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E-Learning Application and Teacher Autonomy: A Comprehensive Review

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ABSTRACT

The integration of technology in education has transformed the traditional teaching and learning landscape, giving rise to various innovative approaches. One such approach is e-learning, which refers to the use of electronic devices and internet platforms to deliver educational content. With the increasing availability and accessibility of digital resources, e-learning has gained significant attention in recent years. However, challenges related to teacher readiness and technological limitations must be addressed to harness the benefits of e-learning for teacher autonomy fully. This paper applied the PRISMA approach in finding the primary data based on keywords such as "e-learning, teacher, autonomy, school". Based on advanced searching on SCOPUS and Web of Science, we found (n=33). Expert scholars decided to develop three themes, which are [1] The Role of E-Learning in Empowering Teachers, [2] Challenges and Barriers in Implementing E-Learning for Teacher Autonomy, [3] Promoting Teacher Autonomy through Effective E-Learning Design. Future research should focus on exploring effective strategies for integrating e-learning applications into different educational contexts, addressing the specific needs and challenges faced by teachers. Additionally, investigating the impact of e-learning on teacher autonomy and professional development can provide valuable insights for educational policymakers and practitioners.

Keywords:
E-learning; teacher; autonomy; school

1. Introduction

In the rapidly evolving landscape of education, the integration of technology has been a transformative force, redefining pedagogical approaches and reshaping the roles of educators. One of the key developments in this regard is the emergence of e-learning, which refers to using electronic technologies to facilitate educational activities, both in traditional classroom settings and online environments [1, 2]. E-learning offers numerous advantages, such as flexibility, accessibility, and the ability to personalize learning experiences [3, 4]. These advantages have led to its widespread adoption in educational institutions worldwide. E-learning applications, in particular,

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have emerged as powerful tools that promise to enhance teachers' autonomy in the digital [5]. This structured review delves into the intersection of e-learning applications and teacher autonomy, shedding light on the evolving relationship between technology and pedagogy. Teacher autonomy, a foundational principle in education, pertains to educators' ability to exercise independent judgment, decision-making, and creativity in their teaching practices [6, 7]. Historically, this autonomy was predominantly manifest in traditional classroom settings. However, as education increasingly transcends physical boundaries and engages learners in virtual spaces, the concept of teacher autonomy has extended its reach into the digital realm.

This comprehensive review explores the multifaceted ways in which e-learning applications empower educators to exercise greater autonomy over their instructional methods, course content, and student engagement strategies. In doing so, we seek to provide a comprehensive overview of the current state of e-learning applications, identify trends and challenges, and offer insights into the potential benefits and pitfalls of technology-enhanced teacher autonomy. Figure 1 shows the characteristics of e-learning applications that have the potential to empower teachers by providing them with a broader range of instructional resources, personalized learning environments, and opportunities for professional development. The study discusses how e-learning applications empower teachers to exercise greater autonomy in their instructional practices, course design, and engagement strategies. It addresses the gap in understanding the impact on teacher autonomy in the evolving digital education landscape. The review provides a holistic overview of the current state and potential advantages and drawbacks of technology-enhanced teacher autonomy. It explores tools, strategies, and best practices that promote independence and creativity among educators and offers insights and recommendations for future research in this area. The article contributes to the continuous improvement of educational practices and the empowerment of teachers in the digital age.

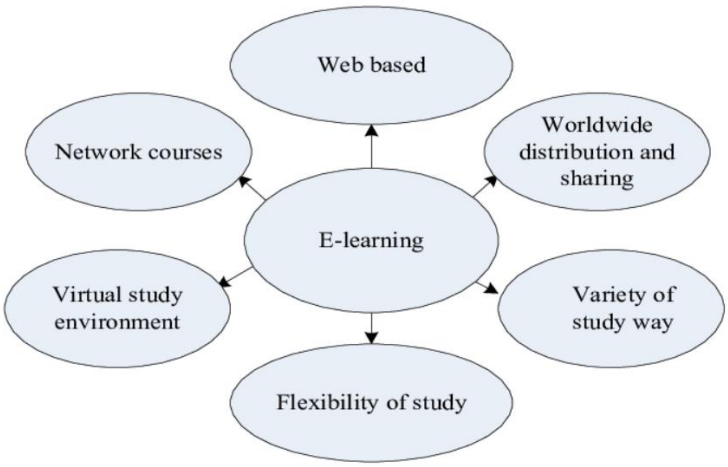

Fig. 1. Characteristics of e-learning [8]

2. Literature Review

In recent times, there has been a notable transformation in the realm of education, with a substantial shift towards the utilization of digital platforms and e-learning applications. This all-encompassing analysis endeavors to investigate the influence of e-learning on the autonomy of teachers, delving into the advantages and obstacles associated with this pioneering approach. Through the scrutiny of extant research, this review aspires to offer valuable insights into the

significance of e-learning in empowering educators and fostering their professional growth.

2.1 E-Learning

The education field has witnessed a significant shift towards digital platforms and e-learning applications. E-learning offers numerous advantages that contribute to the enhancement of teacher autonomy [9]. Peng *et al.,* [10] discovered digital learning provides teachers with a flexible and personalized learning environment. Moreover, e-learning platforms offer a wide range of interactive tools and resources, enabling teachers to explore innovative teaching methods and incorporate digital content into their lessons [11]. Furthermore, e-learning encourages self-directed learning among educators [12]. By engaging in online courses and virtual communities of practice, teachers can take ownership of their professional development, choosing topics and resources that align with their interests and areas of expertise. This autonomy empowers educators to become lifelong learners, continuously updating their knowledge and skills to meet the evolving demands of the education sector [13].

While e-learning presents numerous benefits, it also challenges teacher autonomy. One significant concern is the potential for digital overload and information overload [14]. With the vast resources available online, teachers may find it challenging to navigate the abundance of information and select the most relevant and reliable sources. This issue calls for the development of digital literacy skills and critical thinking abilities among educators to effectively utilize e-learning platforms [15]. Furthermore, the lack of face-to-face interaction in e-learning environments can impede the formation of interpersonal bonds between professors and students. Building rapport and understanding student needs may be more challenging through virtual channels, potentially impacting the effectiveness of instruction and teacher-student engagement. Consequently, teachers must leverage various communication tools and strategies to foster meaningful connections and maintain a supportive learning environment.

E-learning applications have the potential to significantly impact teacher autonomy in the modern educational landscape [16]. The benefits of e-learning, such as flexibility, personalization, and self-directed learning, empower educators to enhance their professional growth and adapt to the ever-changing demands of the education sector. However, challenges surrounding digital overload and limited interpersonal interactions necessitate cultivating digital literacy skills and implementing effective communication strategies [16, 17]. By addressing these challenges, educational institutions can harness the full potential of e-learning, fostering an environment that promotes teacher autonomy and ultimately enhances the quality of education.

2.2 Teacher Autonomy

Educators' degree of freedom and independence in making decisions about their teaching practices, curriculum design, and assessment procedures is referred to as teacher autonomy. It includes instructors' professional judgment in adapting their instruction to meet the different needs of their students and linking it with educational goals [18]. Teacher autonomy is vital in fostering creativity, innovation, and a sense of ownership within the teaching profession. E-learning applications offer a wide range of tools and resources that empower teachers to control their teaching practices. These applications allow educators to design personalized learning experiences, select appropriate teaching materials, and adapt instructional strategies to suit individual student needs. By leveraging e-learning platforms, teachers can transcend time and space constraints, allowing for asynchronous learning and remote instruction. Furthermore, e-learning applications

often include features that enable teachers to track student progress, collect data, and analyze learning outcomes [16]. This data-driven approach empowers educators to make informed decisions about their teaching methods, identify areas for improvement, and provide targeted interventions. The availability of real-time feedback and assessment data enhances teacher autonomy by enabling educators to customize their instructional approach to optimize student learning.

A large volume of published studies describing the integration of e-learning applications in classrooms offers several benefits that promote teacher autonomy. As Rawashdeh *et al.,* [4] state, educators can leverage the tools to access a vast array of educational resources, including multimedia content, simulations, and interactive learning materials. This abundance of resources allows teachers to diversify their instructional strategies, cater to different learning styles, and foster a more inclusive learning environment. Moreover, e-learning applications facilitate collaboration and networking among teachers [18]. Besides, teachers' autonomy in designing lessons and incorporating digital tools was influenced by factors such as the features of the lesson plan and the articulation between student autonomy and digital technologies. Online platforms and forums allow educators to share ideas, best practices, and innovative teaching methods. This collaborative environment empowers teachers to expand their professional network, exchange knowledge, and reflect on their teaching practices, enhancing their autonomy. However, it is important to acknowledge the challenges that come with the integration of e-learning applications. Kadel [20] identified challenges to teacher autonomy in digital applications, including the lack of access to online resources, limited autonomy in curriculum design, and a lack of support for professional development and collaboration. These challenges can hinder teachers' ability to integrate digital technology into their teaching practice effectively [20]. Teachers may face a learning curve when adapting to new technologies and navigating the complexities of these platforms [21]. Additionally, the reliance on technology can sometimes limit teacher autonomy, as educators may feel bound by the constraints imposed by the e-learning system or the embedded curriculum [16]. Therefore, it is crucial for educational institutions to provide support and professional development opportunities to enable teachers to integrate e-learning applications while preserving their autonomy effectively.

The study explores the integration of serious games and problem-based learning to bridge the gap between students' daily experiences and educational pursuits, highlighting the potential benefits of this approach. The model allows teachers to create games based on problems [22]. The main scientific contribution of this work is related to teachers' autonomy, creating a motivating learning environment, and fostering the relationship between theory and practice. Another study reported initial evidence of teacher autonomy in subject time allocation within the context of computer-based instruction implementation, and further study is needed to illuminate drivers of teacher's decisions [23]. Studies have shown that learner autonomy plays a decisive role in online learning. However, teachers' autonomy supportiveness is still under-researched, considering the lack of an appropriate context-specific scale for the investigation of online teachers' autonomy support [24]. Recent evidence suggested that teachers of English in China may be encouraged to develop greater autonomy, both as teachers and learners, through e-learning in an interactive learning environment [5].

3. Methodology

3.1 Identification

In order to select suitable papers for this report, a structured review process was employed,

consisting of three main phases. The initial phase involved identifying keywords and exploring related terms using resources such as thesauruses, dictionaries, encyclopedias, and previous studies. Once the relevant keywords were established, search strings were created for the Scopus and WoS databases, as detailed in Table 1. During the first step of the systematic review process, a total of 847 papers were successfully retrieved from both databases for further analysis.

Table 1
The search string

Scopus	TITLE-ABS-KEY ((electronic OR digital OR technology) AND (learning OR education) AND teacher AND autonomy AND school) AND PUBYEAR > 2021 AND PUBYEAR < 2024 AND (LIMIT-TO (SUBJAREA, "SOCI")) AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (PUBSTAGE, "final"))
WoS	(electronic OR digital OR technology) AND (learning OR education) AND teacher AND autonomy AND school (Topic) and Preprint Citation Index (Exclude – Database) and 2023 or 2022 (Publication Years) and Article (Document Types) and English (Languages and Social Sciences (Research Domains)

3.2 Screening

In the initial screening phase, 84 papers were selected for further evaluation based on the scholars' specific inclusion and exclusion criteria. Subsequently, the study proceeded to the second stage, wherein duplicate papers were eliminated, resulting in the exclusion of 7 papers. The primary criterion utilized in this screening process was literature, particularly research articles, which serve as the primary source of practical advice. Additionally, systematic reviews, reviews, meta-synthesis, meta-analyses, books, book series, chapters, and conference proceedings that did not align with the latest research were excluded. Moreover, the review was confined to publications written in the English language. It is important to note that the timeframe for this study spanned the years 2022 and 2023. Consequently, a total of 33 publications remained after applying the specific criteria for elimination.

Table 2
The selection criterion for searching

Criterion	Inclusion	Exclusion
Language	English	Non-English
Timeline	2022 – 2023	< 2022
Literature type	Journal (article)	Conference, book, review
Publication stage	Final	In Press
Subject area	Social Science	Besides Social Science

3.3 Eligibility

During the third stage, which is the eligibility phase of the study, a comprehensive list of 77 articles was compiled. Each article's title and key content were carefully examined to ensure alignment with the inclusion criteria and study objectives. A total of 44 reports that were unrelated to the research or not in a journal article format were excluded. These reports included articles with non-significant titles and abstracts unrelated to the study's objectives. Consequently, 33 articles that met the criteria for review remained. For more information, please consult Figure 2.

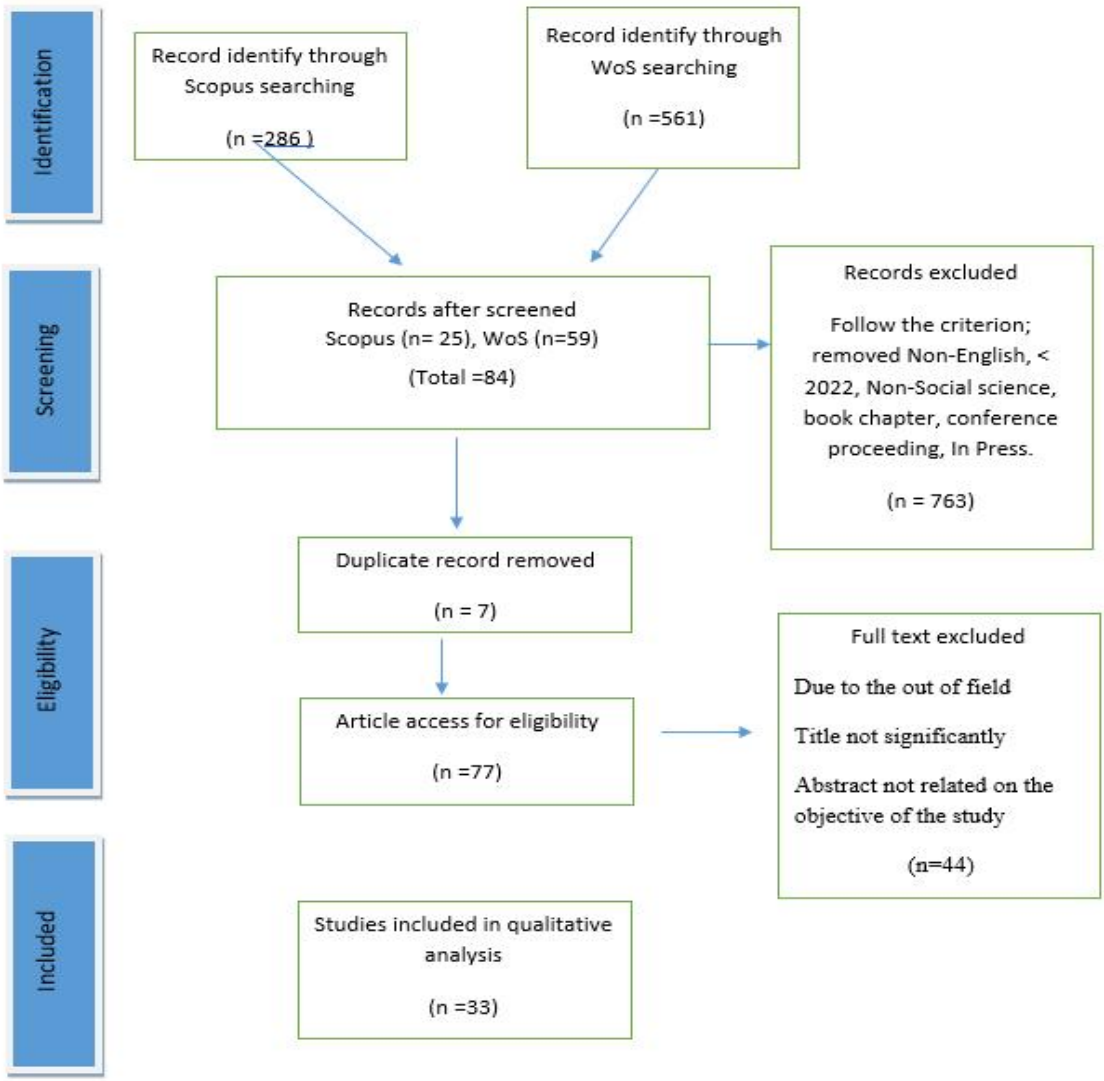

Fig. 2. Flow diagram of the proposed searching study [25]

3.4 Data Abstraction and Analysis

In this study, an integrative analysis was performed as one of the assessment approaches used to examine and synthesize several research designs (qualitative, quantitative, and mixed methodologies). Expert research focused on establishing relevant subjects and sub-topics. The data collection phase was the first step in the theme's development. The authors carefully analyzed 33 papers for statements or material addressing questions raised by this current study. The writers and experts next assess current studies' e-learning application and teacher autonomy situation, determining and forming relevant groups in the second stage. The three main themes that emerged from the approach are [1] The role of e-learning in empowering teachers, [2] Challenges and barriers in implementing e-learning for teacher autonomy, [3] promoting teacher autonomy through effective e-learning design (refer to Table 3). 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 any 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 problems, two experts performed the examinations, one specializing in educational management & leadership and the other in educational leadership & instructional supervision. The expert review phase helped ensure each sub-theme's clarity, importance, and adequacy by establishing domain validity. Adjustments based on the author's discretion based on expert feedback and comments have been made.

4. Results

In the dynamic and ever-changing realm of education, the incorporation of technology has emerged as a prominent catalyst, revolutionizing conventional teaching approaches and providing educators with unprecedented prospects for professional development. In this particular milieu, electronic learning applications have emerged as a promising avenue for bolstering teacher autonomy, facilitating educators in assuming control over their instructional methods and tailoring them to the specific requirements of their students. Based on the search technique, 33 articles were extracted and assessed. All articles were categorized based on three key themes: the importance of e-learning in empowering teachers (15 articles), obstacles and barriers in adopting e-learning for teacher autonomy (10 articles), and fostering teacher autonomy through e-learning design (8 articles).

Table 3
The research article's findings are based on themes

Authors	Title	Year	Source Title	Scopus	Web of Science	Theme
Peng *et al.,* [10]	Examining ICT attitudes, use and support in blended learning settings for students' reading performance: Approaches of artificial intelligence and multilevel model	2023	Computers and Education	/		Theme 1
Martín *et al*., [15]	Self-Assessment and Pre-Service Teachers' Self-Regulated Learning in a School Organisation Course in Hybrid Learning	2022	Journal of Interactive Media in Education	/		Theme 3
Prasetiyo *et al.,* [26]	Promoting Digital Citizenship among Student-Teachers: The Role of Project-Based Learning in Improving Appropriate Online Behaviors	2023	Participatory Educational Research	/		Theme 2
Inga-Avila *et al.,* [27]	Determinants of University Students' Satisfaction with Information Technology based classroom use by pandemic Covid19	2022	International Journal of Data and Network Science	/		Theme 1
Fearn [28]	Online Community Projects: Learner-Centred Digital Mediation Tools for Secondary-	2023	Teaching English with Technology	/		Theme 3

	School English as A Foreign Language Curricula				
Rice [29]	Special Education Teachers' Use of Technologies During the COVID-19 Era (Spring 2020-Fall 2021)	2022	Tech trends	/	Theme 3
Bellier *et al.,* [30]	Analysis of a multifaceted interactive pedagogy program in an upper limb anatomy course: A time series study	2023	Anatomical Sciences Education	/	Theme 1
Wang *et al.,* [31]	Opportunities to learn literacy in digital classrooms in New Zealand primary schools: Does class achievement level make a difference?	2023	Teaching and Teacher Education	/	Theme 1
Tzankova *et al.,* [32]	Emergency online school learning during COVID-19 lockdown: A qualitative study of adolescents' experiences in Italy	2023	Current Psychology	/	Theme 3
Chiu [33]	Student engagement in K-12 online learning amid COVID-19: A qualitative approach from a self-determination theory perspective	2023	Interactive Learning Environments	/	Theme 1
McBrayer *et al.,* [34]	Computer-Based Formative Assessment Practices of Core Academics Within a One-To-One Computing Environment	2023	International Journal of Instruction	/	Theme 2
Liao *et al.,* [35]	How technology-enhanced experiential e-learning can facilitate the development of person-centered communication skills online for health care students: a qualitative study	2022	BMC Medical Education	/	Theme 2
Mantilla *et al.,* [36]	Design, development, and evaluation of divtcell app: Gamifying eukaryotic cell division and its effects on academic achievement	2023	Jurnal Pendidikan Ipa Indonesia	/	Theme 2
Larsen and McCormick [37]	Fostering professional responsibility through high-quality professional learning opportunities	2022	Teacher Development	/	Theme 1
Fabian *et al.,* [38]	Identifying factors influencing study skills engagement and participation for online learners in higher education during COVID-19	2022	British Journal of Educational Technology	/	Theme 1

Kerssens and Dijck [39]	Governed by Edtech? Valuing Pedagogical Autonomy in a Platform Society	2022	Harvard Educational Review	/	Theme 1
Hathaway *et al.,* [40]	Teachers' online preparedness in times of crises: trends from Norway and US	2023	Education and Information Technologies	/	Theme 2
Larranaga *et al*., [41]	Perceived opportunities and needs among Primary Education teachers for the educational use of ICT	2023	Educar	/	Theme 3
Yap *et al.,* [42]	Exploring practices of multiliteracies pedagogy through digital technologies: a narrative inquiry	2023	Literacy	/	Theme 3
Cuskelly *et al.,* [43]	Commercial triage in public schooling: COVID-19, autonomy and 'within system' inequality	2023	Journal of Educational Administration and History	/	Theme 2
Tzankova *et al.,* [32]	Emergency online school learning during COVID-19 lockdown: A qualitative study of adolescents' experiences in Italy	2023	Current Psychology	/	Theme 2
Peng *et al.,* [10]	Examining ICT attitudes, use and support in blended learning settings for students' reading performance: Approaches of artificial intelligence and multilevel model	2023	Computers & Education	/	Theme 2
Suriagiri *et al.,* [44]	Online Vs. In-Campus, Comparative Analysis of Intrinsic Motivation Inventory, Student Engagement and Satisfaction: A Way Forward for Post COVID-19 Era	2022	Electronic Journal of E-Learning	/	Theme 2
Valverde *et al.,* [45]	Pedagogical change and innovation culture in secondary education: a Delphi study	2023	Frontiers in Education	/	Theme 2
Wang *et al.,* [46]	Teacher beliefs, classroom process quality, and student engagement in the smart classroom learning environment: A multilevel analysis	2022	Computers & Education	/	Theme 3
Nunvarova *et al.,* [47]	Effectiveness of Digital Storytelling in Teaching Economics	2023	Education Sciences	/	Theme 1

Xia *et al.,* [12]	The moderating effects of gender and need satisfaction on self-regulated learning through Artificial Intelligence (AI)	2023	Education and Information Technologies	/	Theme 3
Guo *et al.,* [48]	The Mechanism of Influence Between ICT and Students' Science Literacy: A Hierarchical and Structural Equation Modelling Study	2022	Journal Of Science Education and Technology	/	Theme 1
Waghid [49]	Teacher educators' pedagogical practices in global citizenship education using the soft vs critical GCE framework	2023	Cogent Education	/	Theme 1
Khadka *et al.,* [50]	Teachers' Humanistic Role in Teaching Mathematics Online During the COVID-19 Pandemic in Nepal	2023	International Journal of Distance Education Technologies	/	Theme 1
Cao and Zenah [51]	Integration of computer-based technology in a smart environment in an EFL structures	2022	Smart Structures and Systems	/	Theme 1
Munson and Evthokia [52]	Getting A Foot in the Door Examining Content-Focused Coaches' Strategies for Gaining Access to Classrooms	2022	Elementary School Journal	/	Theme 3

4.1 The Role of E-Learning in Empowering Teachers

This theme focuses on the ways in which e-learning applications can enhance teacher autonomy. It examines how technology can serve as a tool to facilitate instructional delivery, enable personalized learning experiences, and provide opportunities for self-assessment and professional development. Previous studies have reported that e-learning plays a crucial role in empowering teachers in blended learning settings, as evidenced by the findings in a few studies [10]. These studies shed light on various aspects of e-learning and its impact on both educators and students. However, more recent studies confirmed that the educators involved in these studies faced unique challenges and opportunities as they navigated through different phases of e-learning, including the initial shutdown, the transition to online learning, the hybrid instructional approach, and the eventual return to normalcy. This highlights the need for teachers to adapt and embrace e-learning tools to meet the evolving needs of their students [27, 28].

Researchers have studies that showed that classes with high and low average achievement levels at the beginning of the school year had some differences in teachers' instructional practices and student learning activities. In particular, students from classes with lower average achievement tended to experience instruction with tighter constraints that provided less autonomy in their learning [31]. Recent evidence found a notable implication drawn from previous studies is the importance of providing sustained support to teachers. Teachers who received ongoing support were better equipped to

integrate technology into their teaching practices [31] effectively. This support allowed teachers to continue using technologies that they found beneficial and enjoyable for enhancing student learning [30], emphasizing the role of e-learning as a continuous professional development tool for educators.

Furthermore, e-learning also significantly impacted student engagement and learning outcomes [46], [47]. The implementation of multifaceted interactive pedagogy programs had a substantial impact on students' comprehension of theoretical concepts, their overall satisfaction, and their investment in learning [30]. This suggests that e-learning tools can empower teachers to create engaging and effective student learning experiences. Numerous studies have attempted to highlight the importance of online learning environments that foster student autonomy. Such environments stimulate cognitive engagement and nurture essential lifelong skills in digital literacy and self-regulated learning. Conversely, environments lacking emotional attachment and adequate resources can diminish students' cognitive and emotional engagement. These findings underscore the pivotal role of e-learning in creating learner-centered environments and empowering teachers to design and implement effective online learning experiences [3].

The studies also revealed that e-learning can positively impact teachers' professional development [37]. Participating teachers adapted their teaching practices to align with research-based methods, indicating the potential for e-learning to support ongoing teacher growth and development. Additionally, it was found that e-learning played a role in addressing gender differences in students' self-regulated learning. The satisfaction of the need for autonomy and competence, mediated by e-learning tools, had varying effects on different gender groups [13]. This highlights how e-learning can be used to tailor educational experiences to individual student needs and preferences. A large and growing body of literature has investigated the students who best self-regulated their learning and were more realistic in their self-assessment of their work. However, they were not the highest achievers in some cases in terms of the final assessment of the assignment [35]. Moreover, in the context of science literacy, e-learning was found to impact students' development of this crucial skill significantly. Both student-level and school-level factors related to ICT influenced science literacy outcomes, emphasizing the role of e-learning in enhancing students' academic achievements [48]. Another study indicated the accuracy of utilizing Teaching-Learning-Based Optimization (TLBO) in analyzing the survey results and the potential for students to learn English as a foreign language using computers [51].

On the other hand, the research reveals significant barriers, such as a lack of technology, a predominant focus on content over meaningful dialogue, and the implications of using either a soft or critical GCE approach [49]. These results underscore the need for addressing these challenges to effectively facilitate respectful discussions and cultivate critical global citizenship in students. Previous studies found that when the blended synchronous learning environment affects the cognitive input, extrinsic motivation is the mediating variable. In the process of the blended synchronous learning environment affecting both cognitive input and shallow cognitive input, intrinsic motivation has the mediating effect, extrinsic motivation has a significant positive influence on intrinsic motivation, and in the process of blended synchronous learning environment affecting cognitive input, extrinsic motivation, and intrinsic motivation have chain mediating effect [49].

These studies demonstrate that e-learning is a powerful tool that empowers teachers to enhance their teaching practices, engage students, and improve learning outcomes. E-learning equips educators with the means to navigate the ever-evolving educational landscape and tailor their approaches to meet the diverse needs of their students.

4.2 Challenges and Barriers to Implementing E-Learning for Teacher Autonomy

The findings presented in this collection of studies shed light on the challenges and barriers faced in implementing e-learning while striving to promote teacher autonomy within the educational landscape. These challenges and barriers are closely intertwined with the broader context of digital citizenship, teacher autonomy in technology integration, and the effectiveness of instructional technology.

One of the overarching challenges identified is the need to address technology overuse and ensure responsible digital citizenship among students and educators [26]. The study underscores the importance of providing moral guidance within the framework of digital citizenship. Student-teachers recognize that digital citizenship encompasses principles encompassing knowledge, skills, and appropriate behavior to ensure technology's safe and responsible use. This implies that while promoting e-learning, educators must also instil a sense of responsibility and ethical use of technology, which can be challenging in an increasingly digitalized world. The present research findings reveal a complex relationship between teacher autonomy and the integration of technology, particularly Computer-Based Formative Assessment (CBFA). A significant positive correlation is observed between CBFA usage rates, teacher comfort with technology, and the perceived benefits of using technology. However, this correlation is juxtaposed with a negative relationship between teacher autonomy in selecting teaching methods and CBFA usage rates. This suggests that while teachers more comfortable with technology tend to use it more extensively, those who desire greater autonomy in selecting their teaching methods may be less inclined to use CBFA [34]. This tension between autonomy and technology integration presents a challenge for educators.

The study conducted by Cuskelly *et al.,* [43] examine the shifting perceptions and practices of school principals in the face of the COVID-19 pandemic. Prior to the pandemic, principals primarily viewed their schools as procurers of commercial services for administrative support and teacher professional development. However, the sudden closure of schools necessitated a rapid shift towards the commercialization of technological infrastructure, online learning platforms, video conferencing software, and digital tools for community engagement. The findings of the study highlight the crucial role of educational leadership and professional development in addressing the challenges brought about by these shifts. To effectively navigate the implementation of instructional technology, researchers recommend that school leaders promote purposeful, collaborative, and sustainable professional learning opportunities. This approach can help bridge the differing perceptions among educators regarding the use of instructional technology. Furthermore, the study suggests that teachers should be given a voice in selecting Computer-Based Formative Assessment (CBFA) applications used with their students. This recommendation emphasizes the importance of administrative directives that support the use of CBFA applications while simultaneously allowing for teacher autonomy. Creating an environment that balances teacher autonomy with effective technology integration is crucial in ensuring the successful implementation of instructional technology in schools.

In the quest for effective e-learning, the study results offer insights into enhancing learning outcomes and student engagement. The research identifies key themes related to translating theory into practice, enhancing authenticity through analytical features, and maintaining autonomy through non-directive learning [35]. These themes highlight the significance of features such as accessibility, flexibility, interactivity, and visualization in e-learning, coupled with remote accessibility, flexibility, repetition, retrospection, feedback solicitation, and visualized analytical reports. These features enhance learning outcomes, but the challenge lies in effectively implementing and integrating them into educational practices. Moreover, the evaluation results further demonstrate the positive impact of technology integration on academic achievement. Significant improvements in academic achievement are noted after the implementation of technology-based applications [36]. Game elements, such as badges, leaderboards, challenges, and autonomy, are identified as essential motivators for students in their

learning journeys. This suggests that a carefully designed e-learning environment incorporating gamification elements can positively influence students' academic achievement.

In the context of e-learning during the pandemic, the study findings shed light on teacher preparedness, collaboration, and the need for adaptation. Teachers were required to make technical decisions amidst the crisis, highlighting teacher preparedness's importance in effectively using technology [40]. However, the findings also indicate that some teachers may experience a lack of autonomy in their decision-making, which can be exacerbated by decreasing central support. Collaboration and networks become essential avenues for addressing these challenges. As for student perspective and adaptation, the study reveals related students' perspectives on the changes in Online Synchronous Learning (OSL). While OSL introduced flexibility and autonomy in learning organizations, it also presented challenges related to organization, increased demands, concentration difficulties, stress, and strained relationships [32]. This underscores the importance of adapting teacher-student relationships and collaborative learning to enhance schools' preparedness for digital transitions during emergencies and in regular contexts. The study on reading education reveals complex relationships between various factors, including students' perceived autonomy and competence in ICT, reading format preferences, school ICT resources, and policies [10]. These factors are found to impact reading performance, suggesting that navigating the intricate web of technology integration in education requires careful consideration of multiple variables.

The post-COVID-19 era is seen as an opportunity to incorporate a hybrid mix of blended learning, combining both online and on-campus methods to optimize learning outcomes in terms of engagement and student satisfaction. However, the study indicates that autonomy and belongingness more substantially impact engagement within physical campuses than online learning [18]. This presents a challenge in achieving a seamless balance between the two modes of instruction. Another result revealed that students' perceived autonomy and competence in ICT, preference for different reading formats, quality of school ICT resources, and school ICT use policies are positively related to reading performance. In contrast, school ICT use support for teachers and the teaching of ICT skills are negatively related to students' reading scores [44]. Finally, the study's results emphasize the importance of digital competence and educational innovation. Teachers' digital competence is identified as a critical factor in addressing challenges and barriers related to technology integration. Moreover, the findings highlight limitations in Secondary Education, including curricular inflexibility, a lack of leadership for change, a technocentric perspective on educational innovation, and insufficient training in digital competence for teachers [46]. These limitations underscore the need for comprehensive strategies to enhance digital competence and promote educational innovation.

In summary, the challenges and barriers in implementing e-learning for teacher autonomy encompass a complex interplay of factors, including digital citizenship, technology integration, educational leadership, professional development, learning outcomes, academic achievement, teacher preparedness, student perspectives, and digital competence. Addressing these challenges requires a multifaceted approach that recognizes educators' and students' diverse needs and perspectives in the digital age.

4.3 Promoting Teacher Autonomy through Effective E-Learning Design

This theme focuses on the design principles and strategies that can maximize teacher autonomy in e-learning settings. It explores the importance of providing teachers with agency and control over the learning process, including the ability to customize content, design assessments, and track student progress. The review will analyze empirical studies that demonstrate the positive effects of e-learning on teacher autonomy. The previous study's findings shed light on the intricate relationship between self-

regulated learning and students' self-assessment, emphasizing that self-awareness and self-assessment are not synonymous with final academic outcomes [36]. This insight underscores the significance of promoting self-regulation as part of effective e-learning design, where learners are encouraged to assess and reflect on their progress independently. Another research revealed the learner-centered qualities of Out-of-Classroom Practice (OCP) activities and their substantial impact on secondary-school English as a Foreign Language (EFL) curricula. These findings highlight the importance of integrating learner – centered approaches into e-learning design and educational practices, as they can empower teachers to create more autonomous and student-focused online learning environments [28].

In the context of e-learning design, it's noteworthy that the autonomy dimension received a notably high value in the descriptive analysis. This underscores the importance of autonomy as a valued dimension among respondents, reinforcing the idea that effective e-learning should allow learners to exercise autonomy in their learning processes [32]. Another finding emphasizes the need for e-learning designers to carefully consider balancing real learning experiences, learner autonomy, and overall learner satisfaction, offering a valuable guideline for promoting teacher autonomy through effective e-learning design [41]. It found differences in teachers' digital competencies and observed that digitalization requires time, dedication, and training, which requires greater autonomy in schools. The present finding also revealed that teachers focused their efforts on facilitating the inclusive use of technologies, evaluating and modifying digital instructional materials, and managing the tension between wanting the autonomy to choose technologies while needing organized, sustained support [29]. Implications of this study include considerations for the supporting teachers in sustaining the use of technologies that they enjoyed using and found useful for students.

In the realm of literacy education, where digital technologies are integral, the study emphasizes the autonomy teachers have in designing literacy programs. It also calls for a deeper understanding of how teachers perceive and implement multiliteracies pedagogy (MLP) to harness the potential of digital and multimodal texts [42]. This underscores the importance of e-learning design that supports teachers in effectively implementing MLP, thereby promoting teacher autonomy in literacy education. Furthermore, the study's insights into student engagement, classroom process quality, and the role of teacher education level, beliefs, gender, and teaching grade in the smart classroom context provide valuable guidance for e-learning designers [46]. Effective e-learning design should consider these factors to create engaging and quality online learning environments that empower teachers and promote their autonomy in instructional practices. Another study highlights strategies coaches employ to gain access to classrooms for professional development and offers lessons for e-learning designers. Understanding how coaches navigate the complex dynamics of classroom access provides insights into creating effective e-learning modules that respect and promote teacher autonomy within the digital learning landscape [52]. Effective e-learning design should incorporate provisions for teacher professional development, enhancing their digital competence and autonomy in integrating technology into their teaching practices.

By exploring these three themes, this structured review aims to comprehensively understand the potential benefits, challenges, and strategies related to e-learning applications in fostering teacher autonomy. Through a critical analysis of existing literature, this study will contribute to the existing body of knowledge and inform future research and practice in the field of e-learning and teacher autonomy.

5. Discussion and Conclusions

The result conversation begins with the first theme, which is about the importance of e-learning in empowering teachers. It dives into how e-learning applications enable teachers to improve their instructional practices and increase student engagement. E-learning is crucial for empowering teachers, improving instructional practices, and increasing student engagement. It supports

personalized learning experiences, self-assessment, and professional development. E-learning improves student comprehension, supports teachers' professional development, and addresses gender differences in self-regulated learning. It also contributes to students' science literacy. However, challenges like technology overuse and balancing teacher autonomy and technology integration exist. Despite these challenges, e-learning is a powerful tool for educators.

The second theme discusses the challenges of implementing e-learning while promoting teacher autonomy. These include addressing technology overuse, promoting digital citizenship, and balancing teacher autonomy with technology integration. The COVID-19 pandemic has highlighted the need for professional development and enhancing learning outcomes. Factors like student perspectives, ICT competence, and educational innovation also impact successful implementation. A comprehensive approach is needed to meet diverse needs in the digital age.

The third theme explores e-learning design principles and strategies to maximize teacher autonomy. It emphasizes the importance of allowing teachers control over the learning process, tailoring content, and monitoring student progress. It highlights the impact of learner-centered Out-of-Classroom Practice (OCP) activities on English as a Foreign Language curricula. The theme also emphasizes the need for a judicious balance between authentic learning experiences, learner autonomy, and overall satisfaction. It also highlights the importance of assessing teachers' digital competencies and facilitating inclusive technology use. The theme also highlights the importance of professional development for teachers.

This comprehensive review explores the impact of e-learning applications on teacher autonomy, aiming to enhance teaching practices and improve student outcomes. It highlights the benefits and challenges of e-learning and informs policymakers, administrators, and practitioners in designing effective strategies. The review aims to stimulate further research and dialogue in this area, focusing on strategies for integrating e-learning applications into different educational contexts and providing valuable insights for educational policymakers and practitioners.

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