

Navigating the Complexities and Potentials of Language Learning Machines in EFL Contexts: A Multidimensional Analysis

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Abstract. This research integrates Large Language Models (LLMs), specifically GPT-4, into English as a Foreign Language (EFL) teaching and learning, at the intersection of technology and language pedagogy. Rapid advancements in Artificial Intelligence (AI) have introduced LLMs with significant linguistic capabilities, making them valuable for EFL education. However, there is a dearth of comprehensive theoretical analysis on their implementation, creating a gap in the current knowledge. This study aims to address this gap and provide new insights in educational technology. The researcher conducts a thorough analysis of existing literature on LLMs and EFL education to uncover potential benefits and challenges of LLM integration. The methodology involves theoretical analysis and a systematic literature review. Findings indicate that LLMs have the potential to enhance EFL education, promoting interactive and personalized learning. Nevertheless, challenges exist. Recognizing the implications of these findings for EFL pedagogy, further investigation into practical implementation and impact assessments is encouraged to inform future policies and practices.

Keywords: Artificial Intelligence, EFL Education, Educational Technology, Large Language Models, Language Pedagogy

1 Introduction

Situated at the intriguing confluence of language instruction and emergent technologies, one observes Large Language Models (LLMs), particularly GPT-4, standing on the threshold of integration into the English as a Foreign Language (EFL) milieu[1]–[3]. Large Language Models (LLMs) represent sophisticated computational architectures designed to interpret, generate, and manipulate natural language through data-driven algorithms[4]. Inhabiting the cutting edge of artificial intelligence research, these models, exemplified by GPT-4, can process and synthesise enormous datasets to perform many linguistic tasks, ranging from textual comprehension to generating contextually coherent discourse[5]. In an era where the frontier of possibilities continually broadens in rhythm with technological leaps, a rigorous examination of these intersecting paths becomes more than a mere intellectual exercise. It morphs into an academic imperative. This interplay between LLMs and EFL teaching demands scholarly attention, presenting as it does a fertile field for exploration, ripe with potential yet not without complexities. For instance, LLMs can support personalised vocabulary learning[6], co-creation between humans and AI[1], and project-based learning[7] in EFL contexts.

Simultaneously, this exciting conjunction of artificial intelligence and language education creates a dynamic, multidimensional academic space. On the one hand, it offers a spectrum of opportunities that may redefine traditional EFL instruction paradigms[8]. On the other hand, it brings forth a series of questions, challenges, and ethical considerations that academia must grapple with[1], [8]. Thus, far from being a cursory glance at a trend, this investigation emerges as a pivotal inquiry into an evolving education domain. It heralds a voyage into the depths of this novel EFL-LLM ecosystem, offering a panoramic view that aims to unravel the intricate tapestry of technology-enhanced language learning[1], [6].

As artificial intelligence matures and enters the sunlight of academic recognition, the inception of Large Language Models (LLMs) echoes in the academic landscape. In their digital cognition, these mechanisms wield power to generate text remarkably akin to human composition. An interrogation of these digital entities, probing into their mechanisms, abilities, and confines, casts a beam of understanding on their prospective employment in language education. Models of such nature, GPT-4 being a prime exemplar, flaunt robust language proficiencies, hinting at potential integration into English as a Foreign Language (EFL) environments. They propose a future vision where personalised and interactive learning becomes less of an exception and more of a norm [1], [8].

Nevertheless, amidst the optimism surrounding LLMs, one should tread with caution. Integrating these models into EFL pedagogy unveils itself as a complex dance, far from a straightforward march. It ushers in a spectrum of questions, each querying the potential implications, advantages, and challenges associated with their use [9]. While the allure of LLMs is undeniable, the academic community finds itself at the helm of a journey that requires careful navigation. A balanced perspective is called for, acknowledging the transformative potential of LLMs while remaining vigilant of the potential pitfalls and challenges. It is a narrative that must be carefully unfolded to ensure that this good confluence of AI and EFL instruction truly serves the cause of effective learning. While existing studies have illuminated various aspects of technology-enhanced EFL teaching, a paucity of research rigorously interrogates the efficacies and intricacies of Language Learning Machines (LLMs) within this specific context. This study endeavours to perform a multidimensional analysis of LLMs' potential to transform EFL education, examining their capacity for personalisation and interactivity and interrogating the attendant ethical and technical challenges.

An expedition into the realm of Large Language Models (LLMs) within the context of English as a Foreign Language (EFL) education constitutes the crux of this scholarly endeavour. This investigation aims to illuminate, with academic rigour, the myriad possibilities and implications that LLMs portend for this area of pedagogy. Central to this quest is the guiding query: How could LLMs transform EFL learning landscapes? What potential barriers may manifest with their integration into these settings, and how might they affect learners and educators?[10]–[12]

Delving into these questions carries profound import. It paves the path towards generating fresh insights about a topic rapidly gaining academic and practical significance. As a result, this research contributes to the dynamic corpus of knowledge encompassed within educational technology. It extends beyond a mere academic exercise and emerges as an illuminating exploration through the labyrinth of existing literature, coupled with a thorough theoretical analysis[13], [14]. Such an approach propels this research beyond existing confines towards discovering novel perspectives and insights.

Thus, the endeavour seeks to unmask new layers of understanding and to contour the future trajectory of EFL education. The journey is navigated with an academic compass, guided by the lights of empirical research and theoretical investigation, paving the way towards an enriched understanding of the intricate dance between artificial intelligence and language education. This investigation is not an end but a stepping stone towards an ever-evolving academic dialogue that continually shapes and reshapes the contours of EFL instruction in an era marked by rapid technological progress[8].

2 Methodology

Charting our course into this scholarly exploration, the researcher enlists the strategic tool of an argumentative review, a robust lens that allows for a profound critique of extant literature. This chosen methodology equips us to transcend the confines of summarising earlier findings. It bestows the license to delve, inquire, and debate. Indeed, it enables us to traverse the labyrinth of academic contributions and discover the treasure hidden within: the nuances that elude cursory glances. The argumentative review, with its critical evaluative focus, aids in unmasking connections, inconsistencies, and lacunae in our understanding[15], [16].

Simultaneously, this approach facilitates the construction of a comprehensive theoretical analysis. Armed with arguments and counterarguments, the researcher thoroughly explores the potential inherent in LLMs within the landscape of EFL instruction. It is this meticulous analysis that forms the backbone of our research. Here, the researcher transitions from a merely exploratory stance to active engagement with the literature, challenging established notions and proposing fresh perspectives. Through this journey, the researcher aims to foster deeper insights, adding a new chapter to the unfolding narrative of EFL education in an era of rapidly advancing artificial intelligence technologies[17], [18].

In pursuing academic richness, the researcher has charted a methodical procedure for including germane literature in this review. This process is not one to be taken lightly. Instead, it calls for a keen eye for detail and stringent selectivity. In determining inclusion, criteria hinge on three cardinal pillars: pertinence to our central research queries, the authoritative weight of the source, and the piece's contribution to the composite understanding of LLMs within the sphere of EFL pedagogy. Such rigorous selectivity is crucial in establishing the foundation upon which our arguments rest and thrive.

The works thus selected are diverse, each thread spun from varying contexts, methodologies, and findings. Together, these threads interweave into a rich tapestry that narrates the unfolding story of LLMs and their potential applications in EFL contexts. This assemblage of various studies is not merely to create an archive of knowledge but to ensure that the resulting review is comprehensive, equitably weighted, and enlightening. With this meticulously curated corpus of literature, the researcher can embark on our exploratory journey, navigating the terrain of LLMs in EFL with confidence, informed insight, and an invigorated sense of discovery.

In this systematic review, the locus of investigation encompasses a carefully curated array of 48 peer-reviewed articles spanning the academic years 2015 to 2023. Articles were sourced from databases known for their academic rigour, such as JSTOR, PubMed, and the IEEE Xplore Digital Library. Upon selection, a three-stage coding process was implemented. During the first stage, cursory coding allowed for eliminating tangential studies. Subsequently, thematic coding was undertaken, categorising papers according to the aspects they investigated, be it learner

autonomy, pedagogical shifts, or technological challenges. The final stage involved in-depth coding for more nuanced themes within those broad categories.

Embarking on this voyage of scholarly investigation, the researcher delves into the labyrinthine corridors of pre-existing knowledge, navigating through the vast array of literature and theoretical perspectives surrounding LLMs and EFL education. This task, while rigorous, is akin to the dissection of an intricate fabric, where each thread - each study - is carefully examined, its key propositions scrutinised, and its confines questioned [19]–[22]. Unravelling the research and theoretical conjecture threads allows us to explore their texture, strength, and how they contribute to the larger fabric of understanding concerning LLMs and EFL pedagogy.

Simultaneously, our journey fostered a robust comprehension of theoretical frameworks, furnishing us with tools for nuanced interpretation and informed discernment. This combination of literature review and theoretical exploration paves the way towards apprehending how LLMs might transfigure the terrain of EFL education. The researcher strives to weave a coherent and insightful narrative that transcends mere summary by integrating perspectives drawn from an expansive pantheon of sources. Our endeavour seeks to breathe life into this vibrant confluence of technology and language pedagogy, and in doing so, the researcher hopes to provide fresh, illuminating insights into this promising yet relatively uncharted intersection.

3 Results

An immersive journey through selected literature's dense tapestry has allowed intriguing patterns to the surface. On the one hand, a considerable degree of consensus has materialised, converging upon the portrayal of LLMs as a potential boon for EFL pedagogy [1], [23], [24]. However, within this harmonious chorus of affirmation, the researcher finds a symphony of divergent voices, each carrying nuanced differences in interpretation and emphasis. These varying perspectives engender fertile ground for an enriched exploration of the potential role of LLMs within EFL contexts.

As the researcher journeys through the terrain of EFL contexts, the potential benefits of integrating LLMs become salient. Resounding across this landscape are the harmonious notes of personalisation and interactivity [25], [26]. These features of LLMs, resonating like a well-played symphony, foster a conducive environment for learner autonomy and motivation [27], [28]. Each learner becomes the composer of their learning journey, guided by these models' dynamic, responsive nature. Indeed, LLMs usher in a paradigm where individualised instruction and active engagement in learning experiences flourish, showing a tantalising glimpse of an enriched educational landscape.

Nevertheless, as is often the case with emerging technologies, the potential of LLMs casts a dual shadow that juxtaposes much promise against a backdrop of potential challenges [29], [30]. The literature surfaces critical concerns - technical difficulties that may mar the seamless integration of LLMs, ethical considerations surrounding their use, and the danger of fostering an unhealthy dependence on these models [31], [32]. Though formidable, these thorny issues are not insurmountable obstacles but waypoints, signalling the need for careful, considered navigation.

Though this apparent dichotomy may initially appear as a contradiction, it offers a balanced, comprehensive view of the LLM-EFL intersection. While the allure of LLMs in enhancing EFL education is undeniable, their potential pitfalls are equally significant [33]. A nuanced understanding of this balance forms the bedrock of successful integration, underscoring the

necessity for careful, thoughtful consideration to fully harness the potential of LLMs while circumnavigating the potential drawbacks [34]–[36]. In navigating this delicate balance, the researcher sets the stage for a transformative shift in EFL pedagogy.

Interpreting and evaluating the unearthed findings, akin to ascending a mountain of scholastic stature, unveils a nuanced panorama. One where LLMs, in their intriguing complexity, emerge as a formidable force poised to revolutionise EFL teaching. As the researcher stands at this summit of knowledge, observing the landscape below, he witnesses an educational environment in the throes of transformation. An environment pulsating with potential, ripe for innovation, and brimming with opportunities for learner engagement. Through this lens, the capacity of LLMs to reshape pedagogical practices becomes a visible contour on the horizon, a beacon signalling the dawn of a new era in EFL education.

However, as the researcher traverses this academic terrain, the complexities LLMs introduce cannot be sidestepped. These complexities, emerging like a cluster of formidable boulders, cannot be treated lightly, nor should they cast a shadow over the path forward. They stand not as insurmountable barriers but as intriguing challenges to navigate skillfully. It is worth noting that these challenges do not undermine the potential of LLMs; instead, they illuminate the path, signalling the necessity for thoughtful, intentional implementation. In acknowledging these potential obstacles, the researcher paves the way for a journey of exploration that is both aware and prepared.

The call for continued exploration echoes louder in the intriguing interplay of promises and pitfalls. It invites academia, researchers, and educators to delve deeper into the uncharted waters of this fascinating realm: LLM-enhanced EFL education. This call extends beyond a mere suggestion, transforming into a compelling imperative. It draws us into a new chapter of investigation that promises to unfold novel insights into the harmonious coexistence of LLMs and EFL pedagogy in the quest to harness the transformative potential of this integration. Though riddled with questions and challenges, this journey holds the promise of intellectual growth, paving the way for the evolution of our understanding of EFL instruction in the age of artificial intelligence.

Table 1. The LLM-EFL Nexus: A Thematic Mapping of Benefits, Cautions, and Imperatives for Educators

Key Themes	Consensus in Literature	Divergent Views	What Educators Should Know
Personalization & Interactivity	Agreement on fostering learner autonomy and motivation.	Some argue the extent to which this is effective.	Personalisation options may require instructional design efforts.
Technical Integration	LLMs offer dynamic, responsive learning environments.	Concerns about seamless technical integration.	Teacher training for technology integration is essential.
Ethical Implications	LLMs have transformative educational potential.	Raises questions about data privacy and dependency.	Ethical guidelines and safeguards are needed.

Key Themes	Consensus in Literature	Divergent Views	What Educators Should Know
Future of EFL Pedagogy	Aids in innovation and learner engagement.	Not without complexities and challenges.	Continual professional development and research are critical for effective LLM use.
Potential Pitfalls	Offers a balanced, comprehensive view.	Concerns about over-reliance and pitfalls.	Awareness and strategic planning can mitigate potential pitfalls.

4 Discussion

Attention and discernment become critical attributes as the researcher navigates the intricate landscape of Large Language Models' (LLMs) implications for English as a Foreign Language (EFL) pedagogy. Illuminated by research findings, LLMs emerge as reservoirs of potential when harnessed with judicious intent [2], [37]. Their capacity to enhance personalised and interactive learning experiences becomes an undeniable feature of this scholarly vista [38], [39]. These models present a unique avenue for learners, an opportunity to probe the intricacies of language within a dynamic, responsive milieu that echoes the cadence of human interaction. Herein lies an enticing prospect: transforming a conventional classroom into a vibrant, interactive arena powered by artificial intelligence.

Turning our gaze towards educators, the researcher encounters another intriguing prospect. LLMs, in their remarkable cognitive complexity, can serve as steadfast allies. They offer an invaluable aid in generating diverse, engaging, and contextually appropriate learning materials [40], [40]–[42]. This relationship is symbiotic, a synergy that balances the creative instincts of educators with the computational prowess of LLMs. Nevertheless, it is worth noting that the role of LLMs extends beyond mere assistance; they contribute to a subtle metamorphosis of pedagogical practices, igniting new possibilities and facilitating innovative strategies.

Despite these good insights, it is crucial to remember that the intent of LLM integration within EFL pedagogy is not to replace the educator [38], [43], [44]. Such a notion would undermine the profound importance of human interaction and empathy, integral aspects of effective teaching beyond the reach of even the most sophisticated artificial constructs. Instead, LLMs are envisaged as partners in pedagogy, enriching the teaching process and amplifying educators' efforts rather than superseding them [45], [46]. Their role is to augment teaching, to become facilitators rather than usurpers of the educators' role [47].

This nuanced perspective on LLMs in EFL instruction paints a vibrant picture of classroom transformation. A classroom where technology and pedagogy coalesce, fostering more interactive, adaptive, and personalised learning spaces [48], [49]. A classroom where the traditional roles of teachers and learners are not erased but enriched. A classroom where the possibilities for learner engagement are not constrained by the limitations of traditional pedagogical practices but are expanded by the integration of advanced computational mechanisms. As such, exploring LLMs' role within EFL pedagogy becomes an academic pursuit and an intriguing journey into the future of language education.

Embarking on this academic journey to incorporate Large Language Models (LLMs) within English as a Foreign Language (EFL) pedagogy is tantalising. However, it is akin to navigating a complex labyrinth, a path marked with unexpected twists and turns. Technical conundrums, privacy-related apprehensions, and potential propensity towards over-dependence on artificial constructs loom as formidable obstacles on this exploratory trajectory [30], [50], [51]. As the researcher treads this path, it becomes abundantly clear that this academic expedition, replete with its promise and perils, necessitates the development of nuanced strategies to circumvent these hurdles for the successful integration of LLMs within EFL settings.

Central to these strategies is the cultivation of professional proficiency among educators [52]–[54]. Developing their capacity to manage effectively and optimally utilise LLMs is paramount. Such professional development may encompass understanding the mechanics of these models, developing competencies to leverage their language capabilities, and troubleshooting potential technical glitches. This upskilling of educators is integral to ensuring that LLMs serve their intended purpose: to amplify teaching efficacy and enrich the learning experience, thereby transforming the EFL landscape.

A parallel pursuit accompanying this endeavour is formulating clear guidelines on ethical usage. Privacy considerations and the responsible use of artificial intelligence within the educational sphere warrant careful deliberation [55], [56]. Creating comprehensive guidelines becomes an essential guardrail, ensuring that while the researcher leverages the potential of LLMs, he does not compromise ethical standards. This requires a concerted effort from stakeholders across academia, fostering a discourse on ethical AI in education and shaping a responsible path forward.

Finally, the journey of integrating LLMs into EFL education warrants a balanced perspective. One must ensure that technology complements rather than supersedes traditional pedagogical methodologies. Striking this balance is crucial. It entails recognising and respecting the irreplaceable value of human-led instruction while embracing the transformative potential of technology. LLMs are instruments of enhancement, not replacement. They can illuminate uncharted pedagogical pathways, stimulate innovative teaching approaches, and foster a dynamic, interactive learning milieu. However, they cannot and should not obscure the timeless value of traditional teaching methods and human interaction in education. Hence, a judicious interplay of tradition, innovation, human pedagogy, and machine intelligence becomes the cornerstone of this academic exploration.

The emergence of Large Language Models (LLMs) is a beacon illuminating a novel trajectory in English as a Foreign Language (EFL) pedagogy. It signifies a paradigm shift, a harbinger of a progressive era replete with transformative innovations and boundless possibilities. These AI-powered models, with their potential to redefine the contours of language learning, usher in a dynamic epoch of metamorphosis, altering the traditional pedagogical landscape in manifold ways.

However, traversing this transformative journey is akin to exploring uncharted terrains with daunting challenges and inherent uncertainties. It is a path fraught with technical obstacles and ethical dilemmas, marking an intricate labyrinth requiring careful navigation. However, amidst these challenges, the allure of the promise held by LLMs remains potent and virtually impossible to ignore. Their potential to forge new pathways towards personalised, autonomous, and experiential learning is too tantalising to be overlooked.

LLMs, with their potential to mimic human-like interactions, present a novel framework for language learning. They proffer a dynamic environment where learners can interact, explore, and grow. This, in turn, could catalyse the metamorphosis of traditional EFL classrooms into dynamic ecosystems of engaged learning. This transformative potential underscores the importance of LLMs within contemporary language pedagogy, marking them as powerful instruments that could potentially recast the EFL landscape.

Consequently, it is incumbent upon academicians, researchers, and educators to maintain a relentless pursuit of knowledge in this burgeoning domain. Continuing the exploration of this novel horizon, demystifying the complexities, and harnessing the potential of LLMs to amplify EFL education becomes imperative. It is a call to adapt to these changes, actively shape the narrative, push boundaries, and redefine pedagogical norms for a future where technology and pedagogy harmoniously coalesce.

Table 2. A Comprehensive Exploration of Large Language Models in EFL Pedagogy: Benefits, Challenges, and Practical Applications

Aspect	Description	Practical Implications
Benefits		
Personalisation	LLMs can adapt to individual learner needs, tailoring content to specific vocabularies and language proficiency levels.	Teachers can use LLMs to supplement standard curricula, offering differentiated instruction with minimal additional workload.
Interactivity	Allows for dynamic, human-like engagement, thus enhancing the learning experience.	Creates an environment conducive to real-world language application, aiding in developing communicative competencies.
Resource Efficiency	LLMs can quickly generate many learning materials, such as quizzes, dialogues, and sample essays.	Reduces lesson-planning time and allows for accessible materials customisation to suit particular class needs.
Challenges		
Technical Difficulties	Network latency, software glitches, and hardware inadequacies can disrupt the learning experience.	Educators must be trained to troubleshoot or have alternative plans to circumvent such interruptions.
Ethical Concerns	Potential misuse of technology privacy issues.	Establish clear guidelines on the ethical utilisation of LLMs, including data protection measures.
Over-reliance	Risk of deemphasising traditional methods, thereby making learners too dependent on technology.	Employ LLMs as complementary to, not a substitute for, conventional teaching methods.
Suggested Uses		

Aspect	Description	Practical Implications
Vocabulary Building	Utilise LLMs for generating contextual sentences and quizzes.	Can serve as homework assignments or in-class activities.
Dialogue Practices	LLMs can simulate conversation partners for speaking practice.	Use in language labs or as a supplementary practice outside of regular class hours.
Project-based Learning	Use LLMs to scaffold research, generate questions, and assess student-generated content quality.	Incorporate into long-term assignments where students must interact with the LLM for research and refinement of their projects.

5 Conclusion

Drawing together strands of inquiry, it becomes clear that LLMs emerge as a potent catalyst in EFL education. Their ability to foster interactive and personalised learning experiences illustrates a leap towards innovation in language teaching. However, the accompanying challenges that surface underline the need for cautious optimism. It becomes crucial to balance the evident potential of LLMs with a thoughtful consideration of the intricacies they introduce.

Bridging the gap between present understanding and future possibilities is essential to this exploration. Identified challenges signal the need for further research, specifically aimed at devising strategies to navigate the complexities of LLM integration. Additionally, implications extend to EFL practitioners, urging them to learn to effectively and ethically employ LLMs. This endeavour, it is hoped, will contribute to an enriched body of knowledge that can guide future practices in EFL teaching and learning.

Examining LLMs in EFL contexts requires academia to delve further into this fascinating intersection of technology and pedagogy. Continued exploration and investigation are warranted, each new finding shedding more light on harnessing the potential of LLMs while mitigating pitfalls. As the researcher stands at the threshold of a promising new epoch in EFL education, our collective responsibility is to foster a culture of inquiry, insight, and innovation, ever pushing the boundaries of what is possible in language teaching and learning.

6 References

- [1] M. Perkins, "Academic Integrity considerations of AI Large Language Models in the post-pandemic era: ChatGPT and beyond," *Journal of University Teaching & Learning Practice*, vol. 20, no. 2, p. 07, 2023, doi: 10.53761/1.20.02.07.
- [2] F. R. %J I. J. of E. Baskara and Learning, "Integrating ChatGPT into EFL writing instruction: Benefits and challenges," vol. 5, no. 1, pp. 44–55, 2023.
- [3] F. Baskara and F. %J I. Mukarto, "Exploring the Implications of ChatGPT for Language Learning in Higher Education," vol. 7, no. 2, pp. 343–358, 2023.
- [4] W. X. Zhao *et al.*, "A survey of large language models," *arXiv preprint arXiv:2303.18223*, 2023.

- [5] J. Yang *et al.*, "Harnessing the power of llms in practice: A survey on chatgpt and beyond," *arXiv preprint arXiv:2304.13712*, 2023.
- [6] D. Zou, M. Wang, H. Xie, G. Cheng, F. L. Wang, and L.-K. Lee, "A comparative study on linguistic theories for modeling EFL learners: facilitating personalised vocabulary learning via task recommendations," *Interactive Learning Environments*, vol. 29, no. 2, pp. 270–282, 2021, doi: 10.1080/10494820.2020.1789178.
- [7] P. D. Thuan, "Project-based learning: From theory to EFL classroom practice," in *Proceedings of the 6th International OpenTESOL Conference*, 2018.
- [8] C. Rios-Campos *et al.*, "Artificial Intelligence and Education," *South Florida Journal of Development*, vol. 4, no. 2, pp. 641–655, 2023, doi: 10.46932/sfjdv4n2-001.
- [9] N. Novianti, A. Thomas, and V. To, "Addressing challenges in the practice of critical literacy in EFL classrooms: A new framework," 2020, doi: 10.17509/ijal.v10i1.25049.
- [10] Z. Zainuddin, H. Habiburrahim, S. Muluk, and C. M. Keumala, "How do students become self-directed learners in the EFL flipped-class pedagogy? A study in higher education," *Indonesian Journal of Applied Linguistics*, vol. 8, no. 3, pp. 678–690, 2019, doi: 10.17509/ijal.v8i3.15270.
- [11] J. Roos and H. Nicholas, "Using young learners' language environments for EFL learning: Ways of working with linguistic landscapes," *AILA Review*, vol. 32, no. 1, pp. 91–111, 2019, doi: 10.1075/aila.00022.roo.
- [12] N. Srichanyachon, "EFL Learners' Perceptions of Using LMS.," *Turkish Online Journal of Educational Technology-TOJET*, vol. 13, no. 4, pp. 30–35, 2014.
- [13] C. Costa, M. Hammond, and S. Younie, *Theorising technology in education: An introduction*, vol. 28, no. 4. Taylor & Francis, 2019, pp. 395–399.
- [14] A. Granić, "Educational technology adoption: a systematic review," *Education and Information Technologies*, vol. 27, no. 7, pp. 9725–9744, 2022, doi: 10.1007/s10639-022-10951-7.
- [15] H. F. Moed, J. Bar-Ilan, and G. Halevi, "A new methodology for comparing Google Scholar and Scopus," *Journal of informetrics*, vol. 10, no. 2, pp. 533–551, 2016, doi: 10.1016/j.joi.2016.04.017.
- [16] N. R. Haddaway, A. M. Collins, D. Coughlin, and S. Kirk, "The role of Google Scholar in evidence reviews and its applicability to grey literature searching," *PloS one*, vol. 10, no. 9, p. e0138237, 2015, doi: 10.1371/journal.pone.0138237.
- [17] R. Jiang, "How does artificial intelligence empower EFL teaching and learning nowadays? A review on artificial intelligence in the EFL context," *Frontiers in Psychology*, vol. 13, p. 1049401, 2022, doi: 10.3389/fpsyg.2022.1049401.
- [18] G. Dizon and J. M. Gayed, "Examining the Impact of Grammarly on the Quality of Mobile L2 Writing.," *jalt call Journal*, vol. 17, no. 2, pp. 74–92, 2021, doi: 10.29140/jaltcall.v17n2.336.
- [19] S. Borg, *Teacher cognition and language education: Research and practice*. Bloomsbury Publishing, 2015.
- [20] R. Ellis, *Understanding second language acquisition 2nd edition*. Oxford university press, 2015.
- [21] A. Mackey and S. M. Gass, *Second language research: Methodology and design*. Routledge, 2015.
- [22] M. Long, *Second language acquisition and task-based language teaching*. John Wiley & Sons, 2014.

- [23] O. Koraisi, "Teaching English in the age of AI: Embracing ChatGPT to optimise EFL materials and assessment," *Language Education and Technology*, vol. 3, no. 1, 2023.
- [24] J. Al-Garaady and M. Mahyoob, "ChatGPT's Capabilities in Spotting and Analysing Writing Errors Experienced by EFL Learners," *Arab World English Journals, Special Issue on CALL*, no. 9, 2023.
- [25] E. Bonner, R. Lege, and E. Frazier, "LARGE LANGUAGE MODEL-BASED ARTIFICIAL INTELLIGENCE IN THE LANGUAGE CLASSROOM: PRACTICAL IDEAS FOR TEACHING.," *Teaching English with Technology*, vol. 23, no. 1, 2023, doi: 10.56297/BKAM1691/WIEO1749.
- [26] W. C. H. Hong, "The impact of ChatGPT on foreign language teaching and learning: opportunities in education and research," *Journal of Educational Technology and Innovation*, vol. 5, no. 1, 2023.
- [27] M. Firat, "How chat GPT can transform autodidactic experiences and open education," *Department of Distance Education, Open Education Faculty, Anadolu Unive*, 2023.
- [28] N. P. O. Agustini, "Examining the Role of ChatGPT as a Learning tool in Promoting Students' English Language Learning Autonomy relevant to Kurikulum Merdeka Belajar," *Edukasia: Jurnal Pendidikan Dan Pembelajaran*, vol. 4, no. 2, pp. 921–934, 2023.
- [29] E. Opara, A. Mfon-Ette Theresa, and T. C. Aduke, "ChatGPT for teaching, learning and research: Prospects and challenges," *Opara Emmanuel Chinonso, Adalikwu Mfon-Ette Theresa, Tolorunleke Caroline Aduke (2023). ChatGPT for Teaching, Learning and Research: Prospects and Challenges. Glob Acad J Humanit Soc Sci*, vol. 5, 2023.
- [30] K. Fuchs, "Exploring the opportunities and challenges of NLP models in higher education: is Chat GPT a blessing or a curse?," in *Frontiers in Education*, Frontiers, 2023, p. 1166682.
- [31] L. Yan *et al.*, "Practical and ethical challenges of large language models in education: A systematic scoping review," *British Journal of Educational Technology*, 2023, doi: 10.1111/bjet.13370.
- [32] J. Zhou, H. Müller, A. Holzinger, and F. Chen, "Ethical ChatGPT: Concerns, challenges, and commandments," *arXiv preprint arXiv:2305.10646*, 2023.
- [33] J. Qadir, "Engineering Education in the Era of ChatGPT: Promise and Pitfalls of Generative AI for Education," 2022.
- [34] X. Zhai, "ChatGPT User Experience: Implications for Education," *Available at SSRN 4312418*, 2022.
- [35] S. Elbanna and L. Armstrong, "Exploring the integration of ChatGPT in education: adapting for the future," *Management & Sustainability: An Arab Review*, 2023, doi: 10.1108/MSAR-03-2023-0016.
- [36] S. Rawas, "ChatGPT: Empowering lifelong learning in the digital age of higher education," *Education and Information Technologies*, pp. 1–14, 2023.
- [37] A. M. Mohamed, "Exploring the potential of an AI-based Chatbot (ChatGPT) in enhancing English as a Foreign Language (EFL) teaching: perceptions of EFL Faculty Members," *Education and Information Technologies*, pp. 1–23, 2023.
- [38] E. Kasneci *et al.*, "ChatGPT for good? On opportunities and challenges of large language models for education," 2023, doi: 10.35542/osf.io/5er8f.
- [39] T. Kwon, "Interfaces for Personalised Language Learning with Generative Language Models," Columbia University, 2023.

- [40] C. K. Lo, "What is the impact of ChatGPT on education? A rapid review of the literature," *Education Sciences*, vol. 13, no. 4, p. 410, 2023, doi: 10.3390/educsci13040410.
- [41] S. Sarsa, P. Denny, A. Hellas, and J. Leinonen, "Automatic generation of programming exercises and code explanations using large language models," in *Proceedings of the 2022 ACM Conference on International Computing Education Research-Volume 1*, 2022, pp. 27–43.
- [42] S. Biswas, "Role of Chat GPT in Education," *Available at SSRN 4369981*, 2023.
- [43] A. M. A. Ausat, B. Massang, M. Efendi, N. Nofirman, and Y. Riady, "Can chat GPT replace the role of the teacher in the classroom: A fundamental analysis," *Journal on Education*, vol. 5, no. 4, pp. 16100–16106, 2023.
- [44] D. Baidoo-Anu and L. Owusu Ansah, "Education in the Era of Generative Artificial Intelligence (AI): Understanding the Potential Benefits of ChatGPT in Promoting Teaching and Learning," *Available at SSRN 4337484*, 2023.
- [45] J. Whalen and C. Mouza, "ChatGPT: Challenges, Opportunities, and Implications for Teacher Education," *Contemporary Issues in Technology and Teacher Education*, vol. 23, no. 1, pp. 1–23, 2023.
- [46] M. Farrokhnia, S. K. Banihashem, O. Noroozi, and A. Wals, "A SWOT analysis of ChatGPT: Implications for educational practice and research," *Innovations in Education and Teaching International*, pp. 1–15, 2023, doi: 10.1080/14703297.2023.2195846.
- [47] C. H. Thu, H. C. Bang, and L. Cao, "Integrating ChatGPT into Online Education System in Vietnam: Opportunities and Challenges," 2023, doi: 10.35542/osf.io/hqyut.
- [48] M. E. Dogan, T. Goru Dogan, and A. Bozkurt, "The use of artificial intelligence (AI) in online learning and distance education processes: A systematic review of empirical studies," *Applied Sciences*, vol. 13, no. 5, p. 3056, 2023, doi: 10.3390/app13053056.
- [49] W. S. Sayed *et al.*, "AI-based adaptive personalised content presentation and exercises navigation for an effective and engaging E-learning platform," *Multimedia Tools and Applications*, vol. 82, no. 3, pp. 3303–3333, 2023, doi: 10.1007/s11042-022-13076-8.
- [50] J. J. Huallpa, "Exploring the ethical considerations of using Chat GPT in university education," *Periodicals of Engineering and Natural Sciences*, vol. 11, no. 4, pp. 105–115, 2023.
- [51] M. Halaweh, "ChatGPT in education: Strategies for responsible implementation," 2023, doi: 10.30935/cedtech/13036.
- [52] S. Atlas, "ChatGPT for Higher Education and Professional Development: A Guide to Conversational AI," 2023.
- [53] S. Grassini, "Shaping the future of education: exploring the potential and consequences of AI and ChatGPT in educational settings," *Education Sciences*, vol. 13, no. 7, p. 692, 2023, doi: 10.3390/educsci13070692.
- [54] J. Jeon and S. Lee, "Large language models in education: A focus on the complementary relationship between human teachers and ChatGPT," *Education and Information Technologies*, pp. 1–20, 2023.
- [55] Z. Xiao, "Educational response in the era of ChatGPT: Prohibition or change," *Geographical Research Bulletin*, vol. 2, pp. 116–119, 2023.
- [56] J. E. Chukwuere, "ChatGPT: The game changer for higher education institutions," *Jozac Academic Voice*, vol. 3, pp. 22–27, 2023.