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Digital Technologies in Language Education: A Comprehensive Review and Analysis

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ABSTRACT

This systematic literature review examines the role and efficacy of digital storytelling (DST), the robot-DST strategy, and the normalization of computer-assisted language learning (CALL) in language education. The review is based on a range of studies published between 2019 and 2023 and follows the PRISMA approach for systematic reviews and meta-analysis. The analysis includes the evaluation of training, validation, and testing stages, with the search employing the keywords "educational technologies" to identify relevant articles. The review's findings highlight the potential of digital storytelling as a multimodal approach to language education. However, the limitations of traditional DST methods are also scrutinized. To address these limitations, the study proposes a robot-based DST approach, robot-DST, to enhance student engagement and promote interaction. The effectiveness of this approach is evaluated through a quasi-experimental study conducted in an English as a Foreign Language (EFL) course, comparing it with the conventional animation-based DST approach. Furthermore, the review explores the normalization of computer-assisted language learning (CALL) and the evolving communicative competencies needed for the digital generation. It also delves into the role of digital technology in reshaping academic journals and emphasizes the importance of integrating digital tools in reading instruction within university curricula. While acknowledging the existing inadequacies in current methodologies, the study serves as an inspiration for future researchers. It provides a solid foundation for developing and implementing innovative solutions in language education. In conclusion, this systematic literature review sheds light on the transformative role of digital technologies in language education. It highlights the potential of digital storytelling, introduces the robot-DST strategy as an alternative approach, and explores the normalization of CALL. The review emphasizes the need for integrating digital tools and fostering evolving communicative competencies to meet the demands of the digital generation. It also underscores the importance of further research and innovation in developing effective solutions for language education.

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1. Introduction

In the digital age, the growing digital divide caused by low levels of digital literacy among people has become a major worry [1]. To solve this problem, the "Play with me in Code" course was created to improve pre-service teachers' (PSTs') cognitive abilities and introduce them to computational thinking and Scratch programming [1]. This class heavily emphasizes the concepts of self-directed Learning, problem-solving, creativity, socioemotional skills, and logical computational thinking.

It is critical to analyse how lockdowns affect teenagers' audiovisual competencies during the COVID-19 epidemic and their consequences for sustainability [2]. This study uses educational actors to assess how Ecuadorian teenage audiovisual communication skills are developing, even though online education.

In geography classes, Field [1], argumentation abilities must be developed for linguistic awareness and handling difficult material. According to empirical research, peer evaluation can improve students' written reasoning skills in geography classes [3]. The professional use of Open Educational Resources (OERs) should be emphasized in geography education to provide future instructors with effective techniques [3].

This technology evaluation investigates the potential of ChatGPT, a generative AI chatbot, in language teaching and Learning [4]. It focuses on the digital competency's instructors, and students need to ethically and effectively use this chatbot for language learning help. It examines the advantages, discussions, and disadvantages of using ChatGPT [4]. A new paradigm based on digital pedagogies and technologies from the fifth Industrial Revolution, Digital Language Teaching 5.0, has arisen due to the COVID-19 pandemic [5]. This ground-breaking strategy addresses the pandemic's effects on education problems [5].

Professional development facilitates the improvement of teachers' abilities and the promotion of ongoing professional progress [6]. Additionally, as there is a shortage of existing teacher training in these areas, particularly in non-English language contexts like Spanish, it is necessary to provide specialized direction and support for integrating corpus methodologies and resources into Spanish language teachers' practice.

The course "Digital Technologies in foreign languages teaching: theories, methods, application" was implemented to meet the pandemic's quick shift to e-learning, utilizing blended Learning to provide aspiring teachers with the appropriate digital skills [7].

The development of digital technologies has increased accessibility to adaptive Learning and allowed for customization by the requirements of teachers and the varied student profiles [8]. The factors and methods of their development in pedagogical management are explored because digital competencies are essential for teachers in the digital economy [9].

Utilizing interactive hardware like Arduino boards enhances programming competencies in engineering students, providing engagement and motivation for Learning [10]. Digital technology plays a crucial role in modern second/foreign language education, and there is a growing concern about English as a foreign language (EFL) teachers' competency in computer-assisted language learning (CALL) [11]. The COVID-19 pandemic prompted Hong Kong's public school system to transition to online Learning, leading to adaptations in language instruction to cater to students' diverse linguistic and educational needs [12]. Educators in Hong Kong applied the European Framework for the Digital Competence of Educators (DCE) to tailor virtual instruction, leveraging both synchronous and asynchronous platforms to support student learning [12]. The study highlights the potential use of the DCE framework to assess educators' digital competencies and better prepare them for virtual teaching [13].

The World Economic Forum's 21st-century skills framework emphasizes the importance of nurturing competencies and character qualities in students to prepare them as responsible global citizens. However, many educational systems primarily focus on foundational literacies, overlooking the development of these essential skills. This research explores how English as a second language (ESL) teachers can foster competencies and character qualities through language development tasks using digital tools [14].

The European Commission supports integrating digital technology in language education to enhance innovative teaching practices and promote communicative competence. Incorporating information and communication technology (ICT) is a crucial competency for teachers in utilizing digital tools effectively [15].

The Education 4.0 framework highlights the need for new assessment models of digital competencies and the incorporation of artificial intelligence (AI) tools to evaluate student skills more flexibly and effectively. This study utilized natural language processing (NLP) tools to assess soft skills in engineering, promoting active Learning and educational solutions [16].

Furthermore, the study investigates the implementation of English as a Medium of Instruction (EMI) in the Master of Engineering program at Peter the Great Saint-Petersburg Polytechnic University. It explores the effects of EMI on language and content Learning, teaching delivery, educational quality, access inequalities, language flexibility, and the competencies required for successful EMI teaching [17].

The COVID-19 pandemic has brought about significant challenges for educational institutions, teachers, and students as they swiftly transitioned to online teaching. The response to this new situation varied across educational systems, with adjustments made to teaching habits, approaches, methods, and materials to suit the online context [18]. Telecommunication between students from different countries has become increasingly prevalent in foreign language education. To maximize interactional opportunities in these settings, teachers need new competencies for designing tasks and enhancing digital and pedagogical skills [19]. The evolving technological, economic, and societal landscape highlights the need to revise the competence model for future foreign language teachers, given the increased importance of foreign language learning in school education [20].

Another innovative method for teaching languages is virtual reality (VR), which immerses students in simulated settings where they can practice their language skills and learn about foreign cultures. While integrating VR into language schools can have advantages like bettering language learning experiences, there are also drawbacks. Examples of VR language learning applications are given to demonstrate how they can be used in practice [21]. In addition, automated assessment tools and intelligent language tutors are two ways artificial intelligence (AI) and natural language processing (NLP) technologies revolutionize language teaching. These AI-based solutions cater to the unique demands of each learner and provide individualized feedback, improving language competency and engagement [21].

2. Methodology

Many current studies related to systematic assessments have been undertaken around the globe. This section addresses the need for a systemic analysis of digital technologies in language education. In contrast, the following section presents the method used to find answers to the research formulated by the current research. This review will be divided into three sections:

i. Best practices for online teaching and Learning
ii. Challenges and opportunities for online education

iii. Integration of technology and pedagogy. Next, this section systematically reviews and synthesizes scientific literature to distinguish, select, and analyse digital technologies in language education.

Lastly, the last addresses what action should be taken concerning the posed problems by reflecting upon potential scholars. The pre-recording systematic reviews and meta-analysis (PRISMA) approach is applied in this analysis, a published standard for conducting a systematic literature review. Publication guidelines are generally necessary for guiding writers to assess and review the accuracy and rigour of a review with relevant and necessary details. PRISMA also highlights the randomized studies evaluations survey, which can be a key factor in systematic analysis reports for other study forms [22] (Figure 2).

In terms of tools, two key databases, Scopus and Eric, were used to evaluate the methodology of this research in light of their robust nature. It covered several studies, including education studies. However, like Scopus and Eric, every database could be better and more detailed [23]. In addition, this section provides an overview of the four significant sub-sections: identification, screening, eligibility, and data abstraction.

2.1 Identification

In choosing several appropriate papers for this report, the systematic review consists of three main phases. The first step is keyword recognition and the quest for linked, similar terms based on the thesaurus, dictionaries, encyclopaedia, and previous studies. Accordingly, search strings on Scopus and ERIC (see Table 1) databases were created after all the relevant keywords were decided. In the first step of the systematic review process, the present research successfully retrieved 102 papers from both databases.

Table 1
Search strings from the Scopus and ERIC databases

The search strings	
Scopus	TITLE-ABS-KEY (competency AND language AND teaching AND digital) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (PUBYEAR , 2023) OR LIMIT-TO (PUBYEAR , 2022) OR LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (
ERIC	(competency AND language AND teaching AND digital) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (PUBYEAR , 2023) OR LIMIT-TO (PUBYEAR , 2022) OR LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (

2.2 Screening

Duplicated papers should be excluded during the first step of screening. The first phase omitted 102 articles, while the second phase screened 48 articles based on several inclusion-and-exclusion criteria developed by researchers. Literature (research articles) was the first criterion because it is the primary source of practical information. It also includes the exclusion from the current study of publications in the form of systematic review, review, meta-analysis, meta-synthesis, book series, books, chapters, and conference proceedings. Furthermore, the review concentrated exclusively on papers written in English. It is essential to note that the schedule was chosen for five years (2019–2023). Otherwise, only studies in Malaysia's territory have been selected to conform to the analysis objective. In all, 14 publications based on specific parameters were excluded.

Table 2
The selection criterion is searching

Criterion	Inclusion	Exclusion
Language	English	Non-English
Timeline	2019 – 2023	< 2019
Literature type	Journal (Article)	Conference, Book, Review
Publication Stage	Final	In Press
Subject Area	Science Social	Besides Science Social

2.3 Eligibility

A total of 44 articles are included in the third level, called eligibility. At this stage, all article titles and important text were carefully scrutinized to confirm that the inclusion criteria were satisfied and that the articles were appropriate for the current study's research objectives. As a result, 12 papers were removed since their due to the out-of-field (n=4), title not significantly (n=5), abstract not related to the objective of the study (n=2), and no full text (cannot access) (n=1) relevant to the study's objective based on empirical data. Finally, 32 articles have been made available for review (see Figure 1).

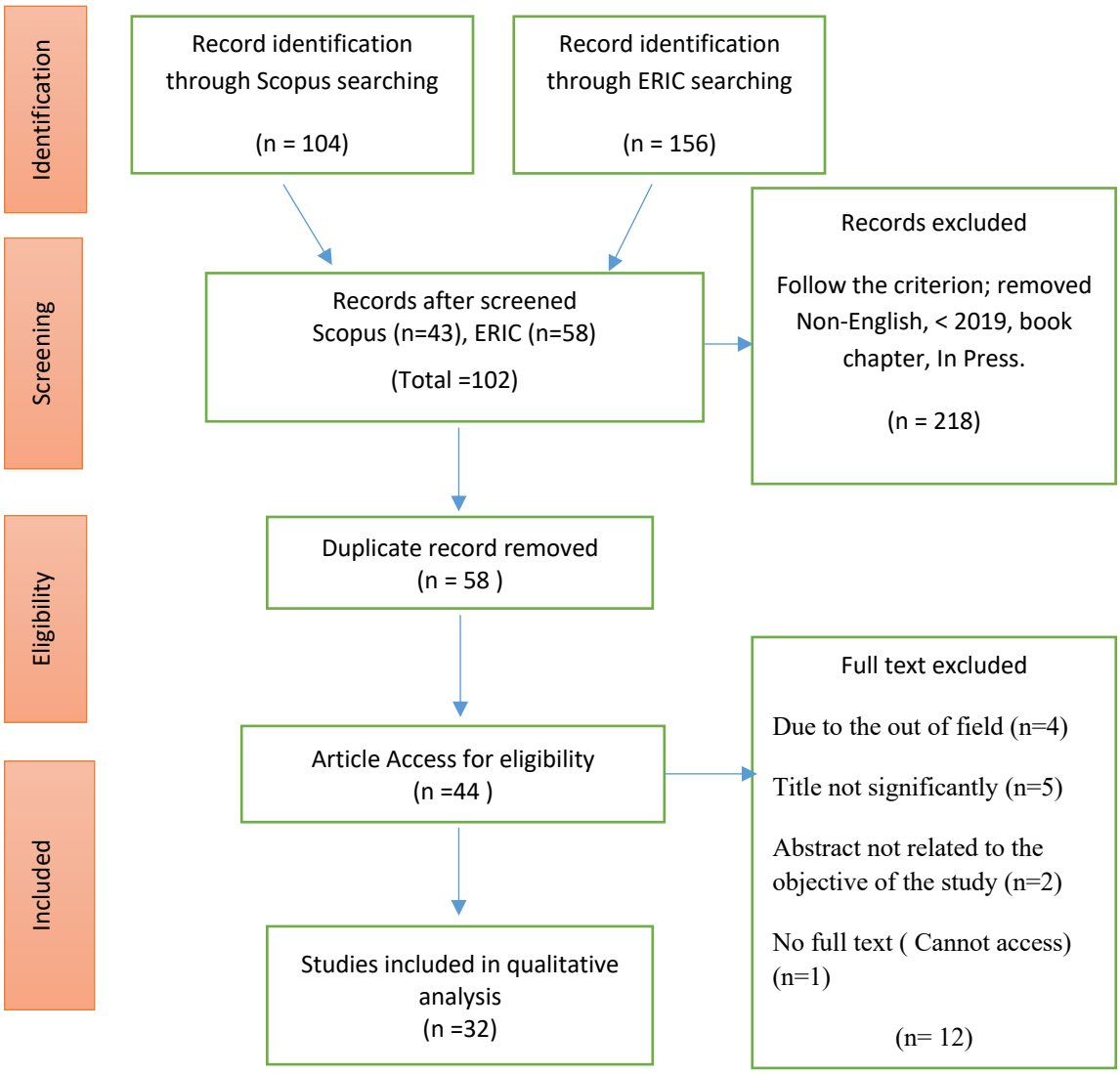

Fig. 1. Flow diagram of the proposed search study [22]

2.4 Data Abstraction and Analysis

An integrative analysis was performed in this study, one of the examination techniques used to analyse and synthesize different research designs (qualitative, quantitative, and mixed methods). Expert research centred on developing appropriate topics and sub-topics. The data collection phase was the first step in developing the theme. The authors have carefully reviewed 32 papers for statements or information addressing questions from this current research. In the second step, the authors and experts then analyse the digital technologies in language education in the country and determine and form meaningful groups. The three main themes that best practices for online teaching and Learning, challenges and opportunities for online education, and integration of technology and pedagogy. The authors resumed each developed theme from here, including any themes, concepts, or ideas having any relationship. Within the framework of this study, the corresponding author worked with other co-authors to establish themes based on the findings. Here, a log was maintained during the data analysis process to document any analysis, opinions, puzzles, or other ideas relevant to the data interpretation.

The authors also compared the findings to resolve discrepancies in the theme-creation process. Note that if any inconsistencies in the themes arose, the authors addressed them with one another. Finally, the developed themes were tweaked to ensure their consistency. To ensure the validity of the issues at hand, the examination was conducted by two experts, one specializing in the Field of education and the other in the language faculty. The expert review phase played a crucial role in verifying each sub-theme's clarity, importance, and adequacy through establishing domain validity. The author made adjustments based on the feedback and comments provided by the experts. This collaborative process ensured the accuracy and reliability of the topics under investigation.

3. Results

3.1 Best Practices for Online Teaching and Learning

In an exploratory study, 75 university-level English language teachers who transitioned to online teaching during the COVID-19 pandemic participated in a survey. The study aimed to identify the competencies teachers need to use interaction to effectively facilitate language learning in online lessons. The findings revealed three additional competencies teachers require: technological, online environment management, and online teacher interactional competencies. These insights can be valuable for both teachers and teacher educators in the context of synchronous online teaching [13].

The effectiveness of an Open Educational Resource (OER) unit in improving the teaching competencies of student teachers was investigated in this study. The focus was on promoting the argumentation competencies of future students through peer feedback methods. The research involved 16 student teachers, and the paper examines how the OER unit enhanced their teaching competencies in this area. The findings provide useful insights for implementing language-aware professionalization of geography teachers using digital learning units [3].

The impact of the COVID-19 pandemic on teachers' digital skills and motivation to integrate new technologies into their classes was explored in this study. The results indicated that teachers improved their digital skills due the increased use of ICT during the pandemic. Younger male teachers below the age of 30 expressed higher motivation to use and incorporate new technologies. However, teachers expressed the ongoing need for additional training opportunities in ICT for both educators and students, presenting new challenges in acquiring and developing digital competencies [24].

Additionally, another study focused on the teaching strategies that promote content learning and literacy development in students with mixed-language abilities in English Medium Instruction (EMI)

courses. The analysis examined multimodal texts created by students based on academic readings. The results revealed that promoting multimodal meanings in the EMI classroom extends the range of literacy learning and enhances linguistic, digital, social, and cognitive skills. This approach also contributes to increased student motivation and improved academic performance in English-medium courses [25].

In understanding semiotic meta functions, style is viewed as the practice of selecting and composing semiotic resources. This approach involves the subjective appropriation of discursive and habitual patterns within the affordances of media infrastructures. Digital storytelling exemplifies a multimodal style practice that integrates text, image, video, and audio to create narrative coherence. Analysing the necessary media-practical, multimodal, and narrative skills in digital storytelling can help operationalize these competencies for new teaching and learning arrangements [26].

Findings indicate limited digital literacy levels among students and teachers, attributed to skill development constraints and restricted access caused by technological, economic, and coverage gaps. Addressing this issue requires urgent educational policies and curriculum integration to strengthen digital competencies [27].

Language educators should utilize digital technology as a pedagogical tool while adapting it to learners' linguistic behaviours and cognitive styles. Communicative competencies should be broadly conceptualized to encompass verbal and nonverbal elements. The role of teachers and parents is crucial in assisting students in developing the necessary communicative competencies for the digital generation field[28].

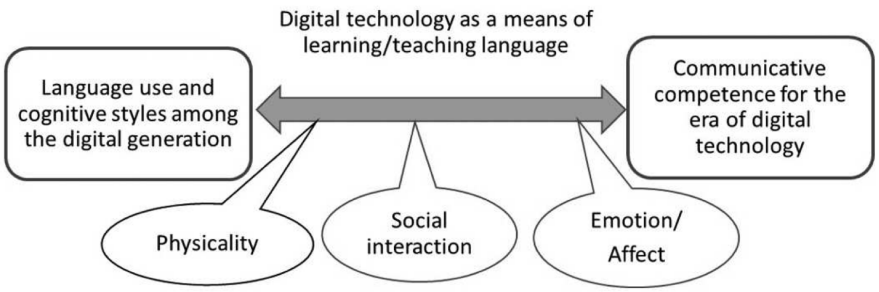

Fig. 2. Language Education in the Era of Digital Technology (Butler, 2021, p. 281)

EFL teachers at Jazan University demonstrate competency, digital literacy, and high levels of online assessment use. Gender was the only significant difference found in teachers' use of technology. Recommendations include adapting to the emerging needs of digital learners and staying abreast of new technologies [29].

3.2 Challenges and Opportunities for Online Education

The study examines the audiovisual communication skills of Ecuadorian adolescents and their development through educational interventions. It adopts a qualitative approach, employing focus groups, interviews, and observations with parents, students, and teachers from public and private institutions. The findings indicate that adolescents autonomously acquire audiovisual skills before college; however, they need more social context, ethical values, and responsibilities associated with comprehensive media learning. Despite the skill and attitude development of online Learning during the pandemic, full media literacy still needs to be discovered. Hence, curriculum innovations in higher

education are needed to incorporate technological changes while upholding deontological principles and promoting democratic values, tolerance, and sustainability [2].

This research investigates the smart teaching abilities of teachers participating in the Khon Kaen University Smart Learning Project in junior high schools in Thailand. It examines teachers' backgrounds, including teaching subjects, teaching grades, and teaching experience, to analyse their smart teaching abilities. The findings reveal that mathematics teachers generally demonstrate smarter teaching abilities than science and English teachers. Moreover, grade 7 teachers and those with 1-10 years of teaching experience exhibit higher smart teaching abilities in their respective variables. The study provides valuable insights into teachers' skills development and is a guideline for enhancing smart teaching ability in new learning environments [30].

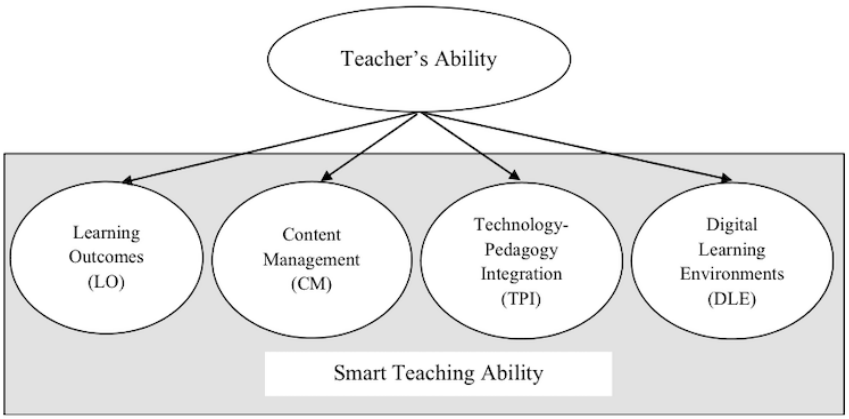

Fig. 3. Smart teaching ability concept model [30]

This study explores how language teachers responded to their student's educational and linguistic needs in online environments. It highlights educators' adaptability in virtual instruction to accommodate students with different levels of English language proficiency. Synchronous and asynchronous platforms were utilized to facilitate effective student learning. Additionally, the study suggests using the Digital Competence Evaluation (DCE) framework to assess educators' digital competencies and enhance their preparedness for virtual teaching. The conclusion emphasizes the need for further research on emergency remote teaching, particularly in primary and secondary language classrooms [12].

The paper discusses the development of a teacher's guide for the digital games Ibigkas! and Learning Likha, aimed at improving the English proficiency of Filipino learners aged 9 to 12 years old. The guide is a companion to the games and offers valuable insights into instructional strategies and approaches. The study highlights the importance of providing alternative means for students to demonstrate competencies beyond academics, fostering inclusivity and student engagement. Furthermore, incorporating e-artefacts in the curriculum alongside traditional approaches contributes to a more comprehensive and rewarding learning experience for students and educators [31].

3.3 Integration of Technology and Pedagogy

Broza *et al.,* emphasize the importance of programming-based learning experiences in raising pre-service teachers' awareness of enhancing thinking skills and creativity, thereby equipping them with valuable pedagogical competencies for future teaching practices. Ihnatova *et al.,* conducted a survey involving 120 respondents, revealing the crucial factors of motivation, educational success,

and the difficulty level in digital-based communication that should be considered when evaluating the effectiveness of teacher training courses.

Asención-Delaney *et al.,* contribute to the Field by proposing training strategies for Spanish pre- and in-service teachers in the pedagogical use of corpus tools, advocating for incorporating such tools in teacher training programs to enhance language instruction. Mahapatra examines the impact of a specific program on teachers' practices, highlighting the influence of motivational factors, administrative support, student response, and awareness of students' language needs on teachers' utilization of digital technologies in their instructional practices.

Nouri *et al.,* shed light on developing computational thinking and general skills through programming, identifying thematic clusters encompassing computational thinking skills and general competencies such as digital literacy, cognitive abilities, collaborative aptitude, language proficiency, and creative problem-solving skills. Bonnah delves into the transformative pedagogy of Twitter, elucidating its potential in extending Learning beyond traditional classroom boundaries and fostering interactive capabilities among students, thereby enabling a socially conscious and inclusive approach to education.

Eppard *et al.,* underscore the crucial role of ongoing intrapersonal and interpersonal dialogue in educational applications, emphasizing its contribution to creating a conducive learning environment that promotes regular and consistent student engagement. Rodriguez-Ruiz *et al.,* demonstrate the efficacy of Natural Language Processing (NLP) tools in reducing biases and enhancing the validity and reliability of assessments of students' digital literacy skills, thereby offering valuable insights into improving evaluation practices in teacher training programs.

Sosnovskaya *et al.,* emphasize the effective utilization of visualization technology in training prospective teachers, particularly in mixed digital and traditional educational settings, highlighting its potential to enhance students' information processing, knowledge transfer, and communication skills. Karunaweera & Wah advocate for a more personalized and tailored approach to teacher training, utilizing the DigCompEdu framework as a diagnostic guide to address the diverse competency levels of educators, fostering their professional growth and development.

Tsagari investigates language assessment literacy among English language teachers (ELTs), providing valuable insights into their assessment practices and training priorities and offering recommendations to enhance their language assessment competencies.

Nikitina's study presents a comprehensive competence model for aspiring foreign language teachers rooted in analysing regulatory documents, international standards, and the subjective experiences of practical training. The proposed model encompasses communicative language, linguodidactic, quasi-professional methodological, and actual practical training elements, offering a versatile framework that aligns with educational and professional standards, thus informing the development of effective pedagogical programs.

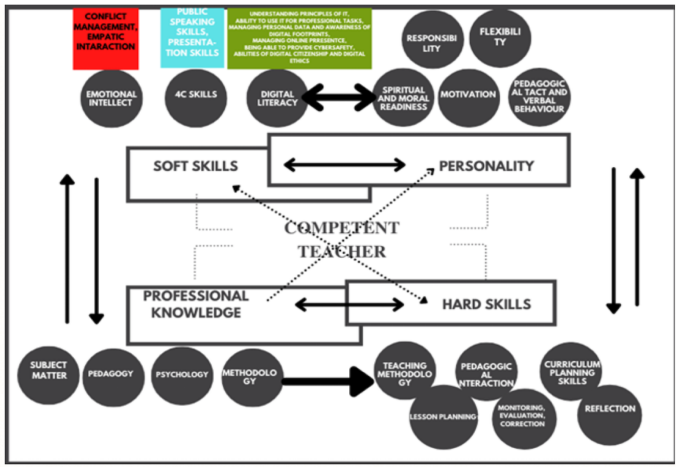

Fig. 4. Competency-based model of a teacher [20]

In conclusion, these studies contribute to the broader understanding and enhancement of teacher training in various domains. Nikitina's study provides a valuable and comprehensive competence model that can guide the preparation of future foreign language teachers.

4. Conclusions

Several key findings emerge from the studies reviewed in the context of online teaching and Learning. Moorhouse *et al.,* identified three additional competencies essential for effective language learning facilitation in online lessons: technological competencies, online environment management competencies, and online teacher interactional competencies. This highlights the importance of equipping teachers with the necessary skills to navigate online platforms and effectively engage students in virtual environments. Morawski & Budke investigated the impact of an Open Educational Resource (OER) unit on the argumentation competencies of student teachers and found promising results, suggesting the potential of digital learning units for enhancing specific teaching competencies. Skevi *et al.,* explored the effects of the COVID-19 pandemic on teachers' digital skills and motivation to integrate new technologies, revealing improvements in digital skills among teachers, particularly among younger male educators.

However, ongoing training opportunities for both educators and students were identified as crucial for further developing digital competencies. Custodio-Espinar & López-Hernández focused on teaching strategies in English Medium Instruction (EMI) courses and demonstrated that multimodal approaches, incorporating various forms of literacy and digital skills, promote student motivation and academic performance. Meier emphasized the importance of understanding the necessary skills in digital storytelling for effective teaching and learning practices. Samane-Cutipa *et al.,* highlighted the urgent need to address limited digital literacy levels among students and teachers through educational policies and curriculum integration. Butler advocated for using digital technology as a pedagogical tool while considering learners' linguistic behaviours and cognitive styles, emphasizing the role of teachers and parents in developing communicative competencies for the digital generation. Finally, Al-Awaid, found that EFL teachers at Jazan University exhibited competency, digital literacy, and high levels of online assessment use, with gender being the only significant difference observed. These findings collectively underscore the importance of providing teachers and students with the necessary technological and digital competencies, incorporating effective teaching strategies, and fostering continuous professional development to meet the evolving needs of digital learners.

The studies reviewed on challenges and opportunities for online education shed light on various aspects of the digital learning landscape. Al-Awaid, emphasizes the need for comprehensive media learning among Ecuadorian adolescents, highlighting the acquisition of audiovisual skills but the need for more social context, ethical values, and responsibilities associated with media literacy. The authors call for curriculum innovations in higher education that incorporate technological changes while promoting democratic values, tolerance, and sustainability. Manakul *et al.,* explore the smart teaching abilities of teachers in Thailand and identify variations across subjects, grade levels, and teaching experience. Their findings provide valuable insights for teachers' skills development and serve as a guideline for enhancing smart teaching ability in new learning environments. Moorhouse *et al.,* investigate language teachers' responses to students' educational and linguistic needs in online environments, emphasizing the adaptability and effectiveness of synchronous and asynchronous platforms. They propose the Digital Competence Evaluation framework to assess educators' digital competencies and enhance their preparedness for virtual teaching. Finally, Moreno *et al.,* discuss the development of a teacher's guide for digital games aimed at improving English proficiency among Filipino learners, emphasizing the importance of alternative means of assessment, inclusivity, and student engagement through e-artefacts. Collectively, these studies underscore the challenges and opportunities of online education, highlighting the importance of comprehensive media literacy, tailored skills development for teachers, adaptability in virtual instruction, and the integration of innovative approaches to enhance student engagement and learning outcomes.

The theme of integrating technology and pedagogy encompasses a diverse range of studies that highlight the significance of incorporating technology into teacher training and educational practices. These studies shed light on various aspects, such as programming-based learning experiences for pre-service teachers [42], the factors affecting the effectiveness of teacher training courses [7], the pedagogical use of corpus tools in language instruction [32], the impact of motivational factors on teachers' utilization of digital technologies [33] and the development of computational thinking and general skills through programming [34] Additionally, the transformative pedagogy of Twitter [35] the importance of ongoing dialogue in educational applications [36] the use of Natural Language Processing tools in assessment practices [37], the effective utilization of visualization technology in teacher training [38] and the personalized approach to teacher training using the DigCompEdu framework [39] are also discussed. Furthermore, the study on language assessment literacy in the English language [23] and the comprehensive competence model for foreign language teachers [20] provide valuable insights into assessment practices and the preparation of future language educators. These studies emphasize the need to integrate technology into pedagogical practices, enhance teacher training programs, and develop comprehensive frameworks that align with educational standards to prepare teachers for the digital era effectively.

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References

[1] Broza, Orit, Liat Biberman-Shalev, and Nurit Chamo. "“Start from scratch”: Integrating computational thinking skills in teacher education program." *Thinking Skills and Creativity* 48 (2023): 101285. https://doi.org/10.1016/j.tsc.2023.101285

[2] Suing, Abel, Juan-Pablo Arrobo-Agila, Ximena Coronado-Otavalo, Viviana Galarza-Ligña, and Amparo Reascos-Trujillo. "Audiovisual Competences in Times of COVID-19: The Role of Educational Actors in Media and Digital Learning of Adolescents." *Sustainability* 15, no. 7 (2023): 6323. https://doi.org/10.3390/su15076323

[3] Morawski, Michael, and Alexandra Budke. "Teaching Written Argumentation to High School Students Using Peer Feedback Methods—Case Studies on the Effectiveness of Digital Learning Units in Teacher Professionalization." *Education Sciences* 13, no. 3 (2023): 268. https://doi.org/10.3390/educsci13030268

[4] Kohnke, Lucas, Benjamin Luke Moorhouse, and Di Zou. "ChatGPT for language teaching and learning." *RELC Journal* (2023): 00336882231162868. https://doi.org/10.1177/00336882231162868
[5] Meniado, Joel C. "Digital Language Teaching 5.0: Technologies, Trends and Competencies." *RELC Journal* (2023): 00336882231160610. https://doi.org/10.1177/00336882231160610
[6] A. K. Kurmankulova, Z. K. Kiynova, and N. Z. Seraliyeva, "Professional development of kazakhstani rural teachers of russian language and literature in the context of digitalization of education." 2022. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85146515147&doi=10.32744%2Fpse.2022.5.38&partnerID=40&md5=2acd0057f2a613fbe96a62f92c20cca2
[7] Ihnatova, Olena, Olesia Zhovnych, and Larysa Drobakha. "The Effectiveness of Blended Learning in English Teacher Training." *Journal of Teaching English for Specific and Academic Purposes* (2022): 377-388. https://doi.org/10.22190/JTESAP2203377I
[8] Karoui, Aous, Lionel Alvarez, Thierry Geoffre, Nathalie Guin, Marie Lefevre, Valentin Lachand-Pascal, and Mario Ramalho. "Towards an automated adaptive learning web platform through personalization of language learning pathways." In *European Conference on Technology Enhanced Learning*, pp. 448-454. Cham: Springer International Publishing, 2022. https://doi.org/10.1007/978-3-031-16290-9_35
[9] Shimichev, Alexey S., Mira B. Rotanova, and Nikita S. Voevodin. "Formation of Future Foreign Language Teacher's Digital Competencies in the Pedagogical Management." In *2022 Conference of Russian Young Researchers in Electrical and Electronic Engineering (ElConRus)*, pp. 1740-1742. IEEE, 2022. https://doi.org/10.1109/ElConRus54750.2022.9755679
[10] Tupac-Yupanqui, Miguel, Cristian Vidal-Silva, Leopoldo Pavesi-Farriol, Aurora Sánchez Ortiz, Jesennia Cardenas-Cobo, and Felipe Pereira. "Exploiting Arduino features to develop programming competencies." *IEEE Access* 10 (2022): 20602-20615. https://doi.org/10.1109/ACCESS.2022.3150101
[11] Park, Moonyoung, and Jeong-Bae Son. "Pre-service EFL teachers' readiness in computer-assisted language learning and teaching." *Asia Pacific Journal of Education* 42, no. 2 (2022): 320-334. https://doi.org/10.1080/02188791.2020.1815649
[12] Wong, Kevin M., and Benjamin Luke Moorhouse. "Digital competence and online language teaching: Hong Kong language teacher practices in primary and secondary classrooms." *System* 103 (2021): 102653. https://doi.org/10.1016/j.system.2021.102653
[13] Moorhouse, Benjamin Luke, Yanna Li, and Steve Walsh. "E-classroom interactional competencies: Mediating and assisting language learning during synchronous online lessons." *RELC Journal* 54, no. 1 (2023): 114-128. https://doi.org/10.1177/0033688220985274
[14] Jose, Kshema. "Conversations through Web 2.0 tools: Nurturing 21st century Values in the ESL Classroom." *Rupkatha Journal on Interdisciplinary Studies in Humanities* 13, no. 2 (2021): 1-16. https://doi.org/10.21659/rupkatha.v13n2.35
[15] F. J. S. Martín, "The Integration of Technology and Its Pedagogical Adaptation to the Teaching of Spanish as a Foreign Language." 2021. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85139559137&doi=10.7311%2FITINERARIOS.33.2021.11&partnerID=40&md5=0ff0d91e0b9b62c390d0d55b5d23c518
[16] J. E. D. Cowin, "Education and globalization: Artificial intelligence, augmented reality digital technologies, and distributed ledger technology networks." 2021. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85118885558&partnerID=40&md5=243a6df250807637c7410b414a50e0a1
[17] Ipatov, Oleg, Sofia Saramaha, Darina Barinova, Anna Rubtsova, and Maria Odinokaya. "English as Medium of Instruction: Language and Content Combination in Digitized Higher Engineering Education." *Annals of DAAAM & Proceedings* 10, no. 2 (2021). https://doi.org/10.2507/32nd.daaam.proceedings.026
[18] Gavranović, Valentina, and Marijana Prodanović. "ESP Teachers' Perspectives on the Online Teaching Environment Imposed in the Covid-19 Era-A Case Study." *The New Educational Review* 64 (2021): 188-197. https://doi.org/10.15804/tner.21.64.2.15
[19] Ekin, Semih, Ufuk Balaman, and Fatma Badem-Korkmaz. "Tracking telecollaborative tasks through design, feedback, implementation, and reflection processes in pre-service language teacher education." *Applied Linguistics Review* 0 (2021). https://doi.org/10.1515/applirev-2020-0147
[20] Nikitina, G. A. "Complex competency-based model of the intending foreign language teacher." *Perspectives of Science & Education* 53, no. 5 (2021). https://doi.org/10.32744/pse.2021.5.15
[21] Hartono, Hartono, Nani Hidayati, and Wiyaka Wiyaka. "Pre-service English teachers' motivation to pursue a career in teaching viewed from speaking self-efficacy." *International Journal of Evaluation and Research in Education (IJERE)* 12, no. 1 (2023): 517-526. https://doi.org/10.11591/ijere.v12i1.23358
[22] Moher, D., A. Liberati, J. Tetzlaff, and D. G. Altman. "The PRISMA Group preferred reporting items for systematic reviews and meta-analyses." *PLoS Med* 6, no. 7 (2009): e1000097. https://doi.org/10.1371/journal.pmed.1000097

[23] Nayernia, Akram, Rana Nosrati, and Hassan Mohebbi. "The Factors Contributing to Language Teachers' Effectiveness in an EFL Learning Context: A Questionnaire Validation Study." *Profile Issues in TeachersProfessional Development* 24, no. 2 (2022): 63-79. https://doi.org/10.15446/profile.v24n2.93571
[24] Skevi, Olympia, José Luis Ortega-Martin, and Gracia González-Gijón. "Use of ICTs and the Digital Competences of Foreign Language Teachers before and during the State of Alarm." *Language Related Research* 14, no. 1 (2023): 145-166.
[25] Custodio-Espinar, Magdalena, and Alfonso López-Hernández. "Beyond Written-Linguistic Modes of Meanings: Multimodal Representations to Extend the Range of Literacy Learning in EMI Students." *Journal of Language Teaching and Research* 14, no. 1 (2023): 6-19. https://doi.org/10.17507/jltr.1401.02
[26] Meier, Stefan. "Digital Storytelling: A Didactic Approach to Multimodal Coherence." *Frontiers in Communication* 7 (2022): 906268. https://doi.org/10.3389/fcomm.2022.906268
[27] Samane-Cutipa, Virginia A., Ana M. Quispe-Quispe, Fabiola Talavera-Mendoza, and Cesar H. Limaymanta. "Digital Gaps Influencing the Online Learning of Rural Students in Secondary Education: A Systematic Review." *world* 1, no. 9 (2022): 10. https://doi.org/10.18178/ijiet.2022.12.7.1671
[28] Butler, Yuko Goto. "Language education in the era of digital technology." *jalt* 44, no. 1 (2022): 137. https://doi.org/10.37546/JALTJJ44.1-7
[29] Al-Awaid, Salmeen Abdulrahman Abdullah. "Online education and assessment: Profiling EFL teachers' competency in Saudi Arabia." *World Journal of English Language* 12, no. 2 (2022): 1-82. https://doi.org/10.5430/wjel.v12n2p82
[30] Manakul, Theeradej, Anucha Somabut, and Kulthida Tuamsuk. "Smart teaching abilities of junior high school teachers in Thailand." *Cogent Education* 10, no. 1 (2023): 2186009. https://doi.org/10.1080/2331186X.2023.2186009
[31] Balderas, Seira Vera, and Javier Moreno Tapia. "Las competencias docentes en la enseñanza del idioma inglés en un contexto universitario durante la pandemia de la COVID-19." *Universidad y Sociedad* 14, no. S1 (2022): 151-160.
[32] Asención-Delaney, Yuly, Joseph G. Collentine, Jersus J. Colmenares, and Alfredo Urzúa. "Training teachers to use corpus tools in the Spanish language classroom." *Journal of Spanish Language Teaching* 9, no. 2 (2022): 134-147. https://doi.org/10.1080/23247797.2022.2157082
[33] Mahapatra, Santosh Kumar. "Impact of digital technology training on English for science and technology teachers in India." *RELC Journal* 51, no. 1 (2020): 117-133. https://doi.org/10.1177/0033688220907401
[34] Nouri, Jalal, Lechen Zhang, Linda Mannila, and Eva Norén. "Development of computational thinking, digital competence and 21st century skills when learning programming in K-9." *Education Inquiry* 11, no. 1 (2020): 1-17. https://doi.org/10.1080/20004508.2019.1627844
[35] Bonnah, Theodore G. "Using Twitter to Increase L2 Interaction: Findings from a High-Functioning Japanese University ESL Class." *Ubiquitous Learning* 12, no. 1 (2019): 35. https://doi.org/10.18848/1835-9795/CGP/v12i01/35-53
[36] Eppard, Jenny, Amir Kaviani, Michael Bowles, and Jason Johnson. "EdTech Culturation: Integrating a Culturally Relevant Pedagogy into Educational Technology." *Electronic Journal of e-Learning* 19, no. 6 (2021): 516-530. https://doi.org/10.34190/ejel.19.6.2065
[37] Rodriguez-Ruiz, Jorge, Alvaro Alvarez-Delgado, and Patricia Caratozzolo. "Use of Natural Language Processing (NLP) Tools to Assess Digital Literacy Skills." In *2021 Machine Learning-Driven Digital Technologies for Educational Innovation Workshop*, pp. 1-8. IEEE, 2021. https://doi.org/10.1109/IEEECONF53024.2021.9733779
[38] Sosnovskaya, Irina Vitalevna, Nadezhda Ilinichna Nikonova, Svetlana Yrievna Zalutskaya, Nina Pavlovna Terentyeva, and Elena Olegovna Galitskyh. "Visualization Practices in Training Pedagogy Students." *Webology* 18 (2021). https://doi.org/10.14704/WEB/V18SI04/WEB18188
[39] Karunaweera, A. Sajani, and Lee Kean Wah. "Measuring digital competence: An exploratory study mapping digital competence profiles of Sri Lankan English language teachers." *Asia Pacific Journal of Educators and Education* 36, no. 1 (2021): 93-112. https://doi.org/10.21315/apjee2021.36.1.6
[40] Tsagari, Dina. "Gauging the Assessment Literacy Levels of English Language Teachers in Norway." *The European Journal of Applied Linguistics and TEFL* 10, no. 1 (2021): 161-192.
[41] Moreno, Ma Monica L., Dominique Marie Antoinette Manahan, Marika Gianina Fernandez, Jose Isidro Beraquit, Nicole Bugayong, and Ma Mercedes T. Rodrigo. "The Development of a Teacher's Guide for English Proficiency Games." (2019).
[42] Abdullah, Norillah, Sharifah Sariah Syed Hassan, Mohamed Abdelmagid, and Siti Nazilah Mat Ali. "Learning from the Perspectives of Albert Bandura and Abdullah Nashih Ulwan: Implications towards the 21st Century Education." *Dinamika Ilmu* 20, no. 2 (2020): 199-218. https://doi.org/10.21093/di.v20i2.2423