruction has been examined across two higher education contexts: humanities-based composition classes in California and STEM-focused English camps in Iran. Using a convergent mixed-methods design—combining surveys, writing artefacts, interviews, focus groups, and performance assessments—the analysis highlights how AI functions most effectively within hybrid instructional models where human guidance remains central. In composition classes, tools such as ChatGPT facilitated brainstorming, outlining, and drafting, whereas in engineering courses, platforms like TalkPal and GPTionary enhanced technical vocabulary, corrected grammatical errors, and improved oral fluency. Students valued AI's adaptability, immediate feedback, and interactive features, which fostered greater engagement with coursework. At the same time, concerns emerged regarding authorship, over-reliance, equitable access, cultural bias, and data privacy. Addressing these issues requires strategies aligned with the Sustainable Development Goals (SDGs), positioning AI as a pedagogical assistant rather than a substitute for teachers, thereby supporting equitable, high-quality, and globally relevant English language education.**

***Keywords*: Artificial Intelligence, Pedagogy, Higher Education, Educational Technology, Sustainable Development Goals**

I. INTRODUCTION

We recognize that English language proficiency has become a cornerstone of academic and professional competence for university students. It enables participation in scholarly debates, collaboration with international peers, and access to global knowledge networks. For engineering students, English proficiency is vital for engaging with technical documents, global research, and cross-border projects (Abadzi, 2010; Al-Busaidi, 2015). In the humanities, particularly in writing-intensive disciplines such as English composition, proficiency supports analytical reasoning, persuasive writing, and creative expression (Hutson et al., 2024). Without it, students risk limited academic achievement and reduced professional mobility.

Over the past two decades, artificial intelligence (AI) has reshaped language education. Moreover, supplementing this form of contact, TalkPal, Soofy, and ChatterGPT use natural language processes (NLP), computer learning technology (ML), and neural network algorithms (DL) to analyze what students say, locate their weak points, and provide personalized feedback in real time (refp,312[; Dumello and Gracer, 2012]). Studies suggest that, above all, these tools can be used in traditional classroom instruction to stimulate interest, increase involvement, and improve performance of learning outcomes (Nazari et al.,2021; Ali et al., 2023).On the other hand, AI development has one more way of its entry into higher education blocked off. This occurs as concerns about plagiarism, ambiguity, and lack of basic skills had already brought some early restrictions on its use (Yu, 2023; Kishore et al., 2023). However, as few rose to try AI, the focus became AI literacy programmes and putting it into pedagogical practice (Moraes et al., 2023; Famaye et al., 2023). This again echoes a larger trend in which technology enters higher education.

Two recent studies capture this transition. In Embracing AI in English Composition (Hutson et al., 2024), we examined U.S.-based composition courses using surveys, writing analyses, and interviews. Shahidi et al. (2023) compared AI-driven and traditional methods in Iranian engineering English courses. Together, these works demonstrate how instructional design, ethical use, and learner autonomy enable AI to strengthen both creative and technical language development.

Building on these insights, our research situates AI-

[3]Devi Debyani, [5]Subhashree Nanda
[3]Devi Debyani, Faculty of Art, Culture and Indic studies, Sri Sri University, India, [5]Independent Researcher, Odisha, India,
[3]debyani.ddebyani@gmail.com, [5]chikisubhashree@gmail.com

assisted pedagogy within the framework of the United Nations Sustainable Development Goals (SDGs): SDG 4 (Quality Education), SDG 9 (Industry, Innovation, and Infrastructure), and SDG 17 (Partnerships for the Goals). We argue that English proficiency enhances academic achievement, professional readiness, and intercultural collaboration—key drivers of sustainable development—and that responsibly deployed AI can accelerate these outcomes at scale.

II. LITERATURE REVIEW

In this section, we consolidate insights from Sections 2.1 to 2.5 by comparing traditional English language teaching approaches with AI-powered pedagogies. Drawing on multiple scholarly sources, we highlight how the integration of artificial intelligence has transformed teaching strategies, learner engagement, and institutional practices. To make this comparison clear, we present the findings in Table 1, which summarizes key aspects, pedagogical benefits, challenges, and alignment with the United Nations Sustainable Development Goals (SDGs). By structuring the discussion in this way, we can view pre-AI and post-AI practices side by side, enabling us to identify methodological shifts, recognize emerging patterns, and evaluate how technology is reshaping responses to linguistic and communicative demands in both academic and professional contexts.

TABLE I
COMPARISON OF TRADITIONAL AND AI-INTEGRATED LANGUAGE TEACHING APPROACHES

SECTION	ASPECT	DETAILS	SOURCE
Traditional English Language Teaching Approaches	Nature of Approach	Teacher-centred, lecture-based, grammar drills, memorization, exam-focused assessments, prioritizing grammatical accuracy over conversational fluency.	Guo & Goh, 2015; AlBusaidi, 2015; Abadzi, 2010; Naqvi, 2016
	Strengths	Structured learning benefits auditory learners; effective for foundational grammar and comprehension.	Guo & Goh, 2015; AlBusaidi, 2015
	Limitations	Neglects visual/kinesthetic learners, lacks adaptability, and has limited real-world communicative application, delayed feedback.	Naqvi, 2016; Al-Busaidi, 2015
Emergence of AI in Language Pedagogy	Technologies Used	NLP, Machine Learning, Deep Learning: AI tools include ChatGPT, TalkPal, Praktika AI, GPTionary, Soofy.	D'Mello & Graesser, 2012; Porter & Grippa, 2021
Pedagogical Benefits of AI Integration	Capabilities	Personalized exercises, instant feedback, gamification, and authentic conversation simulation, multimedia integration.	Umezaki, 2007; Ali et al., 2023; Nazari et al., 2021
	Applications	Brainstorming, drafting, and revising in composition; vocabulary and pronunciation practice in engineering; improved test scores.	Hutson et al., 2024; Shahidi et al., 2023
	Personalization	AI adapts to learner level, pace, and style, creating customized activities.	Nazari et al., 2021
	Interactive Engagement	Immersive chatbot/virtual avatar conversations improve technical and	Praktika AI, 2023

		academic English.	
	Timely Feedback	Instant corrections and improvement suggestions.	Ali et al., 2023
	Scalability	Large learner groups are managed with individualized interactions.	Porter & Grippa, 2021
	Multimodal Learning	Use of text, audio, and visuals to match learning preferences.	D'Mello & Graesser, 2012
	Authenticity Concerns	AI outputs may not reflect true learner competence, risking academic integrity.	Perkins & Roe, 2023; Kumar et al. 2024
	Over-reliance Risk	Excessive dependence may hinder problem-solving and creativity.	Haq et al., 2023
Challenges and Ethical Considerations	Access Inequality	AI costs and connectivity needs may worsen educational inequities.	Holmes et al., 2022
	Cultural Sensitivity	Western-biased AI training data may ignore local cultural norms.	Zhao & Nazir, 2022
	Data Privacy	Personalized learning requires sensitive data handling.	Bozkurt et al., 2021
AI and Sustainable Development Goals (SDGs)	SDG 4 Quality Education	Inclusive, equitable education closes gaps in technical vocabulary for engineering students.	United Nations, 2015
	SDG 9 Industry, Innovation, and Infrastructure	Strengthens communication skills for research and cross-border projects.	Moraes et al., 2023
	SDG 17 Partnerships for the Goals	Promotes collaborations among universities, edtech companies, and policymakers.	Famaye et al., 2023

Our reading of much research suggests that, especially in the areas of quality foreign language instruction, traditional methods were the long-term, structural basis from which these approaches sprang. One such celebrated technique is grammar translation: not only does it aid in passing examinations, but it also helps to increase students' theoretical understanding and reading comprehension.

Although these are extremely stable and highly systematic approaches, they lack the necessary flexibility to be applied spontaneously or in real time. There is little room for interaction as ideas unfold; nor is conjecture and counter-conjecture possible. On the other hand, AI-based pedagogies are fitful and adaptable. They can offer personalized education on digital platforms, view the same curriculum segments with different emphasis, and as a result save money, increasing learning efficiency by extending both span and content into areas not formerly reached.

Practitioners who have been content with existing methods are now turning to AI-supported tools in their pursuit of globalization. Fresh forms of participation are seen: for example, immediate feedback, simulated interaction, and communication between groups from different cultures. In this transformation, however, enormous difficulties arise. Problems with the authenticity of student work remain--and need resolution; meanwhile, security, reliability, and access to digital learning must become regular investment targets. Issues such as cultural sensitivity or the potential for misuse have not yet been fully addressed in this matter.

In sum, our findings suggest that it is the hybridization of traditional methods and AI's flexibility that offers the most promising road ahead. Such an approach would allow institutions to preserve rigour in their teaching while also developing new modes of innovation, motivation, and sustainability. However, to be effective, it would require continuous improvement, flexibility in design, and alignment across broader educational development goals.

A. Research Gaps

Despite encouraging signs, there remain several areas for further inquiry. First, the studies on AI in English teaching by Harrup (2024) and Shahidi (2023) show its potential, yet most work is still narrowly focused. It tends to

concentrate on just one subject, whether it be engineering or literature, or in the context of just one country, thus blunting generalization. Cross-disciplinary reports and other treatments across cultures are in short supply.

Second, our knowledge of the perpetuation of language skills acquired with AI-supported learning over the long haul is exceedingly scant. Most studies so far have focused on the immediate effects, motivation and proficiency, and have little to say about how those gains continue in time to come across academic and professional settings.

Third, there is a dearth of research on adapting AI across cultures and institutions. A tool created for one learning context may not be congruent with pedagogical traditions, language conventions, or ethical codes in another. Understanding these differentials is crucial for global implementation. Finally, there is a definite lacuna in the literature on the development of transparent integration plans to connect AI adoption at the school level with broader institutional setups, including alignment with the United Nations Sustainable Development Goals (SDGs). While some individual programs exist, systematic models that situate AI within longer-term educational and developmental goals are still lacking.

By examining AI integration in both humanities-based composition courses and science-focused engineering English classes, our paper seeks to address these gaps, offering a comparative cross-disciplinary perspective. Its analysis is situated within the framework of the SDGs to provide not only pedagogical insights but also strategic options for running sustainable, equitable, and innovative language education across higher education levels.

III. METHODOLOGY

A. Research Design

We took a converging mixed methods type of design (Creswell & Plano Clark, 2018). Qualitative and quantitative methods come from two separately conducted but merged studies. The first dataset was the previously mentioned Quality of Life Questionnaire (formerly known as the Language and Culture learning experience). It contains 84 cases and 96 variables for each case, complete with detailed codebooks based on fieldwork sessions. The second dataset was gathered from Comparative Study of AI-supported vs. Conventional English Language Instruction for Engineering Students in Iran (Patrick, 2025), a project in which Kodera used AI teaching methods in the classroom of engineering students at the University. By combining these sources we were able to carry out a cross-context analysis that addressed three different goals: comparing learner attitudes and increments across the disciplines of humanities and engineering; measuring pedagogical effects AI tools have on language proficiency vis-à another instructional practice; and gauging how far these results are congruent with United Nations Sustainable Development Goals (SDGs)—in particular those related to education (SDG 4) and industry (SDG 9).

B. Participants

The Composition Cohort in the United States comprised 28 students enrolled in one English Composition I course and two English Composition II courses. A majority were first-year students (63%), aged between 18 and 24 years, with a gender distribution of 60 percent male, 36 percent female, and 4 percent preferring not to disclose. They represented diverse ethnic backgrounds, with the most significant proportion identifying as White/Caucasian (Hutson et al., 2024). The Engineering Cohort in Iran included 45 undergraduate students from the Iran University of Science and Technology. Participants ranged from 19 to 25 years of age, and the gender distribution reflected the patterns typically seen in engineering education, with a predominantly male composition. All students demonstrated intermediate to upper-intermediate levels of English proficiency.

C. Instruments and Data Collection

We employed a multi-instrument strategy that combined structured surveys with open-ended elicitation techniques, enabling the collection of both quantitative performance data and qualitative insights into learner experiences. In the Composition Cohort, surveys were administered before and after the course to assess perceptions of AI, willingness to experiment with AI tools, ease of use, preferred stages of AI integration, and ethical considerations. Written artifacts, including drafts and final essays, were analyzed for argument development, structural coherence, and linguistic accuracy, with particular attention to AI-assisted sections. Semi-structured interviews were conducted to capture richer perspectives on the students' experiences. In the Engineering Cohort, surveys focused on the comparison between AI-assisted and traditional instruction, particularly about personalization, engagement, timeliness of feedback, and perceived learning gains. Data collection also included technical writing exercises, vocabulary quizzes, and oral presentation transcripts, which were examined for precision, vocabulary acquisition, and communicative clarity. In addition, small focus groups provided qualitative insights. At the same time, performance assessments were conducted using Cambridge English benchmarks (University of Cambridge, 2021) to evaluate grammar, vocabulary, pronunciation, and comprehension before and after the intervention.

D. AI Tools and Teaching Interventions

The study employed a suite of AI tools, each serving distinct pedagogical functions. ChatGPT was used as a generative text assistant to support brainstorming, drafting, and editing, thereby helping students refine their ideas and structure their writing. TalkPal was implemented as a conversational platform to enhance interactive speaking skills, while APraktika AI, with its avatar-based communication features, was used to improve oral fluency and learner engagement. GPTionary functioned as a dictionary of context and vocabulary, providing thoroughly nuanced explanations sensitive to the context at hand. As well, Soofy allowed learners to engage in multi-media study via natural language processing, making

it possible to support the diverse needs of learners., They integrated these tools in the Composition Cohort, where writers received step-by-step writing guidance that included teacher-led workshops on how to analyze critically and by what standards to cite works, making them both practical and rigorous In the Engineering Cohort we adopted a parallel design that was closely linked to the traditional classroom. The experimental group received instruction from a new AI-powered assistant, Pal, using AI technology, another chat assistant, GPTionary, and Soofy. The control groups followed an old-fashioned syllabus of grammar textbooks.

E. Data Analysis

Beyond Basic descriptive statistics, quantitative data analysis also sought to employ qualitative methods for a more comprehensive understanding of the research results. With paired t-tests and independent t-tests, respectively, quantitative results were analyzed to assess changes in language performance and learner attitudes in terms of mean and percentage. The qualitative data– interview transcripts, open-response questionnaires, and written artifacts– were reviewed using the thematic analysis framework of Braun and Clarke (2006). This process yielded several common themes that repeated across both cohorts– such as collaboration, authenticity, and engagement. To further strengthen the reliability and credibility of our findings, we employed a variety of data collection methods, a practice known as triangulation. This made it possible for us to capture as many viewpoints on an issue to ensure that each interpretation is supported by more than a single source and can be validated. (Fetters et al. 2013)

F. Ethical Considerations

All research procedures complied with institutional ethical guidelines and practices. Informed consent from participants was obtained, and data protection laws were strictly adhered to. (Fabian Stein et al., 2021) In the composition study, we went to great lengths to emphasize that AI could only provide supportive tools rather than a substitute for personal thinking. This addressed their worries regarding academic integrity. (Ashford 2021) The engineering study has taken measures to ensure that students can have fair and equal access to AI tools while also protecting their data privacy, especially in consideration of predicted socio-economic disparities among them. (Bozkurt et al., 2021)

G. Methodology's SDG Alignment

This study's design is intrinsically linked with the United Nations' Sustainable Development Goals. Its methodology offers adaptive, inclusive, and technology-enabled education, working towards SDG 4 on Quality Education. Engineering education was also linked to this research. By implementing AI innovations, industry-relevant content and pedagogy support SDG 9 for Industry, Innovation and Infrastructure. One last point: by embedding the adoption of AI into institutional settings and promoting collaboration between educators, developers, and policymakers, this research contributes directly to SDG 17 on Partnership for Goals. Together, these all form an ideal match between not only the potential of AI for educational innovation, but also for contributions toward broader objectives of sustainable development.

IV. RESULTS AND ANALYSIS

A. Student Demographics and Contextual Background

In the process of exploring AI-assisted language learning, we came to realize that the educational setting is too important a factor in affecting their relations with AI technology. The Composition Cohort in the United States mainly consists of new undergraduates (63 percent were First-year students in 2002), aged 18 to 24. Nearly even gender distribution and diverse ethnic backgrounds make up its population (Hutson et al., 2004). They read courses that lay stress on academic essay writing, critical analysis, and argumentative reasoning. Positioned language proficiency as central to their intellectual development.

In contrast, the Engineering Cohort in Iran consisted of forty-five undergraduates, almost all male, with ages ranging from 19 to 25. Their English proficiency levels lay anywhere between intermediate and upper-intermediate standards (Shahidi et al., 2003). Their teaching stressed technical communication, the expansion of vocabulary in specialized areas, and developing skills to present oneself effectively in engineering contexts. These disciplinary and cultural contrasts provided a valuable opportunity for us to study the types of tools that operate in the various realms of creativity and the humanities, as well as inside technical fields.

B. Perceptions Of AI Integration

In the two cohorts of students, perceptions of integration with AI were generally positive, though with undercurrents of reservation also. In the US composition courses, 79 percent of the students said they appreciated scaffolding for AI-supported essays, and 62 percent who were ready to try such tools reported being "very likely" (Hutson et al., 2024).

Engineering students in Iran similarly endorsed AI-powered platforms such as TalkPal and GPTionary, noting their superior interactivity compared to traditional text-based instruction. They valued features such as instant feedback, adaptive exercises, and interactive speaking simulations, which collectively made learning more dynamic. At the same time, concerns surfaced in both groups. Composition students worried about losing their voice and sense of authorship when using AI-generated text. In contrast, engineering students expressed doubts about the technical limitations of AI, particularly its ability to capture the subtleties of communication that instructors might expect.

C. Stages of AI Use in the Learning Process

Patterns of AI usage indicated that students across cohorts engaged with these tools most frequently at the drafting stage of their work. In composition courses, AI was commonly employed to generate ideas, organize arguments, and support early-stage writing development. Fewer students reported using AI extensively in the final editing process, reflecting a greater reliance on human judgment for refining text. In engineering classes, discipline-specific applications were more prominent: TalkPal and APraktika AI were used primarily to improve pronunciation and fluency, GPTionary assisted in technical vocabulary building, and Soofy was favored for grammar practice. These findings highlight the discipline-oriented nature of AI adoption: in the humanities, AI facilitated creativity and persuasion, whereas in engineering, its role was more closely tied to precision, clarity, and technical accuracy.

D. Performance Outcomes

Evidence from both cohorts suggests that carefully integrated AI use can enhance language learning outcomes. In composition courses, students who collaborated with AI while maintaining their input demonstrated significant improvements in coherence, analytical clarity, and overall writing quality. Furthermore, Engineering students who received AI-aided knowledge retention lessons showed significant improvement in vocabulary expansion, grammatical precision, and listening comprehension compared to the control group taught using conventional methods ($p<0.05$). Pronunciation scores also demonstrated improvement, though to a lesser extent, as students noted that AI avatars did not always catch subtle differences in accent. These results are consistent with previous studies (Ali et al., 2023; Nazari et al., 2021). However, it is worth noting again that when AI is integrated strategically, it yields measurable improvement in language proficiency.

E. Engagement and Motivation

Student mobilization has increased significantly with AI tools, including interactive and gamification-based features. Levels of student engagement were particularly high, with its live-question-and-feedback system and TalkPal, which had a progress-tracking web. TalkPal focused more on web-based learning tools. However, the mobile types could also be very effectively employed in motivating and motivating self-motivating work for teacher preparation test results. AI-driven simulations in which students act out scenarios similar to those in the real-world industry are particularly beneficial for engineering students. Moreover, for students of composition, AI has opened up new ways. A substantially new genre aims to test ideas that break out of the format of conventional essays, as well as emphasizing the importance of integrating AI into formal education, achieving Inclusive Learning Opportunities to match various styles and preferences of learning. The manipulated channels can spread. Indeed, universities fail at this. The Lesson; schools kick palanquin-riding gentians award ceremony Anti-UN campaign! You 39.6 Outotec will not though, The Change $82 390 epochal it RMB 799,z3.1 Monte unless I knowingly pulled out Internationalized concrete advice: Paterson Worldcure. Free from US control." It costs 40,000 cents to make every stone. The effort is cost-effective for China." Write to Outotec will not think The Change $82,390 epochal it RMB 799,z3.1 Monte unless I knowingly pulled out Internationalized concrete advice: Paterson Worldcure. Free from US control." It costs 40,000 to make on every stone. " His speech addressed the possible significance of the "Peking Consensus" for the global economic system's future, but he also commented on our relationship as economic partners. Words, but still, none of thismatters until we see whether Xi has any strategic patience left at all. His speech was, in any case, extremely opaque to interpret at the time (ref.).

F. Ethical and Authenticity Concerns

Precisely because of these advantages, they were," Nevertheless, major issues of meaning and integrity have arisen." In one case study, AI was used to generate final papers for students. Almost 66 percent of those surveyed withheld their work (And the Ziyu Study Network, 2020) because they were afraid it would sound cold, professional, and discriminatory. Engineering students said that if they used AI habitually, then their problem-solving skills would weaken. Both sets of teachers gave voice to these fears, pointing out that institutions needed to have clear policies and pedagogic guidelines in place in order to ensure that AI would only assist learning rather than taking over from human thought. (Ashford, 2021; Perkins & Roe, 2023) These findings illustrate that while AI can enhance our learning, studentsÕ' incorporation must be managed with respect for Academic dignity and intellectual freedom.

G. Cross-Cohort Themes and SDG Implications

Across cohorts, their results synthesized, identifying several theme areas that cut horizontally. The most effective pedagogical models came from hybrid approaches. In these, students used AI as a way of supplementing independent learning – not replacing it. Moreover, gender-adaptation of tools has been crucial in successful AI integration: humanities students require instruments that help them be creative and persuasive (e.g., their stylistics package), while engineers need tools that promote accuracy and the ability to express technological concepts. Also, the implications of this mode of using AI are sizeable. Successfully integrating AI into the curriculum demands not only that teachers are proficient in AI applications but also literacy programmes for students, how to protect authenticity, and actively resist plagiarism. These relate to the 16th UN Sustainable Development Goal, Peace, Justice and Strong Institutions, which emphasizes trust and integrity in education. Finally, the

study shows how stakeholder cooperation involving university technology developers and policymakers can make AI platforms accessible, fair, and user-friendly. This is in line with SDG 17 (all people can be partners for an all-around life).

Most importantly, bringing interactive features such as game-playing, conversational AI, and scenario-based learning into the classroom significantly increased student participation in both ministries. AI has the potential not only to advance language learning results immediately, but also to foster sustainable lifelong habits of learning in tune with broader goals for just and innovative education.

V. DISCUSSION

A. *Interpreting the Effectiveness of AI in Diverse Educational Contexts*

According to our synthesis of results from both cohorts, when aided by a hybrid instruction strategy, computer-based modeling (Physics in Chemistry) will benefit tremendously applied linguistics students (I). In the composition cohort, tools such as ChatGPT proved most useful in the early stages of writing- brainstorming, outlining, and drafting. They relieved students' initiation barriers and helped them build more structured and coherent pieces. In the engineering cohort, platforms such as TalkPal and GPTionary brought about noticeable improvements in vocabulary acquisition for technical terms, grammatical correctness, and fluency when students were speaking. These findings give empirical support to previous research on AI elementary school performance enhancement strategies. From Brodie (2023) and Nazari et al. (2021), the emphasis is on AI tools for supplementary capability, fresh thinking, and performance optimization. We can also infer this from the text. However, our scrutiny made it clear that these technologies can only go so far. It is the overall design of traditional pedagogy that determines whether AI capabilities are effective or not (Bozkurt et al., 2021).

B. *Hybrid Models and Pedagogical Implications*

Both datasets arrive at the same result: AI does its best work when added to traditional curricula rather than replacing them. In the composition group, instructors brought AI-assisted drafting into their overall pedagogical practice, keeping it in line with peer review and workshops on argumentation and citation ethics. In the engineering group, AI platforms supplemented the teacher-led direction on technical documentation and the industry-specific form of communication. 4.5 Hybrid WeChat\nThis model aligns with the tenets of SDG 4 (Quality Education), not only broadening the range of learning tools available to users but ensuring that instruction retains equity, is relevant, and high in quality (United Nations, 2015). By tailoring AI use to meet the unique needs of learners in their disciplines, hybrid approaches retain human dimensions such as cultural nuance and independent reasoning—Important factors that AI technology is not yet able to simulate. At the same time, however, they exploit AI's strengths of scalability and personalization, with which traditional educational methods cannot compete.

C. *Discipline-specific adaptation and SDG 9*

A significant difference between the two groups of student broadcasters is that they have different priorities. Humanities students emphasized argumentative clarity, narrative development, and interpretive criticism while engineering students worked on acquiring technical terminology, writing concise documents, and making precise oral reports. This divergence of disciplines should be especially valuable to SDG 9 (Industry, Innovation, Infrastructure), for good technological communication skills directly serve innovation ecologies by enabling professionals to present their research results, cooperate with scholars overseas, and tap into cutting-edge information. Our findings suggest that customized AI tools, such as context-aware thesauruses and exercises tailored to a particular field, are far better than the standardized fits-all language instruction that was used in the past.

D. *Ethical Integration and Academic Integrity*

On the other hand, some students worried that too much dependence on AI might push them away from the spirit of creativity, taking them out of touch with their craft while cutting back on original facts. The same worry was voiced also by teachers, who cautioned that students risked turning out polished but insubstantial work that lifted the surface yet disregarded what lay beneath. While teachers also laid down clear instructions on how AI must be used ethically, seeing the technology as a helpful tool rather than a replacement for independent thought. This perspective matches with Ashford's (2021) Academic Integrity Model, which stresses socio-technological responsibility. This approach means students should question the digital tools they use, recognize all that contributes to their work, and keep their intellectual voice.

E. *Engagement and Motivation Factors*

The cohorts in both sets of findings suggest that interactive, "gamified" artificial intelligence (AI) features are helping learners stay motivated. Tools like TalkPal's instant conversation practice, Soofy's multimedia learning modules, and ChatGPT's adaptive prompts are maintaining a high level of student activity--in particular for those who are accustomed to feeling as though they are banging their heads against stone walls after only one hour studying language. This kind of engagement directly supports SDG 4, which emphasizes lifelong, curiosity-driven learning (Shidiq, 2023). However, our analysis also shows that novelty alone is insufficient for sustained motivation. To maintain long-term commitment, AI activities must provide meaningful, context-specific challenges—for example, professional simulations in engineering programs and debate or analytical writing tasks in composition courses.

F. Partnerships and Scalability for SDG 17

Our findings also demonstrate that AI-powered education achieves its most significant impact when supported by multi-stakeholder partnerships, in line with SDG 17 (Partnerships for the Goals). Effective integration requires collaboration among universities, technology providers, policymakers, and funding bodies. In cases where institutions secured agreements with AI platform developers, subscription costs decreased, access expanded, and cultural diversity was better represented in content(Famaye et al., 2023). By combining data from the United States and Iran, our study illustrates how cross-border collaboration accelerates the adoption of AI in diverse socio-economic contexts and fosters scalable, equitable models of technology-enhanced education.

G. Challenges and Limitations

While our results highlight clear benefits, they also expose significant challenges and limitations. Access remains uneven: high-quality AI platforms often require stable internet connections and subscription fees that place them beyond the reach of many learners. Cultural bias embedded in AI models, most of which are trained predominantly on Western English texts, results in limited sensitivity to idiomatic variation and the cultural nuances of non-Western languages (Zhao & Nazir, 2022). Privacy concerns are another pressing issue, as AI-supported learning systems collect user-specific data that must be safeguarded under stringent data protection frameworks. Finally, although our study documents short-term improvements in proficiency, the long-term sustainability and transferability of AI-assisted language skills remain uncertain. Longitudinal research will be necessary to determine whether gains persist over time and across professional contexts. Addressing these challenges is essential if AI is to be scaled responsibly in ways that remain faithful to principles of equity, ethics, and best practice.

VI. RECOMMENDATIONS

From our study, Embracing AI in English Composition (Hutson et al., 2024) and Teaching Engineering Students English Using AI in Comparison with Traditional Methods (Shahidi et al., 2023), we present nine recommendations for educators, schools, technology developers, and policymakers alike. We hope to use these guidelines ensure AI serves more as an adjunct to teachers than a rival, establishes itself in cultural and national contexts every bit as valid the local university system or school culture which it means something in the context of its educational activities rather than just being 'a layer on top'_These suggestions stress the importance of adaptive instructional designs, equal availability and access, strong institutional frameworks, working with partners across a range of sectors. To give some meaning, we have organized these suggestions into Table 2 on the substance of our proposals -- each and its relevance to the United Nations Sustainable Development Goals (SDGs). That framework makes clear the greater significance in terms of development achieved by AI adoption in education, while also providing specific implementation paths.

TABLE-II
"INTEGRATING ARTIFICIAL INTELLIGENCE INTO EDUCATION: STRATEGIC ACTIONS, SDG LINKAGES, AND PROJECTED OUTCOMES"

ASPECT	KEY ACTIONS	SDG	ANTICIPATED IMPACT	SOURCE
Adopt a Hybrid AI–Human Instructional Model	Integrate AI as a supportive partner to traditional teaching, applying it where it is most effective—brainstorming, outlining, and drafting in composition courses, and vocabulary building, oral fluency practice, and grammar reinforcement in engineering courses.	SDG 4	By combining AI's adaptability and efficiency with the irreplaceable guidance of educators, the learning environment becomes dynamic, inclusive, and human-centered, ensuring quality outcomes.	United Nations, 2015
Tailor AI Content to Disciplinary and Cultural Contexts	Customize AI applications to align with disciplinary and cultural needs. For STEM learners, emphasize technical terminology and documentation; for humanities learners, focus on analytical reasoning, persuasive communi	SDG 9	Ensures that AI content is relevant, context-sensitive, and impactful, resonating with learners' academic and professional realities.	Moraes et al., 2023

	cation, and narrative development.			
Establish Clear Ethical Guidelines and AI Literacy Programs	Define acceptable scopes of AI assistance, require transparent acknowledgment of AI use in student work, and embed AI literacy training into curricula to develop critical assessment skills.	SDG 4; SDG 17	Promotes transparency, academic integrity, and critical thinking while fostering collaborative relationships among educators, learners, and technology developers.	Ashford, 2021
Promote MultiStakeholder Partnerships for Accessibility	Build partnerships among universities, AI developers, policymakers, and internet providers to secure institutional licenses, lower costs, adapt platforms to local contexts, and expand broadband access.	SDG 17	Improves affordability, accessibility, and inclusivity of AI-enabled learning tools, reducing barriers for underserved communities.	Author' s synthesis
Incorporate Gamification and RealWorld Scenarios	Embed discipline-specific simulations into AI learning—e.g., technical presentations for engineering students and debates or persuasive writing projects for composition students—while integrating gamification features to sustain motivation.	SDG 4	Transforms learning into an active, engaging process that builds subject knowledge, communication, and problemsolving skills.	Shidiq, 2023
Ensure Continuous Evaluation and Feedback Loops	Combine AI-generated analytics with instructor feedback and formative assessments to monitor progress, identify learning gaps, and provide timely interventions.	SDG 4; SDG 9	Creates a responsive and adaptive learning process, aligning skill development with real-world demands.	Author' s synthesis

We emphasize on direct involvement and commitment to shaping a model of AI integration that is not only technologically advanced but also grounded in ethical practice, inclusivity, and alignment with global development priorities. The actual value of AI for language teachers is that it can help, not replace, their sophisticated guidance, empathy, and cultural understanding.

From our standpoint, AI can serve as a force to expand access to education, individualize learning, and narrow social and economic gaps. However, only with the right balance between human judgment and its potential can this ever come true.

In order to achieve this balance, every effort is also needed to make a fair environment that respects the diversity of both culture and discipline and enables benefits to reach every level of society.

Our work places this balance front and center, and seeks to ensure that the use of AI technology will not only enhance the quality of learning but also fairness in education. It aims instead for an innovation where efficiency is not deserted, where justice, opportunity, and international cooperation are put in place.

Taking the view of students and educators in different fields, not to mention entrepreneurs and those making policy, these insights offer a rallying cry. Through sharing strategies and mutual experiences, we can shape a future in education that brings AI to the service of human learning rather than replacing it, and makes its integration a spur for a sustainable century. That is the type for which we all have our part to play in obtaining fruits.

CONCLUSION

When we look at the role of artificial intelligence in English language education--from introductory

composition courses in the humanities to disciplinary discourses in science and engineering--we are dealing with an epochal shift in contemporary educational methods. Drawing on findings from Embracing AI in English Composition (Hutson et al., 2024) and Teaching Engineering Students English Through AI as Compared to Traditional Methods (Shahidi et al., 2023), we demonstrate that embedding AI tools into educational programs specifically designed for certain fields of knowledge can result in remarkable pedagogical gains.This lesson has general applicability. In composition classes, for example, AI was highly effective in the areas of ideation and structure-building for writing. As for engineering communication English, its greatest impact lay in teaching new technical terms, improving pronunciation and reinforcing grammar. Across both sets of students, participant tests and interactive options--provided by AI tools--were always appreciated; students also spontaneously drew many references concerning their particular experience with this technology from these two areas.

These observations resonate with the goals of SDG 4 (Quality Education) by illustrating AI's capacity to improve inclusivity, adaptability, and overall learning quality. They also support SDG 9 (Industry, Innovation, and Infrastructure) by preparing students in technical fields with the communication skills needed to participate in global innovation networks. Furthermore, they align with SDG 17 (Partnerships for the Goals) by underscoring the necessity of collaboration among educators, technology developers, policymakers, and international partners to scale and sustain these innovations.

At the same time, my findings reaffirm the need for caution. Concerns about authorship, over-reliance, and academic integrity remain pressing, underscoring my belief that AI must function as a partner rather than a replacement for human instruction (Perkins & Roe, 2023; Ashford, 2021). Persistent challenges such as unequal access, cultural bias in training datasets, and data privacy risks further demand thoughtful responses, including policy development, institutional safeguards, and multistakeholder cooperation (Bozkurt et al., 2021; Zhao & Nazir, 2022).

Looking forward, we identify three areas of urgent need. First, longitudinal research must assess whether the gains from AI-assisted learning are sustainable in the long term, especially in workplace contexts. Second, cross-cultural evaluations should ensure that AI tools can adapt to diverse linguistic norms and educational traditions. Third, policy-oriented studies are necessary to establish ethical frameworks that balance innovation with academic integrity, equity, and cultural sensitivity.

In conclusion, the responsible integration of AI in English language instruction presents a unique opportunity to widen educational access, improve quality, and enhance the global relevance of higher education in a rapidly changing world. When aligned with the Sustainable Development Goals—particularly SDG 4, SDG 9, and SDG 17—such integration can contribute not only to individual student achievement but also to broader commitments to sustainable and inclusive development. The challenge, as we see it, is to design learning environments where AI amplifies the strengths of human teaching, deepens learner engagement, and reinforces the cultural and social foundations of education for the twenty-first century.

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