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Pedagogical Approaches Integrated with Technologies in Foreign Language Education Pre- and Post-COVID-19

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ABSTRACT

This qualitative research aims to delve into the impact of these disruptions, such as COVID-19 and advances in Artificial Intelligence, on foreign language teaching and learning, with a specific focus on English. The methodology involved analysing 5,000 research articles published pre- and post-COVID-19 from 2015 to 2024, including 132 empirical and case studies and 20 review papers. The key findings were: 1) Information and communication have significantly contributed to changes in English education through applications of popular digital tools such as Web 2.0, interactive whiteboards, mobile devices, virtual reality, digital games, social media, and generative AI. These tools support the acquisition of English skills; 2) There have been shifts in the relationship between teachers, pedagogy, and learners due to technological interventions in both formal and informal settings; 3) The COVID-19 pandemic transformed the research on the EFL landscape and led to the emergent remote teaching, with profound implications for technology-integrated teaching and learning strategies. The conclusions drawn were that digital tools play an integral role in English language pedagogy, and their use has reshaped the relationships between teachers and learners. The pandemic accelerated this digital transformation and remote teaching is likely to be an important part of English language education going forward.

Keywords: Digital Technologies, English Learning and Teaching, Information and Communication Technologies (ICT), Pedagogy, Technology-Integrated EFL

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1. Introduction

We are experiencing a life with some disruptions created by emergent pandemics as well as technologies. Education, an essential aspect of our life, is no exception. Globalisation is increasingly widespread across the world; foreign language education has become in vogue. If an individual wants to communicate with someone from a different country, s(h)e would like to speak a foreign language both understand. Therefore, foreign language education, taught by both native and non-native people, is a discipline requiring easier access to teachers from every corner of the world while having many learners eager to find suitable language teachers whenever they want to start a learning journey. Thus, Information and Communication Technologies (ICT), or Digital Technologies, have been necessary for the development of language-related subjects. For many years, many terms have been used to describe language learning through technology. Computer-assisted language learning (CALL), as Warschauer et Healey (1998) claimed, was used for language teaching as early as the 1960s. Around 2000, CALL studied teaching practices integrated with computers in the classroom (Warschauer, 1998) and dealt with network-based language teaching (Warschauer et Kern, 1999). These terms indicate characteristics of technologies that are integrated with language learning, such as a quick connection between teachers and learners at a far distance. It is noted that since 2000, we have undergone innovations in information technology, such as shifting Web1.0 to

Web2.0, while advancements have also reshaped the education landscape, from classrooms, schools, and homes to everywhere.

In EFL classrooms, the utilisation of Web 2.0 has shown that technologies change language education (Akyüz, 2015). As Prinsky (2001) referred to young people in the 21st century as the " Net Generation", with the rise of computers and the internet, educators and researchers have developed an interest in mobile learning. Virtual Reality (VR, AR and MxR) has also gained popularity as research works on educational game development and examines their effectiveness in the learning process. These technologies were discussed in language education research, as well as their advantages and different acceptance levels from teachers and students (Maria, 2015; Thomas, 2017). Notably, as educators and learners had to teach and learn in an online environment during COVID-19, a growing amount of research focuses on digital language learning and teaching. Interaction between teachers and students presents challenges as well as the potential for practical strategies in technology-embedded environments (Mumford & Dikilitas.,2020; Iqbal, Niazi & Hafeez.,2021; Carbajal-Carrera., 2021). Moreover, since the publicity of ChatGPT released by OpenAI along with the appearance of other generative AI tools, teachers and educators have expressed their concerns for ethical implications while also being interested in AI's potential as an efficient educational tool for language education (Kasneci et al., 2023).

English has been widely used in transcultural communications. Many countries have adopted English as a target foreign language or a second language for citizens to learn. Because of this, a lot of research has been conducted. The research aims to gain insights into current technology-assisted language learning from English teaching and learning as its research accounts for most publications and the most researched foreign language in the academia of language education. The goal of the study is to find out actual changes in research focus on technology-integrated language education impacted by COVID-19 and advances in AI. It also wants to reveal more implications to help facilitate language education as well as increase the effectiveness of language learning.

1.1. Literature Review

Current studies have shown tremendous interest in the integration of technologies with language learning. Many researchers have looked at different types of technology tools used for language learning and have delved into their impacts on teachers and learners and the process of acquisition of language skills. Shadiev et Yang (2020) reviewed studies from 2014 and 2019 on technologies used for language education in different foreign languages; Başar et al. (2022) reviewed content analysis on research related to technology-integrated foreign language teaching and learning, investigating a wide range of technologies and their user experience among students.

The most researched technologies included computer-assisted and mobile-assisted language learning, online language learning, visual reality (VR, AR and MxR), digital games, social media, robots and artificial intelligence. Research indicates that integrating technology into language education helps support the language learning process. As the research intends to gain more insights into the utilisation of technology in English teaching and learning, it is crucial to understand how educators implement teaching via technologies and whether learners can acquire the English language as effectively as with traditional instruction methods from teachers. The research sorted review papers in the last ten years between 2015 and the first half of 2024 on combining technology with English education, categorising three main researched objectives (learners, teachers and digital tools) and examining their frequency in research publications.

1.1.1. CALL and MALL

From the perspective of the pedagogy of EFL, the adoption of technology should consider instruction, learners' interactions and the effectiveness of language acquisition. Reviewed Studies tended to research specific digital tools applied in classrooms as well as technology-integration teaching and learning methods for a particular English skill. Research reveals that changes in teaching methods featured multimodality (Lim et al., 2022), encouraging students to actively participate in class activities and promoting learners' learning engagement (Iqbal et al., 2021). Bui (2022) reviewed 20 empirical studies on EFL teachers ʾintegration of technologies and gave three types of practice: skill-based, rule-based and function-based practices. Some researchers also pointed out that many teachers integrate digital technologies into traditional instruction, an existing opinion among educators.

Corpus-based language teaching and learning has been advocated by researchers. As a new instruction method, the corpus can engage learners in contexts to learn English words and phrases, although this method presents challenges in its implementation (Lusta et al., 2023). Kaur et al. (2023) conducted a meta-analysis of language learning adaptive systems from 2011-2021, discussing the animated pedagogical agents and intelligent tutoring systems to assist learners' language learning based on different hardware and software. In addition, studies on English writing and reading using various digital tools are also gaining attention. Karatay (2024) selected 40 articles from 2013 and 2021 based on grounded theory to investigate the use of automated writing evaluation in second and foreign language learning in the classrooms, indicating the importance of a combination of AWE and teacher feedback approaches in writing instruction. Oakley (2024) examined 86 peer-reviewed articles between 2003 and 2023 on teaching English Reading using Digital technologies at the level of primary and secondary Education. She mentioned that flashcards, drills practice and reading- and- reading-and-listening models were studied in reading fluency teaching strategies. CALL is a broad term used for generalising various types of information technologies when researchers found that foreign language education involved more than one digital tool. Some studies have focused on a specific technology and its impacts on language teaching and learning.

Mobile-assisted language learning, featuring ubiquitous technologies, including smartphones and tablets, has been popular among foreign language studies. Bozdoğan (2015) reviewed research conducted between 2010 and 2015 on m-learning, showing a skill-based tendency in MALL. Besides, MALL research pays particular attention to different settings, including in-and-out-of-classroom learning. Klimova (2021) gave a detailed review of university students using mobile apps to learn English out of class from 2017 to 2020, pointing out the necessity of the involvement of educators in the design of vocabulary app design for end users. MALL and its empirical pedagogical case studies could be found in the exploration of EFL skills acquisition and app designs, even though there is a limited number of meta-analyses on MALL and its pedagogical implications.

1.1.2. Online

Internet and information technology played a crucial role in online learning during the Pandemic (Li,2021). Educators and students face challenges in adapting to online Education (Almahasees et al., 2021). Tao et al. (2022) reviewed 25 articles about online English teaching and learning in terms of 3 categories: learners learning languages online, teachers teaching language online and Institutional and administrative issues, highlighting the importance of collaborative learning and learner-centred strategies in the online language class. Sun et al. (2024) reviewed the impacts of blended learning on Business English majors in China between 2012 and 2022 in the backdrop of the pandemic, indicating a profound influence of online

learning. Related research has gone deep into different web-based tools, such as MOOCs, Learning Management Systems, video conferencing, and virtual classrooms, which could be found in empirical and case studies.

1.1.3. VR, Digital Games, Social Media, and AI

Edutainment, a term defined as a feature of the technology implementation of modern forms of entertainment in Education (Anikina & Yakimenko, 2015), has raised attention in mobile learning, game-based learning, and VR learning (Frohberg & Schwabe, 2009). It could be seen from the reviews that many researchers are willing to study games and VR tools in both formal and informal educational settings. Acquah & Katz (2020) reviewed empirical studies on digital game-based second language learning for K-12 students between 2015 and 2020, revealing games' high interactivity and application in language skills learning. Researchers found positive effects of game-based language learning, so they discussed the potential roles of digital games in formal education settings, encouraging more pedagogy consideration to be designed with games for implementation in classroom activities. Luo et al. (2024) reviewed research papers on reality (VR, AR and MR) applications in English language education between 2013 and 2023, finding that xR tools could have positive effects on learners' speaking and writing skills. It is important to note that the research summarised application scenarios in instructions about specific implementation. Other studies on VR language learning also emphasised the effectiveness of VR applications in speaking skill development. Yudintseva (2023) reviewed 34 studies on English-speaking communication skills between 2015 and 2022, presenting theoretical frameworks in second language acquisitions that include cognitive constructivism, social constructivism, and situated learning with a combination of VR design rationale for facilitating English language learning. Immersion and interaction of VR language learning were discussed in current reviews.

Social media is a popular tool for learners to practice their English. According to the review research (Lee & Roger, 2023), teachers and students, during the COVID-19, often used social media tools, such as WhatsApp and Facebook, for their communication and learning, and a study investigated the innovative method, so-called a "language teaching in the digital wild"(Aslan,E. 2023). Pikhart and Botezat (2021) analysed research papers between 2010 and 2020 about the impacts of social media on second language acquisition. The research found its effectiveness in task-based language teaching and improvement of oral communication skills.

AI, the latest trendy term, has caught educators' and researchers' attention since the invention of intelligent tutoring systems. The recent global popularity is attributed to ChatGPT, a Generative chatbot released by OpenAI. Though Generative AI tools were published a year ago, some researchers have had an interest in their application in Education as well as language education, as AI-related technologies, such as machine learning and neural networks, have been examined in education practices. Law (2024) reviewed studies between 2017 and 2023 about whether AI tools can facilitate language learning. The research listed a summary of empirical studies that discussed the integration of AI features with pedagogical approaches and learning strategies. Du and Daniel (2024) reviewed 24 studies about chatbots' effectiveness on spoken English skills between 2017 and 2023, revealing their positive impact on pronunciation correction through practising speaking with AI bots. However, research related to AI in Education requires further research and an in-depth understanding of its scale and trend of advancement.

1.2. Research Questions

Previous reviews have provided insights into technological tools and their impacts on EFL. However, this research is concerned about what changes contributed to these impacts. If there hadn't been COVID-19, would the landscape of technology integration with EFL be the same as it is today? It is necessary to gain more findings in comparison with the related studies before and after COVID-19 so that we can find a more transparent view of the development of language learning integrated with technologies, guiding more future studies. Therefore, based on the purposes of research, this study attempts to answer the following questions:

- What are the changes in research interests before and after COVID-19?
- What are the impacts of digital technologies on foreign language pedagogical approaches?

2. Method

2.1. Data Selection

The methodology adheres to Preferred Reporting Items in Systematic Reviews and Meta-analysis (PRISMA) Guideline (Page et al, 2021) conducting data search and selection (Figure 1).

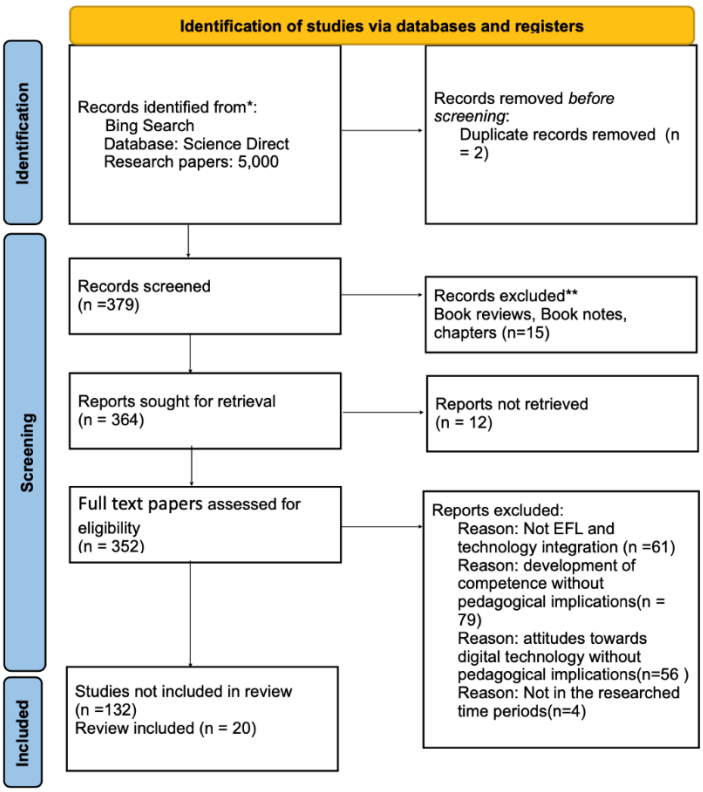


Figure 1. PRISMA Flow Diagram

This research conducted a qualitative review process: a. Identify the scope of review; b. Conduct initial screening; c. Set the criteria of inclusion and exclusion; d. Evaluate research using content analysis, and e. Presenting selection results.

The research identified the focus of the literature search is studies on technologies integrated into EFL and EFL pedagogy and instruction related to technology application between 2015 and 2024. Review studies (publication year and researched period) should be published later

than 2015. The research uses the Science Direct database and keywords: foreign language learning AND digital technology; foreign language teaching AND digital technology; language OR technology; language instruction OR technology, screening and selecting relevant 10,000 papers.

Through initial screening, the research chose 5,000 papers including technology, EFL, second language acquisition between 2015 and 2024 and reviews conducted at least including a year later than 2015. The initial screening eventually obtained 351research articles.

Inclusion and exclusion criteria were established. The research carefully screened each paper's abstract and full text to make decisions. There are 132 research papers and 20 reviews meeting the inclusion criteria.

The **inclusion criteria**:

- The research is about teaching methods instruction activities, and instruction design,
- The research is about learners' performance and engagement in the teaching and learning process,
- The research is about EFL,
- The research was published between 2015 and 2024, and review research was examined containing a year later than 2015.

The **exclusion criteria**:

- The research is about the development of teachers' technological competence without pedagogical implications,
- The research is about learners' behaviours and attitudes towards technology embedded in language learning without pedagogical implications and conclusions about learning strategies,
- The research was published earlier than 2015, and reviews contain research out of the range of time,
- The research is not EFL.

2.2. Data Analysis

After screening full texts, data were extracted from all selected papers in tables for further analysis, including study objectives, researched technologies, research language skill(s), education levels, published year, author, paper name, abstract, research methods and technology-integrated models. In order to compare 2015-2019 (Pre-COVID-19) with 2020-2024 (COVID-19 and post-era), the research divided the whole dataset into two sub-datasets. Next, the research used Tableau for visualising the difference in two periods in terms of extracted data, and then all selected papers' abstracts were edited as a format of table for VOSviewer software (https://www.vosviewer.com) analysing its text co-occurrence network to gain insights into research network relationship and Tableau (https://www.tableau.com) visualising proportional components of coded data for comparison.

3. Findings

3.1. Q1: What Are the Changes in Related Research Interests Before and After COVID-19?

From perspective of types of studied technologies, it shows that a more diverse trend (Figure 2). It is noticeable that social media has gained more attention because during the lockdown, teachers and students relied on social media tools for communication. After the end of the pandemic, researchers found that social media can improve learners' speaking skills.

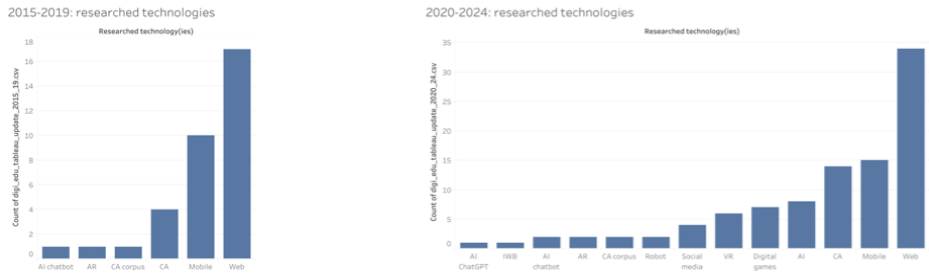


Figure 2. The group of both bar charts compared two periods of researched technologies in all coded data, revealing that more technologies were applied in EFL, particularly social media, AI and digital games

From the perspective of education levels (Figure 3), it is clear to see that before COVID-19, most research on corpus-based language learning, mobile learning and online learning was at higher education level. One possible explanation is that it was easier to conduct interviews and experiments at universities. There were fewer studies on K-12 education and informal learning settings in the domain of mobile learning and online learning. After COVID-19, on the other hand, the scope of research on the application of digital tools in K-12 Education has widely spread to VR, digital games, social media, robots and AI. More research has shown concern about technology integration with formal Education at all levels. The data result could be interpreted as the impact of distance learning during the pandemic: the internet dominantly became the mediator for teaching and learning at all levels of formal Education.

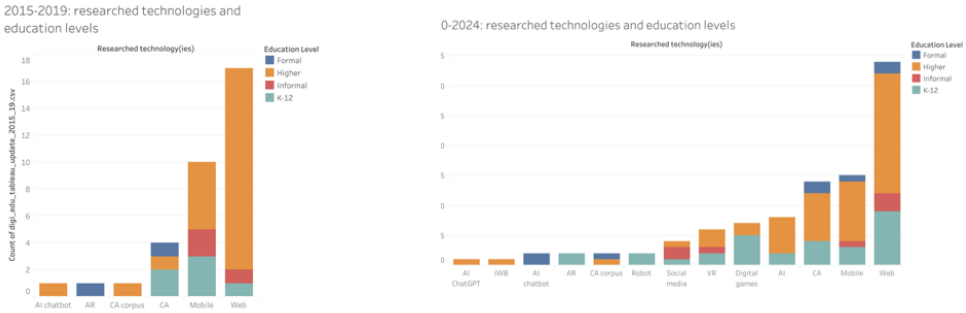


Figure 3. From the data, the study identified four education levels: formal, higher, informal, and K-12, and utilised stack bars to display the proportions of researched technologies in these four education levels

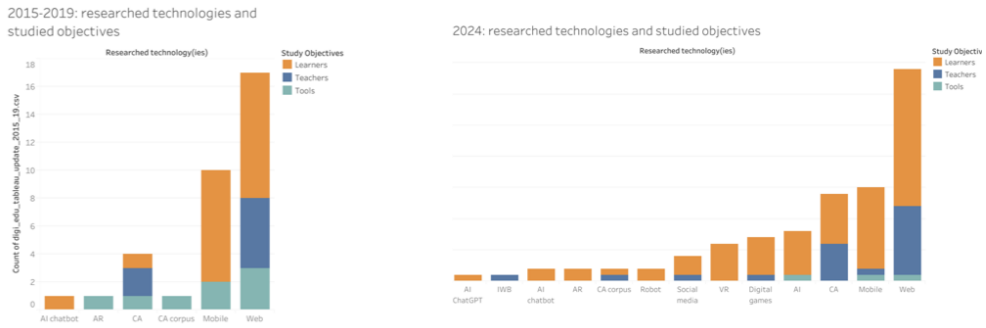


Figure 4. Stack bars were used to represent the proportions of research technologies that contain learners, teachers, and digital tools by sorting out three studied objectives from the data

When EFL research was conducted during these five years (2020-2024), many problems were discerned from ERT, such as online engagement, the need for socialising and self-directed learning without the presence of teachers. As it is presented in Figure 4, learners have always been the centre of research, and more studies were on tools compared with those after COVID-19. A possible explanation is that teachers and learners struggled with a virtual environment, emphasizing the use of tools over researching them. The period saw extensive use of experiments, interviews, and questionnaires, generating a significant amount of data around the globe during and after the lockdown period.

From the perspective of researched English language skills, more research on speaking, writing and vocabulary (Figure 5), and most of studies have been interested in online pedagogical activities instructed by teachers since 2020 while digital tool-learner interaction has also been explored in all research skills. Since the COVID-19, research on EFL technology integration shows a more diverse and insightful trend.

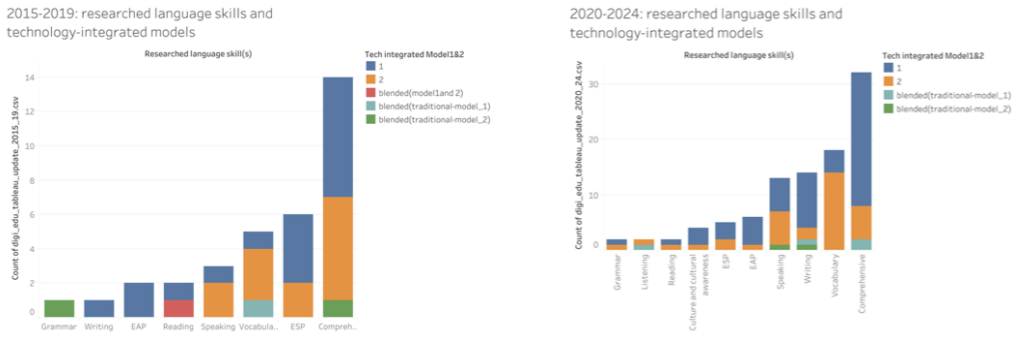


Figure 5. According to the framework of interaction models (see Figure 6), the study sorted out specific researched language skills and categorised them into four technology-integrated interaction models

3.2. Q2: What Are the Impacts of Digital Technologies on foreign Language Pedagogical Approaches? (Figure 6)

Based on the literature review results, this study summarises traditional classroom and technology integrated EFL classroom between teachers, pedagogy, and learners. Based on the interaction property of SLA (Loewen & Sato, 2018), the research categorises 3 types of interaction. Traditionally, teachers design activities for interactions with students in the classroom. Learners interact with teachers through specific didactic activities.

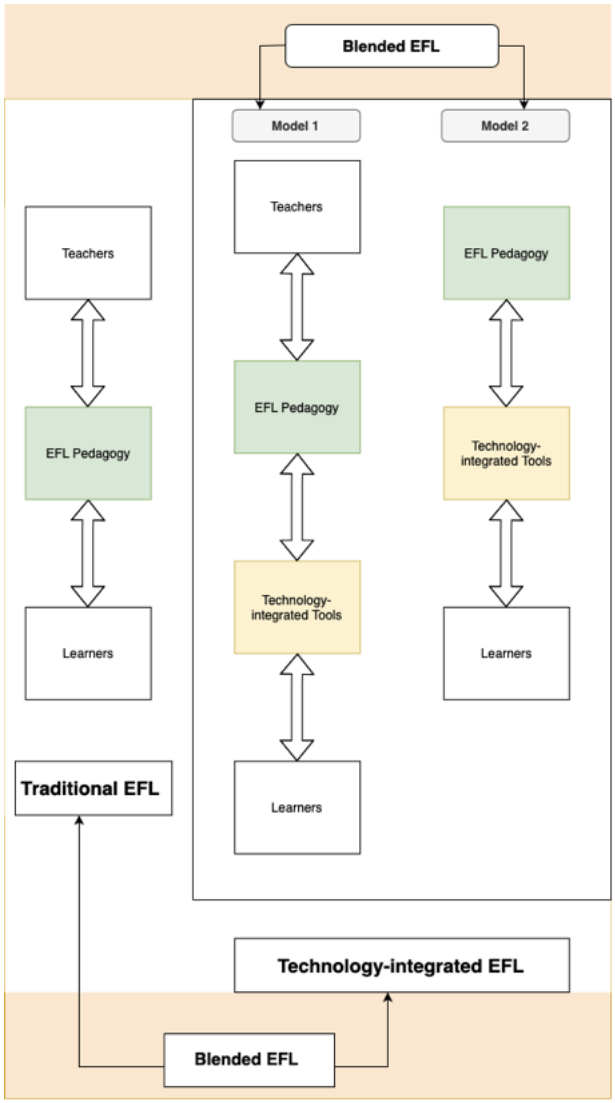


Figure 6. Impacts of Technologies on EFL Environment

As technologies become an integral part of interaction process, teachers are using technology tools to implement their and interact with learners. On the one hand, in traditional EFL classrooms, students engage with the teaching activities to achieve their learning goals. On the other hand, in environments where technology is integrated, the instruction directly involves students in various settings without the traditional barriers. Moreover, as research shows, English learning can be self-directed with digital tools. This has led to a new way of learning that only involves students and technology tools, designed to fulfil learning goals without the presence of teachers. Although educators and teachers are invisible in the technology integration learning process, their teaching strategies and content are embedded in digital tools, such as Duolingo. Digital games, mobile, and VR apps have been used to foster learning that centers around learners.

In addition, studies have shown an interest in a blended approach for EFL learning. Teachers conduct classes in person while also engaging with learners online in real time, incorporating activities into both virtual and traditional classrooms. Some research also shows interest in a mix of EFL teaching methods that integrate technology, both with and without the presence of teachers. The summary of all reviewed papers in this research indicates that technology has significantly transformed the traditional teaching and learning environments but also created new ones.

4. Discussion

4.1. Traditional and Innovative Pedagogical Approaches

Some research has frequently mentioned the importance of innovation in EFL pedagogy integrated with technology, even though, in many interviews and questionnaires, participants hold the view that they simply shift an on-site classroom to a virtual environment. Contrary to the viewpoint, the study reveals more research on the development of new methods for digital education.

Some research has explored educational theories' integration with technology. Firstly, researchers use theories to explain technology-integrated EFL and design teaching and learning activities, such as situated learning for embodied language writing classes online (Park & Park, 2022); grounded theory as a methodology to collect data from Automatic Writing Evaluation (Karatay, 2024). Cognition-related theories, such as multimedia learning, dual coding theory and Involvement Load Hypothesis (Huang & Hew, 2023), were studied to improve the language learning experience in different English skills. The research found that consideration around pedagogy in the digital environment has gained more attention. Second language acquisition and social-linguistic theory have been discussed in the context of technology integration language learning.

Secondly, because of the features of various digital tools, researchers interested in digital games and VR and AR apps have discussed pedagogical designs for different tools. research is related to cognitive load, immersion, and engagement. The research observed engagement persisting for more extended periods after the pandemic outbreak.

Thirdly, although direct theories on technology-based teaching methods are scarce, the research found that certain empirical studies' exploration of the effectiveness of technology integration for specific EFL skill acquisition provides new insights, which have extended pre-COVID-19-related research.

Last but not least, innovation in research methods, especially in Machine Learning and AI, is noteworthy. As the adoption of technology in EFL has expanded after COVID-19, further research is expected to deepen our understanding of EFL teachers and learners. This includes improving innovative teaching methods, exploring the psychological processes involved in technology-based learning, and examining how technology alters behavior (Wu et al., 2024).

4.2. Artificial Intelligence and Foreign Language Education

Artificial Intelligence has become a trend over the past ten years. The research on AI started as early as 1964 and 1966 (Zhai & Wibowo, 2023). Zhai (2023) reviewed studies on using AI dialogue systems to improve EFL between 2013 and 2022. Machine Learning and Natural Language Processing intrigued educators for their application in educational activities (Ahmad K et al., 2020; Tang et al., 2022; Tlili A. et al., 2023). Particularly after the publicity of ChatGPT, researchers were quickly aware of its value to education, so research in Generative AI can be found in publications. Most research on AI was related to writing and speaking in self-autonomous learning, even though an increasing number of studies show concerns about the ethical use of AI tools in Higher Education (for instance, a survey was conducted on AI-related policies: *https://www.educause.edu/research/2024/2024-educause-action-plan-ai-policies-and-guidelines*). In addition, research has tried to reveal its effectiveness in language learning (Law, 2024). However, more research is needed to specify teaching methods, learning strategies and AI literacy integrated with AI tools (UNESCO, 2024, pp27-28). AI has been a disruptor, changing the way of teaching and learning, maybe even our thinking in the future,

as we no longer spend a long time designing teaching plans and preparing activities through the internet or the shared ideas from teachers. Nonetheless, AI can facilitate the teaching process and handle various tasks more efficiently (Warschauer et al., 2023).

Moreover, students can immediately gain answers in a few seconds and complete their writing without their own thoughts. Whether the misuse of AI is against the fundamentals of education has sparked debates. However, the research holds the view that if AI can be applied ethically under specific guidelines for learners to follow, AI will be an innovative learning tool for English as well as other languages' learning. Large Language Models can create multimedia-based language learning, such as stories with animated pictures. AI can broaden the imagination of educators and learners. Besides, AI can design teaching slides and make quizzes, audio materials, and different voices in a short time. All these features can be components of future intelligent teaching. Thus, an AI-assisted EFL may be a promising area for further exploration.

5. Conclusion

Admittedly, there are some limitations in the research: 1. a shortage of a detailed exploration in peer-reviewed journal databases as some accesses are limited, so some research papers cannot be fully screened; 2. some excluded research could be partly related to the purposes of the research, so the excluded papers were also discussed but not analysed in the dataset;

The landscape has been expanded after COVID-19. To some extent, it has shaped the overall scenery of a 10-year research on technology-integrated EFL (Figure 7, see below) with a stark contrast with two periods before and after the outbreak of Covid-19 (Figure 8, see below). More technologies have been discussed, and more studies have been conducted in exploration of not just its breadth but also the depth of integration into EFL practices.

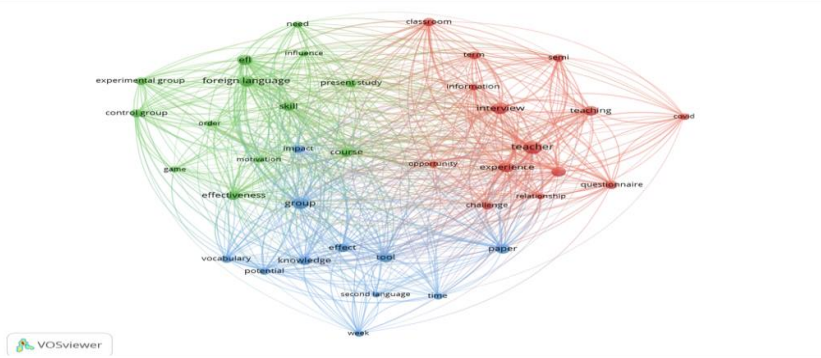
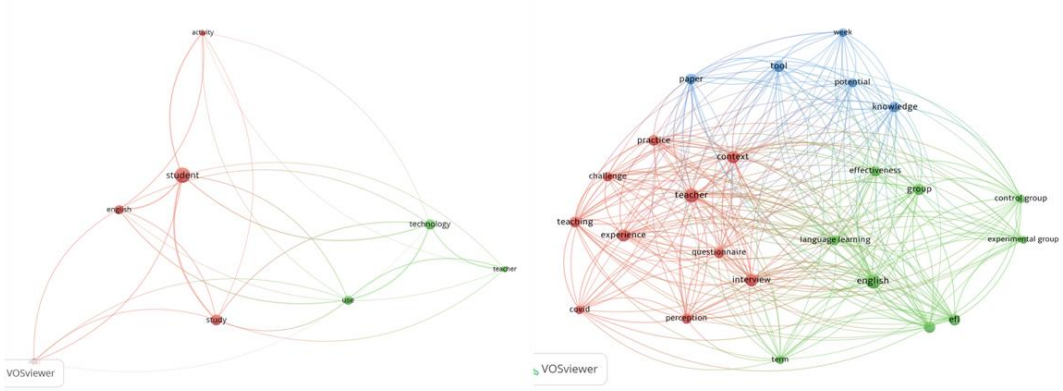


Figure 7. The study utilised VOSviewer to obtain the co-occurrence network of all selected abstracts from the data over the entire ten years



Abstract Text Network _2015-2019 **Abstract Text Network _2020-2024**

Figure 8. The study utilised VOSviewer to obtain all selected abstracts' co-occurrence network from the data and display them for comparison

Relevant research is ongoing, and data is still being accumulated as the landscape is expected to change again. At that time, the drivers of change and emergent trends will be discussed. Both teachers and learners may have a better user experience when engaging with technology and a deeper understanding of technology integration.

Additionally, the forward-looking perspective suggests an intriguing trend towards the mix of various technological tools. For example, in STEM research, a combination of AI and VR has been applied in simulation studies, a trend which can be seen from two website links: https://gtc.inf.ethz.ch/publications/adaptive-tutoring-on-a-virtual-reality-driving-simulator.html (2017); https://www.researchcollection.ethz.ch/handle/20.500.11850/634829 (2023).

An increased likelihood of combinations with technologies in language education may contribute to more research and creative proposals for changes in EFL pedagogy. Considering these developments, there is a pressing need for innovative teaching strategies that leverage the potential of emerging technologies. Furthermore, future research should explore effective integrations of technology in EFL teaching, evaluate their impact on learners, and develop pedagogical models that can foster an enriched learning environment. The culmination of these efforts will not only enhance teaching methods but also elevate the quality and effectiveness of technology integrated EFL education in the ever-changing landscape of foreign language learning.

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