

# Digitalization of the Educational Environment: New Strategies for Teaching and Learning Foreign Languages

*Digitalización del entorno educativo: nuevas estrategias para la enseñanza y el aprendizaje de lenguas extranjeras*

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## Abstract

The rapidly changing educational landscape, driven by continual advancements in digital technologies, exponential data growth, and the emergence of new tools for processing and delivering knowledge, has deeply transformed foreign language (FL) instruction. The development of digital learning environments, electronic resources, and web-based educational formats has introduced new demands for the digitalization and overhaul of FL teaching. This article presents a comprehensive literature review exploring scholars' perspectives on the opportunities and challenges of digital transformation in FL education. It investigates how educators and learners adapt to the realities of the ICT era and how technological progress reshapes teaching and learning dynamics. The findings suggest that innovative digital tools—such as digital storytelling, immersive environments, and massively multiplayer online role-playing games (MMORPGs)—can greatly enhance learner engagement and performance. However, their effective application is often hindered by the absence of a solid scientific and pedagogical foundation. Therefore, the article emphasizes the need to develop digital linguodidactics as a complete framework for integrating theoretical and practical aspects of technology-enhanced FL education. Establishing such a foundation would facilitate the creation of systematic, scalable, and evidence-based pedagogical strategies that fully harness the potential of digital transformation in language teaching and learning.

**Keywords:** FL education digital transformation; FL instruction; language learning strategies; digital linguodidactics, German language, higher education.

## Resumen

El paradigma educativo en rápida evolución, impulsado por el dinámico desarrollo de las tecnologías digitales, el crecimiento exponencial de la información y la aparición de nuevas herramientas para procesar y transmitir conocimientos, ha transformado profundamente la enseñanza de lenguas extranjeras (LE). La creación de entornos de aprendizaje digitales, recursos electrónicos y formatos educativos basados en la web ha generado nuevas exigencias para la digitalización y la transformación de la enseñanza de

LE. Este artículo presenta una revisión integradora de la literatura que explora las perspectivas de diversos académicos sobre las oportunidades y los desafíos de la transformación digital en la educación lingüística. Examina cómo los docentes y los estudiantes se adaptan a las realidades de la era de las TIC y cómo los avances tecnológicos están remodelando los procesos de enseñanza y aprendizaje. Los resultados revelan que las herramientas digitales innovadoras, como la narración digital, los entornos inmersivos y los juegos de rol multijugador masivo en línea (MMORPG), ofrecen un gran potencial para mejorar la implicación y el rendimiento del alumnado. Sin embargo, su implementación efectiva suele verse limitada por la ausencia de una base científica y pedagógica coherente. En consecuencia, el artículo destaca la importancia de desarrollar una lingüodidáctica digital como marco integral que integre los aspectos teóricos y prácticos de la educación en LE mediada por la tecnología, garantizando estrategias pedagógicas sistemáticas, escalables y basadas en la evidencia que aprovechen plenamente el potencial de la transformación digital en la enseñanza y el aprendizaje de lenguas.

**Palabras clave:** transformación digital de la enseñanza de lenguas extranjeras; instrucción en lenguas extranjeras; estrategias de aprendizaje de idiomas; lingüodidáctica digital; idioma alemán; educación superior.

## 1. INTRODUCTION

In modern society, education, including language learning, faces a dual challenge: it must satisfy individuals' intellectual and professional needs while also fostering and expanding society's collective potential. Historical and cultural experiences demonstrate that language education can promote sociocultural harmony, reinforce linguistic and cultural identities, facilitate territorial, social, and professional mobility necessary in today's world, and ensure open access to new knowledge and skills. Furthermore, electronic, digital, and telecommunication technologies, combined with theories examining their use based on needs, motives, age, education level, and other factors, play a vital role in shaping foreign language teaching strategies and methods within the context of a new human lifestyle and a global educational environment.

Meanwhile, language education today, both in structure and content, often resembles outdated industrial production methods: standardized, conveyor-belt curricula delivered in blocks and sections, divided into classes, levels, and stages; standardized tests that measure only academic achievement and not students' true abilities. The development of self-directed learning, based on a) principles from cognitive science and b) the innate desire to learn, rejects this mass-produced system and enables anyone to take control of their own educational path. At the same time, new realities and societal demands are becoming clear (Mialkovska *et al.*, 2024).

The digital transformation (DT) is currently experiencing a significant acceleration in the global education landscape. The overall evolution of teaching innovation driven by digitalization occurs in three stages: technology, innovation, and transformation. Teaching foreign languages has changed considerably during this process, showing new traits in learning environments, resources, methods, and technologies. However, both worldwide and nationally, the DT of foreign language training has not yet reached its full potential. Because of the importance of digital technology, foreign language training must

balance technological progress with humanistic reasoning. Creating a comprehensive digital connection throughout the entire process and scenario is vital for developing a more open, flexible, and personalized approach to FL training, while also fueling the digital revolution in foreign language education.

## 2. LITERATURE REVIEW

### 2.1. ‘State-of-the-art’: digital technologies integration into FL education

Recent years have seen a revolution in teaching and learning, especially in foreign language (FL) training, due to the integration of digital technologies into education, particularly in higher education. As Ramamuthie and Aziz (2022) correctly point out, educators must adapt their teaching strategies and increase awareness of technology-based methods to improve students’ foreign-language fluency.

According to Xu (2024), there are currently three main sources of resources for teaching foreign languages: government-invested and shared resources, school-developed materials created independently by schools, and commercial resources produced by businesses. The creation and distribution of foreign language teaching materials have become more diverse due to digitization. The patterns of supply and demand for FL teaching resources are improved by the “big resource pool” of foreign language materials provided by organizations like digital libraries and museums, as well as by FL course materials on various virtual laboratories, MOOCs, SPOCs, and other platforms.

Teaching needs to be reorganized and its processes redesigned to support digitization. Both systematicity and synergy should be prioritized in advancing the digital transformation of foreign language instruction, and effective promotion strategies should be explored from the perspectives of teacher skills, infrastructure, application innovation, educational philosophy, and guarantee mechanisms (Kiaer, 2025).

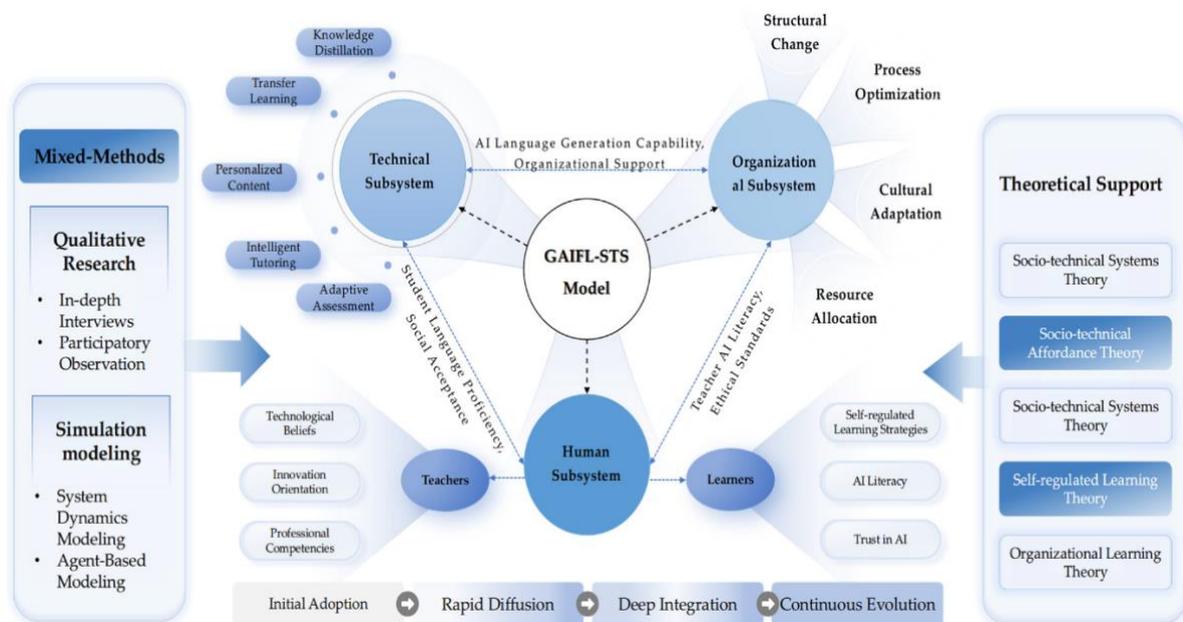
### 2.2. The role of AI

A new era of digital transformation in FL teaching has begun with the advent of GenAI, which uses advanced techniques like knowledge distillation, transfer learning, and large language models (Kasneji *et al.*, 2023). By intentionally integrating AI-based tools and systems, this change involves a fundamental reorganization of organizational procedures, educational methods, and learner experiences (Bond *et al.*, 2019). Although earlier research has examined the use of AI in education, especially in intelligent tutoring systems and adaptive learning environments (Kulik & Fletcher, 2016), there is still no clear understanding of the specific impact of GenAI on foreign language instruction.

Zhang and Dong (2024) utilize the Generative AI-assisted Foreign Language Education Socio-Technical System (GAIFL-STS) model to examine the complex dynamics and effects of integrating generative AI into foreign language teaching. To explore the opportunities, challenges, and outcomes of AI adoption from multiple dimensions, levels, and stakeholder perspectives, the study adopts an integrated mixed-methods approach that includes qualitative case studies and hybrid simulation modeling. The qualitative findings, gathered from observations, interviews, and document analyses, highlight the ethical, cultural, and societal conflicts that emerge while also demonstrating the transformative potential of generative AI to improve language learning experiences. The

quantitative results, achieved through agent-based modeling and system dynamics, provide a comprehensive understanding of the key factors, feedback loops, and emergent properties that influence the pathways and impacts of AI integration. Collectively, these findings offer valuable insights into practices, procedures, and policies that can foster the responsible, equitable, and effective use of AI in language education.

Based on socio-technical systems theory, Zhang and Dong’s (2024) GAIFL-STS model aims to capture the complex interactions among technology, organizations, and human actors in FL instruction DT. The socio-technical affordance theory of Lyytinen *et al.* (2021) is extended by the GAIFL-STS model, offering a dynamic, multi-level perspective for analyzing the evolutionary process and impact mechanism of GenAI in transforming foreign language instruction. The GAIFL-STS model includes three interconnected subsystems, as shown in Figure 1: (1) the technical subsystem, which encompasses GenAI techniques such as knowledge distillation, transfer learning, and large language models, along with their affordances for intelligent tutoring, personalized content creation, and adaptive assessment; (2) the organizational subsystem, involving structural, cultural, and procedural changes within educational institutions to support AI technology integration and governance; and (3) the human subsystem, comprising administrators, learners, and foreign language instructors who interpret, adopt, and apply the affordances enabled by AI in practical contexts (Figure 1).



**Figure 1.** Generative AI-assisted Foreign Language Education Socio-Technical System (GAIFL-STS) model  
Source: Zhang and Dong (2024)

### 2.3. Eco-linguistics approach

An innovative approach to digitalizing the English language teaching and learning environment was proposed by Tang (2024). To support digital tools in the English classroom, this paper follows eco-linguistics principles for teaching, enhances the question generation model's encoder, refines textual information using gated self-

attention, and develops a new automatic generation model for English exercises by obtaining embedded representations of articles and combining them with embedded responses. In the controlled test, the experimental class scored 84.309 points, which is 12.355 points higher than the control class, with significance, while the post-test control class scored 71.954 points. A significant difference was observed in the post-test scores, and the two-tailed test yielded a coefficient of 0.035, less than 0.05. In the learning interest poll, 89% of respondents selected “strongly agree” or “agree,” 8.5% were uncertain, and 2.5% disagreed. Students in the experimental class appeared much more interested in learning English overall. Besides paying closer attention in class, they are more eager to practice English outside of class. This study addresses the digital transformation of traditional English instruction by introducing new concepts and approaches.

Eco-linguistics, which sees language as an independent ecosystem, is another area of study that combines ecological and linguistic aspects (Ye & Wang, 2023). Based on the diversity, interactivity, and wholeness of the ecosystem, eco-linguistics provides a new perspective for language research and teaching. Ecolinguistics offers recommendations for digitally transforming English instruction: 1) Strengthen the overall structure of teaching English in colleges and higher education; 2) Provide multifaceted, comprehensive interactive instruction; 3) Continuously update language teaching materials; 4) Develop an eco-linguistic teaching model centered on social and humanistic environments (Waqar & Majeed, 2023).

Son (2024), in his monographic work “*Insights into digital literacy in language teaching*,” explores digital pedagogies, digital literacy, digital technologies, and digital language teaching. The book emphasizes the need for language instructors to enhance their digital teaching methods and skills. It highlights five key components of digital literacy: searching for and evaluating information, creating content, communicating, collaborating with others, and staying safe online. The book offers both a theoretical foundation and practical guidance for language instructors and researchers with varying levels of experience in technology-enhanced language instruction. However, many other publications, in books and magazines, follow similar approaches. Rarely do we see truly innovative strategies based on systemic digital transformation that include practical, real-world suggestions.

Meanwhile, creating an interactive environment is viewed as the main goal of digitalization in FL teaching and learning. Many researchers emphasize the importance of interactive strategies (Getenet *et al.*, 2024), arguing that using these techniques supports the development of students with different intelligences. Additionally, fostering cognitive skills, creative abilities, and overall creative potential in each student can be effectively stimulated through activities done in pairs or small groups.

#### **2.4. Innovative gamification**

Gamification has become an innovative teaching method recently, especially for teaching English to young learners. Teachers aim to boost motivation, engagement, and ultimately language learning by adding game elements to the curriculum. Web-based gamification technology and interactive exercises tend to be more engaging for students, according to some research. For example, Wichadee and Pattanapichet (2018) see Kahoot! as a good alternative to digital games because it increases students’ motivation to learn languages.

Additionally, MMORPGs like World of Warcraft and Second Life are of particular interest to researchers studying second language acquisition. The virtual worlds of MMORPGs, scholars say, offer excellent opportunities for language development, especially in communication skills. These environments help with learning a second language because they can be applied to real-world situations, such as negotiating when buying or selling (Martins, 2023).

Meanwhile, research in the field is mostly narrow and scattered, lacking fundamental conclusions and a clear educational approach. With this in mind, the study's goal is to define the objectives, content, methods, formats, and tools of digital linguodidactics aimed at establishing patterns and identifying effective ways to teach language using information and communication resources.

### **3. METHODS**

The theoretical and methodological foundation of this work is rooted in current concepts and theories in foreign language teaching, research, and development within digital linguodidactics, along with recent advances in psychological and pedagogical studies focused on human-computer interactions, as well as contemporary theories on digital textbook and learning system development. Systems analysis was used to examine the interdisciplinary nature of digital linguodidactics. The primary research tool is an integrative review.

#### **3.1. Sample**

The sample of literature entries for analysis consists of 34 items.

#### **3.2. Data collection**

The process of finding and screening was conducted across the following scientometric databases (libraries): ScienceDirect, Wiley, MDPI, ResearchGate, Emerald Insight, and ERIC. The scope of inquiries included: digital transformation of FL teaching environments; FL teaching digitalization concerns; innovative digital tools in FL education.

Criteria for inclusion in the final sample required either empirical research, a thorough theoretical study, a systematic review, a report, or a case study. Screening was carried out in three stages: topic screening, abstract screening, and review of results and findings.

#### **3.3. Data analysis**

Data analysis was conducted using the integrative review method, which allowed for a comprehensive literature synthesis that incorporated findings from multiple research approaches and theoretical sources to explore the phenomenon of digitalization in FL instruction and the educational environment, with the goal of achieving a thorough understanding of the topic.

### **4. RESULTS AND DISCUSSION**

Learning English has become more accessible and effective thanks to innovative teaching methods enabled by the digital revolution. By addressing a variety of student needs and promoting active participation, the use of interactive multimedia, online platforms, and adaptive learning systems has customized education (Qoura, 2021). Additionally, video

conferencing, collaborative online spaces, and virtual classrooms have eliminated national borders, encouraging international cooperation and cross-cultural exchange among students. At the same time, this shift faces certain challenges, mainly the lack of robust basic and experiential studies focused on the process and effects of digitalization in the FL educational environment. In reality, practice often surpasses theory in this area, which may limit the full positive potential of digitalization practices in FL instruction.

Meanwhile, questions emerge about how methodological changes are adopted in educational programs to integrate new digital technologies. These efforts often emphasize maintaining existing structures and practices instead of harnessing the transformative power of technology in education, which entails instructors learning how to create and deliver digital content and engage students in virtual settings.

Adaptive learning is a forward-thinking approach that uses technology to customize the educational process for each student's unique needs. Using online platforms and algorithms, the content and challenges are adjusted in real-time based on student performance and responses. Ramírez and León (2023) suggest a personalized and dynamic learning experience, allowing students to move at a customized pace and concentrate on areas that need more attention.

Furthermore, students must be open to using technological tools to support their language learning if foreign language instruction is to successfully move into digital technology. It can be difficult or even impossible for educators to succeed in digital transformation without student cooperation during the learning transfer (Baser *et al.*, 2016). Another important issue is students' digital fluency. While significant progress has been made in understanding language learning strategies (LLS), according to Lee (2023), the internet and Web 2.0 have brought major changes to human interaction, requiring a reevaluation of LLS in today's digital context, especially considering digital nativeness. Consequently, 891 college students took part in a comprehensive quantitative study. Two tools were used to analyze their patterns and frequency of LLS use, along with their level of digital fluency: Teo's Digital Natives Assessment Scale (DNAS) and Oxford's Strategy Inventory for Language Learning (SILL). All of the strategies listed in SILL were used to some degree by the participants. However, they reported using the compensatory, memory, and metacognitive strategies more often than the cognitive, social, and emotional ones. There were notable differences in LLS use among participants with different levels of digital fluency. Additionally, Lee's (2023) research shows that these current participants behave differently in their usage patterns compared to earlier generations.

#### **4.1. Digital storytelling: implications and challenges**

Another innovative tool is digital storytelling (DST). Students' creation of digital stories is one of the most effective instructional strategies that has been shown to enhance EFL classroom effectiveness. DST is considered a successful approach that leverages modern technology for teaching and learning various subjects. Digital stories are virtual communications, both written and spoken, designed to engage the audience and sustain their interest while sharing knowledge and perspectives on different topics. They have been widely and successfully used in foreign language instruction. There are many advantages to integrating them into teaching. One of the most significant is helping students develop skills essential for studying and working in the twenty-first century

(Robin & McNeil, 2019). In the context of teaching foreign languages, DST projects have been shown to improve a range of student abilities, including research, organization, presentation, technology skills, and more (Ekmekçi, 2016). According to Abdelmageed and El-Naggar's (2018) research, digital storytelling has a statistically significant positive impact on the oral performance of English language learners. It has also been demonstrated that the process of creating digital stories effectively promotes students' writing skills (Friatin & Jauharoh, 2017).

In the FL classroom, DST projects follow the writing process, align with the presentational mode of communication, and provide students with meaningful, practical assignments (Asnas, 2024). According to research, digital storytelling surpasses traditional storytelling in attracting and holding learners' attention, interests, and motivation, while also promoting learner collaboration, group work, and idea organization. It helps learners understand complex learning material and present information in a practical and meaningful way (Shi & Cheung, 2024). Throughout the learning process, DST helps students recall, improve, develop, apply, and expand their creativity. It enables students to write more creatively and efficiently by visualizing their work, leading to increased perception and genuine personal learning, which enhances both the writing process and overall learning experience. In essence, DST is a systematic approach that allows educators to design effective educational activities based on clear learning objectives.

Meanwhile, concerns emerge about using this tool for FL instruction. In particular, copyright issues are critical for this type of assignment. Since the format is digital, it's important to address how to manage digital information, making basic information ethics highly relevant. Many students want to include their favorite music, anime, and characters; however, this is sometimes forbidden because it infringes on copyrights and image rights. Additionally, as empirical research shows (Kasami, 2018), some students struggle with narrative tasks such as writing scenarios in English, and others face time constraints in completing the assignment.

#### **4.2. Potential and concerns of MMORPGs**

Additionally, researchers believe that MMORPGs offer a wide range of stimuli that help players engage with the language they encounter in games (Ng *et al.*, 2021). When combined with linguistic resources, elements like visual cues, voice acting, language, storytelling, and context enhance the learning experience. These games also promote incidental learning, where players fill gaps in their language knowledge without a dictionary by using surrounding context to understand the meaning of unfamiliar words. However, even though MMORPGs provide diverse language environments for learners to explore and immerse themselves in, they also present challenges, such as cognitive overload, the risk of addiction, and the need to learn informal language and gaming slang instead of everyday speech.

#### **4.3. Possibilities of virtual reality**

Many studies in language learning examine virtual reality (VR) technology as a new educational tool (Stockwell & Reinders, 2019). However, despite the increasing number of studies, many research opportunities are still unexplored. This gap is due to rapid technological progress and difficulties accessing the necessary VR environment tools.

Recent research by Bahari (2021) aims to assess the advantages and disadvantages of using virtual reality environments for teaching language skills. While VR environments are generally effective, it is important to determine the specific proportions of each language skill. The results show an imbalance in research on acquiring language skills via virtual reality, with a focus on speaking and listening more than reading and writing. This imbalance is especially risky in MMORPGs as learning tools because providing meaningful opportunities to teach comprehensive writing skills outside of brief, casual chats is very difficult, if not impossible.

#### 4.4. The need for digital linguodidactics

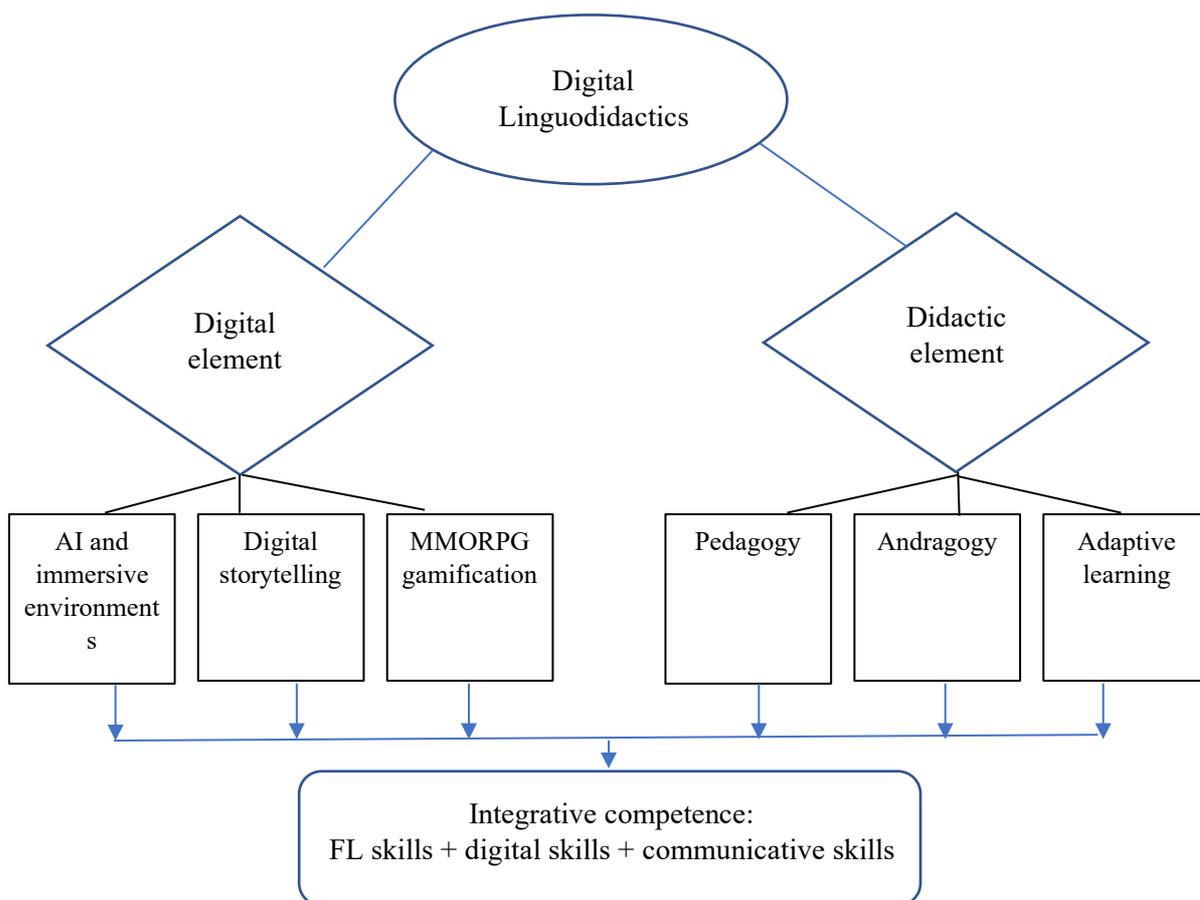
The prospects, innovations, and concerns in language education discussed earlier have underscored the need to develop a new research area and academic discipline called digital linguodidactics. This field identifies patterns, key content elements, and how to organize the process of learning a new language and developing communicative and verbal skills using digital tools. These tools add interactivity, multimedia, hypermedia, mobility, multifunctionality, variability, accessibility—including remote access—and other features to language learning. At the same time, there is an urgent need to transform new pedagogical practices into established, technology-based learning theories. In particular, Ji et al. (2023) emphasize the importance of more research on human-AI collaboration in FL education, pointing out a critical gap: 75% of studies did not clearly describe the role of human teachers or include them in AI-integrated FL learning.

This is especially important because, according to study findings, students' opinions on how online teaching platforms can improve their learning fall into two categories: positive and negative. The respondents' opinions varied based on their prior experiences, learning preferences, skills, and any issues or challenges they faced while learning online. Tarazi and Ruiz-Cecilia (2023) specifically aimed to examine the correlation between students' academic achievement and their level of engagement during online learning. 423 bachelor students from three Palestinian higher education institutions completed a closed-ended questionnaire as part of the quantitative data collection. About 58.6% of participating students expressed dissatisfaction with their online education and held negative views of online learning environments. Consequently, as the authors correctly conclude, further research should explore online course design, platform resources, and teaching techniques believed to be essential for increasing student engagement. Farrell and Brunton (2020) also concluded that different structural and psychosocial factors influence how effectively students engage with online learning.

In digital linguodidactics, the scientific prerequisites and foundations for addressing key issues in developing a foreign language teaching system—aimed at its application across various types of intellectual and communicative activities—include principles from pedagogy, psychology, linguistics, foreign language didactics, and teaching methods, as well as interdisciplinary sciences located at the intersection of multiple fields: educational psychology, communication psychology, psycholinguistics, sociolinguistics, linguacultural studies, and others. A crucial element in understanding the specifics of digital language learning is found in developments within foreign language education theory, communication theory, attention theory, psychology of consciousness, acquisition management theory, discourse theory, psychosemantics, text theory, andragogy, among several other areas. These disciplines support the implementation of ideas and principles such as individualization, motivation, interactivity, comprehensive and concentric

presentation of educational material, invariability, integration, modularity, discursivity, eventfulness, and more in e-learning.

Thus, the authors propose introducing digital linguodidactics as an innovative platform for developing new strategies for teaching and learning foreign languages in a digital environment. Digital linguodidactics would enable the integration of digital technologies into the FL teaching process based on a solid didactic framework rather than a 'common sense' approach or a 'trial and error' method as it is now. Figure 2 illustrates this digital linguodidactics platform (Figure 2).



**Figure 2.** The concept of a digital linguodidactics framework for introducing innovative digital strategies in teaching FL  
Source: developed by the author

In our view, applying digital linguodidactics will greatly lessen the challenges and skill disparities discussed earlier and will support the successful implementation of adaptive learning.

When teaching a language through digital linguodidactics, it is recommended to use an integrated system of approaches (strategies) and methods (tactics) aimed at teaching different forms of communication (oral, written), as well as multidirectional speech activities: from thoughts to words and vice versa, from internal expression to external, from reaction to initiative and vice versa, and from semantic decisions to speech actions. Communicative, student-centered, cognitive, systemic, and object-oriented approaches used in e-learning promote direct strategies (such as memory and compensatory

strategies); indirect strategies (such as metacognitive and emotional strategies); and strategies related to both the educational process and communication. Effective methods in digital language teaching are those that activate a) the process of acquiring language knowledge, developing skills, abilities, and competencies; b) learner independence, offering opportunities for individual choice and control over the scope and other components of learning resources; and c) monitoring and self-monitoring. These include the project method, strategies for activating speech capabilities, visual editing, information resources, educational activities and interaction scenarios, and demonstration examples.

Innovation and openness as key features of digital linguodidactics are linked to the quick updating and relevance of teaching materials. These can be organized around cultural, historical, and modern realities within an integrated landscape of active development. They leverage the creative potential of educational participants and help promote tolerant linguistic consciousness among students. Innovation and openness are also reflected in the use of digital teaching tools, which enhance learning with new qualities and possibilities: interactivity, enabling a broad expansion of independent study and active language teaching methods; multimedia, making educational content more accessible by presenting audiovisual segments of real or imaginary worlds; hypermedia, allowing the creation of hypertext through non-linear connections among information environments; mobility, enabling teachers to quickly update and adapt materials to keep the curriculum relevant and sustain student interest and motivation; adaptability, addressing individual learning paths based on students' skill levels, goals, and psychological or physical characteristics; and multifunctionality, allowing digital tools to be used for both acquiring and reinforcing various aspects of language and speech.

Like pedagogy, digital linguodidactics addresses the concepts of purpose, content, method, and organizational forms of e-learning. However, within an e-learning course, program, or lesson, different goals or combinations of goals can be set, which are more effectively represented as competencies. This personalizes the language learning process, helps identify uneven and flexible competencies—such as a student having strong language skills but weak knowledge of communication registers—and allows for the development of both balanced and unbalanced competencies tailored to individual student needs. For example, a student might mainly want to understand real-life conversations rather than academic or formal speech (and may be less interested in written production); they might also aim to master emotionally engaging speech tactics like compliments or seek to understand news reports supported by video footage, while also evaluating speech strategies (strategic competence) and tactics (functional competence). Therefore, the content of e-language learning should include not only instruction in various aspects of language and speech but also, in specific modules, the development of relevant knowledge and competencies that meet the learner's needs.

In teaching a language through digital linguodidactics, as pedagogical practice shows, it is more effective to use an integrated system of approaches that allow a) to make language learning activity-based through speech activities, spontaneous communication based on role-playing games, and problem-solving situations (communicative-activity approach); b) to consider as much as possible individual psychological, age-related characteristics and personality traits, as well as optimal ways of cognition and performing activities—thinking, speech—such as cognitive styles linked to the dominance of one brain hemisphere, field dependence or independence, reflexivity or impulsiveness in speech

behavior, and reliance on visual or auditory channels of incoming information (personally oriented, cognitive approaches); c) to establish various connections both within the system of the studied language and with other components of language teaching content, including education, behavioral and speech culture, history, traditions, literature, current achievements, and challenges of the country of the language being studied (systemic approach).

Adding collaborative and social dimensions to the behavioral, emotional, and cognitive aspects outlined by Fredricks *et al.* (2004), Redmond *et al.* (2018) proposed a five-dimensional online engagement framework for higher education based on a review of relevant research and discussions with international experts in the field (see Table 1). The authors believe that this is what digital linguodidactics truly aims to achieve.

**Table 1.** Online Learning Engagement Framework

<b>Engagement</b>	<b>Illustrative indicator</b>
Social	fostering relationships, establishing trust, fostering a sense of belonging, and building community
Cognitive	The distribution of expertise, deep discipline understanding, idea integration, choice justification, critical thinking, and metacognition activation
Behavioral	Academic skill development, opportunity and challenge identification, transdisciplinary skill development, agency development, adherence to online learning standards, and peer support and encouragement
Collaborative	Developing professional networks, interacting with teachers, learning alongside peers, and connecting to institutional opportunities
Emotional	Recognizing motivations, communicating assumptions, controlling expectations, and making a commitment to learning

Source: Redmond *et al.* (2018)

Today, many scholars try to develop the best digital strategies for FL teaching and learning, including adaptive learning (Macías-Galeas, 2024), decision support systems to create, manage, and maintain student experience and expectations (Ashmel *et al.*, 2021), immersive environments (Yan & Lowell, 2025), and more. However, most of these studies share a common feature: they focus on a future-oriented paradigm divorced from didactics. As a result, pedagogical experiments in FL teaching based on these findings often follow a 'trial and error' approach, frequently ignoring the context. This leads to gaps and imbalances in students' FL skills, as mentioned earlier.

Meanwhile, as Moradi and Chen (2019) rightly state, achieving today's academic goals requires a combination of technology-enhanced learning and societal constructivism. We believe this idea is useful for developing a model of digitalized FL educational environments. To build concepts, beliefs, and ideas, social constructivist principles

emphasize the importance of students' effort and teamwork in using learning activities, resources, and tools available in real-world settings. Knowledge is not just transmitted from professors to students; instead, it is created by each student or group through active engagement with their physical, social, and technological environments. In this context, digital linguodidactics aims to establish a solid scientific foundation—in pedagogy and andragogy—for effective knowledge creation and sharing practices. **5. CONCLUSION**

In the future, FL instruction in the digital age will inevitably shift from standardization and scale to customization and personalization; from teaching to learning; from imparting knowledge to developing abilities. This change will bring significant transformations to the teaching environment, content, methods, and other aspects, providing students with a more comprehensive and effective educational experience. Multimodal data will be gathered during the teaching process, and students' language proficiency will be thoroughly evaluated across various dimensions, including language knowledge, skills, culture, emotional attitudes, and communication strategies. Each student's language foundation will be accurately assessed, their language learning process monitored, and their potential for future language development forecasted. Ultimately, this will lead to a more open, agile, immersive, and personalized form of FL instruction.

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