THE CONTRIBUTION OF HYBRID EDUCATION TO MORE MEANINGFUL AND EFFECTIVE PRACTICES IN PUBLIC HIGHER EDUCATION: A SYSTEMATIC REVIEW

Gustavo Carvalho Mauricio

Universidade Federal de São Carlos (UFSCar), São Carlos, São Paulo, Brasil

gcmauricio@ufscar.br

Claudinei Zagui Pareschi

Universidade Federal de São Carlos (UFSCar), São Carlos, São Paulo, Brasil

claudineipareschi@estudante.ufscar.br

Daniel Mill

Universidade Federal de São Carlos (UFSCar), São Carlos, São Paulo, Brasil

mill@ufscar.br

Abstract: Based on a review of 78 articles (2019-2024), this study analyzes the potential of Hybrid Education (HE) in teacher training within public higher education. Four key points are highlighted: teacher training, academic culture, challenges, and infrastructure. The success of HE depends on training professors in digital technologies, institutional changes, and investments. When well-structured, HE can promote more inclusive, flexible, and modern teaching.
Keywords: hybrid education; public higher education; digital culture

A CONTRIBUIÇÃO DA EDUCAÇÃO HÍBRIDA PARA PRÁTICAS MAIS SIGNIFICATIVAS E EFETIVAS NO ENSINO SUPERIOR PÚBLICO: UMA REVISÃO SISTEMÁTICA

Resumo: Com base em uma revisão de 78 artigos (2019-2024), este estudo analisa o potencial da Educação Híbrida (EH) na formação de professores no ensino superior público. Destacam-se quatro pontos: formação docente, cultura acadêmica, desafios e infraestrutura. O sucesso da EH depende da capacitação de professores em tecnologias digitais, de mudanças institucionais e de investimentos. Conclui-se que a EH, bem estruturada, promove um ensino mais inclusivo, flexível e moderno.
Palavras-chave: educação híbrida; ensino superior público; cultura digital

LA CONTRIBUCIÓN DE LA EDUCACIÓN HÍBRIDA A PRÁCTICAS MÁS SIGNIFICATIVAS Y EFECTIVAS EN LA EDUCACIÓN SUPERIOR PÚBLICA: UNA REVISIÓN SISTEMÁTICA

Resumen: Basado en una revisión de 78 artículos (2019-2024), este estudio analiza el potencial de la Educación Híbrida (EH) en la formación de profesores en la educación superior pública. Se destacan cuatro puntos: formación docente, cultura académica, desafíos e infraestructura. El éxito de la EH depende de la capacitación de los profesores en tecnologías digitales, de cambios institucionales y de inversiones. Bien estructurada, la EH puede promover una enseñanza más inclusiva, flexible y alineada con la cultura digital.

Palabras clave: educación híbrida; educación superior pública; cultura digital

1 INTRODUCTION

Digital Culture has promoted, in contemporary times, a new worldview in which much of daily activities are mediated by digital technologies, especially in the field of communication. Digital Information and Communication Technologies (DICT) are increasingly present in work relationships, leisure, and significantly in Education. With the advancement of these technologies, the boundaries between the virtual and the real become increasingly blurred; connections intensify and access to knowledge expands. In this context, entry into and permanence in Higher Education become flexible experiences, in which individuals can, in certain circumstances, choose how they wish to study: in person, with interaction between teachers and students, or at a distance, with greater autonomy and flexibility of time and space.

The experience of Emergency Remote Teaching (ERT), experienced between 2020 and 2022, demonstrated that, even in the face of serious limitations, universities were able to create pedagogical strategies that allowed them to hybridize teaching and learning processes. During this period, in-person methodologies were blended with practices specific to Distance Education (DE), relying on emerging digital technologies and active methodologies. As highlighted by Mauricio (2024), the effective implementation of Hybrid Education (HE) in the educational context requires breaking traditional paradigms, allowing the adoption of more adaptable methods with the student at the center of the process. With the pandemic context overcome, it becomes essential to reflect on the possibility of institutionalizing HE not as a solution to all educational problems, but as an interesting alternative to make pedagogical practices more meaningful, contextualized, and aligned with the logic of Digital Culture.

However, the implementation of Hybrid Digital Education (HDE) in public universities faces several barriers, such as: difficulties in accessing and critically using digital technologies by teachers and students; insufficient investments in teacher training; lack of adequate technological infrastructure; and academic structures still marked by curricular rigidity and resistance to innovation. Such factors affect students in vulnerable situations even more intensely, amplifying existing inequalities.

In this scenario, the present article seeks to investigate how HE can contribute to the development of more meaningful and effective pedagogical practices in Public Higher Education,

with a focus on teacher training. To this end, a Systematic Literature Review (SLR) is conducted with the support of the Parsif.al tool, to map, organize, and analyze the most relevant studies on the topic.

The article is organized as follows: it begins with an introduction to the topic in section 1; in section 2, a brief theoretical foundation on HE is presented; in section 3, the methodology of the systematic review is detailed; in section 4, the results obtained from the analysis of selected studies are presented; in section 5, the findings are discussed in light of the literature; and finally, in section 6, final considerations are presented.

2 THEORETICAL FOUNDATION

Traditionally, Higher Education in Brazil has been offered in person, that is, structured in an educational model in which teachers and students share the same physical space, generally in classrooms located in educational institutions. However, contemporary social transformations, especially those driven by the advancement of DICT, have required the review and improvement of this format. The expansion of access to information, the reframing of concepts of time and space, as well as the emergence of new forms of interaction and communication mediated by digital technologies, have contributed to the development of innovative pedagogical practices, opening other possibilities for teaching and learning processes.

Distance Education (DE), characterized by physical separation between teachers and students who are in different locations during part or all of the training process and by communication mediated by digital technologies (Moore; Kearsley, 2008), developed as a response to the demands of a networked society (Castells, 2009) and the need to democratize Higher Education, especially in regions geographically distant from major centers.

This modality has played a strategic role in expanding access to education, favoring educational inclusion. With the incorporation of more advanced DICT, DE underwent an important methodological reconfiguration, offering greater flexibility regarding time, space, and pace of learning and adapting to the new formative requirements of contemporary higher education.

In this context, HE emerges as a promising pedagogical proposal, as it articulates, in a planned and intentional manner, in-person and online activities, promoting more flexible, collaborative practices centered on student protagonism (Horn; Staker, 2015; Bacich; Moran, 2018; Moran, 2015; Camargo; Daros, 2018). By exploring the potential of DICT, HE contributes to the development of

more meaningful learning, contextualized and aligned with the demands of contemporary society and Digital Culture.

HE can be understood as "a teaching and learning process that explores digital technologies in their multiple forms and tools for the sake of educational improvement" (Mill; Chaquime, 2021, p. 12). By intentionally integrating elements of in-person education and DE, this approach constitutes itself as a response to the transformations of contemporary society, proposing an education that promotes collaborative and integrated learning across multiple times and spaces. Grounded in the principles of flexibility, personalization, and autonomy, HE aims to broaden formative experiences, articulating pedagogical and methodological resources from different modalities with a view to strengthening contextualized and meaningful learning.

When associated with active learning methodologies and critical use of DICT, HE is configured as an innovation in the context of Higher Education, as it allows greater personalization of students' formative pathways and pedagogical flexibility. As highlighted by Valente, Almeida, and Garaldini (2017), coexistence in these hybrid and multimodal spaces redefines the forms of interaction, expression, and knowledge construction, introducing new contributions and challenges to educational processes. This combination favors more dynamic, participatory didactic practices aligned with Digital Culture, through the use of resources such as applications, games, videos, social networks, chats, forums, and other digital tools available on the internet.

Furthermore, as pointed out by Veloso, Mill, and Moreira (2023), HE constitutes itself as a result of a historical movement that seeks to overcome dichotomies between in-person and distance modalities. It is a process of a dialectical nature, constructed from tensions and disputes in the educational field, that opens the way for the emergence of new formative scenarios sustained by more integrated, flexible practices connected with contemporary demands. The following presents the methodological procedures adopted in conducting the systematic literature review, based on Mill (2023).

3 METHODOLOGY

A systematic literature review (SLR) was conducted to investigate the process of institutionalization of HE in public universities, especially in the context of teacher training. According to Mill (2023), in times of Digital Culture, the SLR has an important role and great

potential for analyzing scientific production in different areas. The SLR allows for an in-depth analysis of pedagogical practices mediated by digital technologies, as well as the challenges and opportunities associated with the implementation of HE, including issues of infrastructure, teacher training, and changes in academic culture. The following describes the steps of the SLR adopted in this article, according to Mill (2023): planning of the SLR; conducting the research and documentation of the research.

3.1 Planning of the SLR

The SLR followed the principles of Bardin's (1977) content analysis, seeking to identify thematic categories relevant to understanding hybridization in higher education. The selection of studies considered criteria that privilege discussions on the integration between in-person and digital modalities, with a focus on their contribution to more meaningful didactic-pedagogical processes.

The systematic review was conducted based on a structured protocol, developed in the Parsif.al tool, according to Maurício (2024), ensuring transparency and replicability in all stages, as guided by Mill (2023). This method allowed for the application of rigorous inclusion and exclusion criteria, as well as a systematic search in selected databases, ensuring that the analysis was grounded in consistent evidence. Despite methodological rigor, data interpretation maintained a critical approach, articulating the findings to the context of institutionalization of HE in Higher Education. This research sought in the articles, as can be observed in Figure 1, information that could answer the following questions:

Figure 1 - Research Questions

Source: Created by the authors based on Parsif.al, 2025.

To ensure a comprehensive systematic review on the institutionalization of HE in public universities, specific search strategies were developed for each database, maintaining the same conceptual logic but adapting the syntax to the technical requirements of each tool. As a search strategy, texts were mapped in which the descriptors observed below in Chart 1 were contained in the title, abstract, or keywords:

Chart 1. Descriptors used in the research planning phase:

HYBRID EDUCATION	HIGHER EDUCATION
Hybrid Teaching	Higher Education
Hybrid Teaching	University
Hybrid Education	

Source: Own elaboration

Three databases were used to conduct the searches. In the Scopus database, the following string was used: TITLE-ABS-KEY("educação híbrida" OR "ensino híbrido" OR "blended learning") AND TITLE-ABS-KEY("universidade*" OR "ensino superior").

The choice of this syntax is justified by the specific requirements of the database, which requires the definition of the search field, in this case, TITLE-ABS-KEY, covering the title, abstract, and keywords of articles. To refine the results and ensure thematic relevance, Boolean operators were employed, such as AND, which allows the intersection between the central concepts of HE and the context of higher education. Additionally, the wildcard character (*) was used to consider terminological variations, such as "universidades" and "universitário". This strategy resulted in 17 articles in the Scopus database, indicating the effectiveness of the search in a multidisciplinary database with international scope.

In the SciELO database, the following string was used: ("educação híbrida" OR "blended learning" OR "ensino híbrido")(Topic) AND ("universidade*" OR "ensino superior")(Topic). The "Topic" field was chosen because it covers a broader area, including title, abstract, and keywords.

The search structure was simplified, using only parentheses to group related terms. Furthermore, terms in both Portuguese and English, such as "blended learning," were considered to capture international academic production indexed in SciELO. As a result, 57 articles were identified, taking advantage of the coverage of Latin American journals present in this database.

In the CAPES Journals database, the string ("educação híbrida" OR "ensino híbrido" OR "blended learning") AND ("universidade*" OR "ensino superior") was used, without the need for specific fields, adopting generic syntax. Filters were applied to refine the results: document type restricted to articles, only peer-reviewed publications, and open access. These choices aimed to prioritize peer-reviewed scientific articles and ensure content accessibility. The applied criteria ensured academic relevance.

A total of 267 articles were identified in the CAPES Journals database, making it the database with the highest number of selected publications. The high volume of articles can be explained by the fact that the CAPES Journals database aggregates several other databases, which significantly expands the scope of the research.

In total, 341 articles were selected, which comprise an extensive database for analysis, covering information for the guiding questions of this research. This documentary corpus allowed for an in-depth examination of the topics in focus, directing the investigation toward the most relevant aspects of the study.

3.2 Conducting the SLR / Study Selection

Despite syntactic differences between the consulted databases, coherence was maintained in search strategies. All strings used combined synonyms for "hybrid education"—including the terms "educação híbrida," "ensino híbrido," and "blended learning"—associating them with the institutional context of higher education through terms such as "universidade" and "ensino superior," using OR logical operators to encompass terminological variations and AND to cross the two main thematic axes.

The searches were documented on the Parsif.al platform, according to Mill's (2023) protocol, which ensured transparency of inclusion and exclusion criteria and reproducibility of strategies by other researchers. This methodological approach ensured that, even with specific technical adaptations for each database, the systematic review maintained rigor, coherence, and comprehensiveness in identifying relevant studies, considering publications between 2019 and 2024.

Five duplicate articles were identified among the consulted databases. Four of them were automatically detected by the Parsif.al tool itself, while the fifth was identified manually during the selection process, as it appeared with the title in English in one database and in Portuguese in another.

In the selection stage, we examined the titles, abstracts, and keywords of articles to confirm their relevance to the objective of this study, resulting in the exclusion of 258 works. The exclusion criteria applied were: publication period outside the defined temporal scope, typology different from scientific articles, thematic focus distinct from public higher education, unavailability of the full text, and misalignment of the title or abstract with the central theme of the research. After this evaluation, only 78 articles were considered adequate.

4 RESULTS AND DISCUSSION

By conducting a systematic and comparative analysis of the 78 selected articles, it was possible to identify patterns, recurrences, and important divergences for the study in four selected categories: teacher training, changes in academic culture, challenges in implementing HE, and technological infrastructure. The following explores these categories based on how they appear in the texts and in qualitative examples extracted from the studies.

Data analysis reveals a dynamic relationship between the themes, which were addressed with different levels of depth and frequency throughout the research period. This interconnection suggests a reciprocal influence, showing that no theme can be understood in isolation. The implementation of HE constitutes a complex system in which various elements interrelate and mutually influence each other. This finding reinforces the need for an integrated approach in addressing these themes, as solutions to HE challenges demand systemic considerations that account for these multiple interactions.

It is common to find in the literature the terms "Hybrid Teaching" and "Hybrid Education" used as synonyms. However, this study will adopt the term Hybrid Education, as it is broader and more complex, encompassing not only teaching but education as a whole, as a dynamic and multifaceted process.

Regarding HE, the authors researched corroborate the idea that the methodology allows for greater student engagement, aids in pedagogical mediation by teachers, in the development of student autonomy, based on contextualized, active, collaborative, integrative, and meaningful education (Lima; Viana, 2022; Chow; Calixto; Mello, 2021).

4.1 Teacher Training

The theme of teacher training is the most frequently appearing in the studies, present in 69 of the analyzed articles, which reinforces the central role of the teacher in the success of HE implementation. Despite flexibility, constant use of DICT, and active methodologies, the success of HE, as well as the development of student autonomy and protagonism, depends on the teacher's performance in the process by assuming the role of mediator of learning experiences, intending to stimulate students to engage in innovative and collaborative practices. For this, continuous teacher training is required, focused on mastering active methodologies and digital competencies.

This need for continuous training focused on the use of digital technologies is extensively discussed by Vieira and Pedro (2021), Arruda and Siqueira (2021), and Chow et al. (2021). These authors emphasize that mastery of technology alone is not sufficient; it must be combined with solid and critical pedagogical competencies. Teacher training is necessary because pedagogical actions mediated by digital technologies require specific classroom organization, planning, time management, and learning assessment so that there is no mere transposition of traditional education to online

teaching (Silva, 2023). Thus, continuous training is a real necessity for the realization of education mediated by technologies, especially for higher education teachers (Lima; Costa; Lima, 2022).

As a pedagogical innovation, HE faces much resistance from educators. Continuous training also appears as a strategy to address these resistances, as evidenced by Márquez (2022). Caro Torres et al. (2020) argue that HE should be intentionally integrated into undergraduate curricula, preparing future teachers early to work in hybrid contexts. Santos, Barcelos, and Rangel (2021) reinforce the importance of innovative practices in initial teacher training for change to occur in Education.

The lack of formative experiences with digital technologies and hybrid methodologies compromises the pedagogical appropriation of HE in teachers' professional practice and pedagogical planning with the use of digital technologies in online education (Rocha, 2021). For better use of digital technologies in the classroom, there is still much to develop in terms of digital literacy (Marques, 2021).

Zapana et al. (2024) further suggest that international models of training focused on HE can be adapted to the Brazilian context, offering new possibilities to enrich local practices. This can expand the pedagogical repertoire, inspire innovative, inclusive practices more aligned with Digital Culture.

For Mattar (2024), there is a lack of public policies that promote more systematic training in public universities. This topic was also addressed by Ferrer et al. (2021), who alert to existing regional inequalities in access to this type of training. In some cases, the pursuit of training has occurred by the teacher's own initiative, demonstrating the absence of valuation of professional qualification by some institutions. Other institutions choose to offer short-duration courses, which are not sufficient for developing important skills and competencies for online teaching (Vieira; Pedro, 2021).

Furthermore, teacher training is frequently associated with active learning methodologies, as discussed by Silveira (2020) and Nunes and Barcellos (2020). For Lotúmolo Junior and Mill (2020), the use of active methodologies in education is a viable alternative to break with the traditional model of education, based on knowledge transmission by the teacher and content repetition. Thus, it can be inferred that it is necessary to break with the traditional teaching model, defined by Freire (1987) as the banking model of education, in which the teacher transmits ready-made content and students are seen as passive receivers, moving instead toward more meaningful learning, with a more open, dialogical, and critical approach, favoring student protagonism with the use of digital technologies.

Active methodologies are enhanced by digital technologies, which promote more meaningful, collaborative, and critical learning, while expanding times and spaces for learning. Some active methodologies cited were: flipped classroom, station rotation, and gamification (Santos; Carpes, 2022), storytelling, problem-solving, peer learning, and maker learning (Field's; Ribeiro; Souza, 2021), use of concept maps (França; Costa; Freitas, 2019), project-based learning (Cordeiro; Leão; Couto, 2021), among others.

In summary, the studied articles show that teacher training is a key point for the success of HE in public higher education. There is a need for technical training in handling digital technologies, but above all, it is urgent to invest in critical and continuous pedagogical training that helps to reframe practices in the face of Digital Culture demands. Thus, there is consensus: HE will only be effective if promoted by well-prepared teachers, capable of planning and applying pedagogical practices that coherently integrate digital and in-person practices. Their stance should be that of a guide and mediator who seeks to mobilize students' competencies for effective learning. For this, it is necessary to invest in institutional programs of initial and continuous training, with adequate technical-pedagogical support focused on mastering active methodologies and developing digital competencies.

4.2 Changes in Academic Culture

Translating into numbers, the theme "changes in academic culture" appeared in 68 articles, showing how essential this dimension is for the consolidation of HE in universities. This indicates that the simple adoption of digital technologies or active methodologies in education is not sufficient for the institutionalization of HE in public universities. A bigger change is needed in the beliefs, values, and academic practices that reconsider traditional teaching models and encourage more collaborative, flexible, personalized, and critical pedagogical practices. HE can improve education, as it better addresses the profile of contemporary students (Horn; Staker, 2015). However, this requires the restructuring and reorganization of educational systems with the aim of promoting more intensive use of digital technologies, fostering new processes of interaction and mediation (Echalar; Alonso, 2022).

The studies showed that more than a technological change, a transformation of values, practices, and institutional structures is needed. Authors such as Rodríguez Revelo et al. (2021) reinforce that implementing HE requires breaking with traditional cultures, especially regarding the

role of the teacher and student autonomy. For an active and hybrid methodology, a change in teacher and student posture is essential, which favors student protagonism in knowledge construction in a creative manner (Félix; Silva, 2021).

Another recurrent theme in studies on HE is Emergency Remote Teaching (ERT), implemented in educational institutions during the COVID-19 Pandemic. Authors such as Rocha (2021), Brazil et al. (2022), and Silva and Larré (2024) highlight that the pandemic accelerated changes that were previously moving slowly in universities, which, despite the challenges, opened space to reconsider entrenched structures.

For Veloso and Mill (2024), ERT is a configuration of DE, as it used strategies and tools typical of the modality. However, ERT was implemented in an improvised manner, without adequate pedagogical planning, consistent infrastructure, or prior teacher training, exposing historical weaknesses in Brazilian education, such as social vulnerability, increased stress and workload for teachers, infrastructure weaknesses, and public policy issues (Silveira, 2020).

The studies show that it is important to reflect on the changes brought by ERT to think about the future of education mediated by technologies and for a possible future adoption of hybrid models (Silveira, 2020; Oliveira, Méxas; Drumond, 2023). During this period, it was also noted that some teachers experienced an increase in their work hours, dedicating more time to the hybrid format (Brazil et al., 2022).

Resistance to change also appears frequently in the studies, especially in institutions with more conservative cultures, as reported by Santinello et al. (2020) and Carmona and Bollela (2021). Some university students showed resistance to active methodologies, being more aligned with the traditional teaching model (Santos and Carpes, 2022), while others had difficulty with the methodology due to a lack of habit and familiarity, preferring live classes from which they would receive "ready-made" lessons, having difficulty developing their protagonism (Lopes; Cordeiro, 2020).

On the other hand, when there is institutional openness to innovation and dialogue, results tend to be more positive. Zenha and Lopes (2024), for example, show that well-defined institutional policies can contribute to building a culture more favorable to HE adoption. For Félix and Silva (2021), greater investments in public policies are essential to expand the population's access to digital technologies and introduce teachers to active and digital pedagogical practices from their initial training. Furthermore, academic leadership also plays a crucial role in this process, as Silveira (2021)

emphasizes, pointing out that engaged managers have a decisive role in consolidating a new educational culture.

Nunes et al. (2023) emphasize the relevance of transparent and participatory institutional communication, especially in decision-making processes related to the adoption of digital technologies. For Lima and Viana (2022), the construction of an innovation culture does not emerge immediately but requires continuous actions of training and awareness. Another strong point in the literature, observed by Cavalcante and Molin (2021), is the need for permanent dialogue among all institutional actors (managers, teachers, students, and technicians) as an essential condition for deep and lasting cultural changes.

In summary, the studies show that resistance to HE implementation is related to structural aspects of academic culture, historically marked by the valorization of in-person interaction, which generally involves the defense of traditional teaching models. Transforming this culture requires a change in institutional mindset, with clear policies aimed at pedagogical innovation, in a collective movement of reconstructing values, conceptions, and educational practices. Institutions that manage to promote this cultural transformation in an articulated and collective manner tend to achieve better results both in student engagement and in teacher motivation, promoting environments more open to innovation and pedagogical transformations.

4.3 Challenges in Implementing HE

Another recurrent theme in the studies was "challenges faced in implementing HE," being discussed in 68 of the analyzed articles, appearing as relevant and complex. These difficulties are widely perceived as challenges of the contemporary educational scenario itself, which seeks to deal with rapid technological and social transformations.

One of the most cited challenges concerns the lack of methodological clarity in the integration between in-person and virtual activities. Mattar (2024) points out that without well-structured pedagogical guidelines, teachers and students face uncertainties that compromise the teaching and learning process.

Institutional challenges are also frequent. Chow, Calixto, and Mello (2021) and Martín García, Gutierrez Perez, and Martín-Lucas (2021) reinforce that HE is only consolidated when there is

strategic planning combined with management that offers adequate support, which does not always happen in the analyzed universities.

Teacher workload overload also appears prominently in the research of Santinello, Costa, and Santos (2020) and Ribeiro et al. (2024), showing that adapting pedagogical practices to the hybrid format requires time, energy, and resources, often scarce. It is a challenge to know how to integrate these new technologies in the classroom. For this, higher education needs to undergo profound reformulations, as pointed out by Nunes and Barcelos (2020).

Another challenge pointed out in the literature is the absence of specific State public policies aimed at making educational resources available to teachers and students, which hinders HE. The socioeconomic inequality of students also presents itself as an obstacle to the institutionalization of HE. Castioni et al. (2021) and Echalar and Alonso (2022) alert that the lack of access to devices and quality connections directly affects equity in HE, especially in the context of public universities. Without this support, institutions are left unprotected and often improvise solutions that are not sustainable in the long term.

From a technological perspective, platform instability and the lack of continuous technical support compromise the implementation of hybrid pedagogical practices, as pointed out by Cherubim et al. (2024) and Roatta and Tedini (2021). Some students presented difficulties in accessing digital tools (Field's; Ribeiro; Souza, 2021), while others presented difficulties in developing their autonomy and maintaining study habits, a requirement of the pedagogical flexibility provided by HE; difficulties in accessing tools, digital resources, and the internet, and the lack of adequate study spaces (Oliveira; Santos, 2024).

The hybrid ERT model also brought some disadvantages. Students pointed out limitations in interaction with teachers, the emergence of psychological problems, difficulties in studying at home due to a lack of adequate space, an overload of tasks, difficulties in maintaining focus and concentration, and ineffective communication between academic and technical sectors of universities (Oliveira; Méxas; Drummond, 2023). This lack of integration led to the creation of ineffective solutions that do not resolve structural problems concerning HE implementation.

Overall, the studies revealed that the implementation of HE in public universities faces structural, cultural, and pedagogical barriers. The lack of clear guidelines and public policies that standardize and encourage HE adoption worsens the scenario, leaving its implementation often dependent on individual teacher initiative or isolated projects. Overcoming these challenges requires

an integrated approach, combining investments in teacher training, infrastructure, and development of an institutional culture focused on innovation, showing that the consolidation of HE does not depend only on technological resources but on structural, political, and cultural changes that involve all institutional actors collaboratively and continuously.

4.4 Technological Infrastructure

The theme "technological infrastructure" was highlighted in 58 of the reviewed articles, being pointed out as a fundamental and determining element for the success or failure of HE in public universities, evidencing its centrality in the debate. With this data, it can be inferred that, although HE involves active and innovative methodologies and constant use of technologies, its success is deeply linked to the material conditions available in institutions. Without adequate connectivity, updated equipment, stable platforms, and continuous technical support, hybrid initiatives become fragile, unequal, and often unfeasible.

One of the most recurrent problems is poor connectivity, especially during the COVID-19 pandemic. Segenreich and Medeiros (2022) observe that many public institutions, especially in peripheral or rural areas, still face serious difficulties in accessing the internet, which compromises inclusion and equitable access to education. During ERT, research showed that many university students did not have internet access in their homes, reinforcing universities' responsibility to better understand the socioeconomic conditions of their students to assist them (Castioni et al. 2021; Silva et al., 2023).

The absence of updated equipment also appears frequently. According to Maldonado, González, and Abril (2020), Zenha and Lopes (2024), and Oliveira and Santos (2024), the lack of modern devices significantly hinders the active participation of students and teachers in virtual learning environments. Another important barrier is the lack of qualified technical support. Márquez (2022) and Silveira (2020) report that without a team prepared to offer continuous technical assistance, the use of digital technologies becomes frustrating and inefficient. Furthermore, studies such as Nunes and Barcellos (2020) reinforce that investment in infrastructure should go beyond purchasing equipment. It is necessary to include training and continuous support to ensure the effective use of technological tools.

Mattar (2024) and Chow et al. (2021) highlight the importance of well-defined institutional policies to ensure the maintenance and constant updating of technologies, a common factor in institutions that successfully implemented HE. Another recurrent point is the need for greater public investments in technological infrastructure, as argued by Castioni et al. (2021). Without these investments, many public universities cannot advance sustainably. The studies show that where infrastructure is adequate, teachers feel more confident to innovate and students demonstrate greater engagement, as reported by Ferreira et al. (2022).

In summary, the theme of technological infrastructure appears in the studies as an important aspect for the institutionalization of HE in public universities. The precariousness in internet connections, outdated devices, the lack of adequate environments, and the lack of effective technical support compromise access and permanence of more vulnerable students in higher education, reinforcing social exclusion and compromising teachers' commitment to pedagogical innovations. Although important advances have been observed, the path toward effective, accessible, and secure technological infrastructure in public universities still requires coordinated efforts, continuous investments, and an institutional vision committed to long-term innovation.

5 ARTICULATION BETWEEN THE CATEGORIES

The research results reveal a strong intersection among the identified categories: teacher training, academic culture, implementation challenges, and infrastructure. These dimensions did not emerge in isolation; rather, they intertwine in the construction of possible paths toward the institutionalization of HE in public universities.

The need for initial and continuing teacher education plays a central role in this process, as it directly influences the other categories. It is essential for helping teachers face the challenges inherent to implementing HE. Teacher training contributes to overcoming part of the cultural resistances, promotes the critical use of available digital technologies, and expands the capacity for action even in contexts marked by structural fragilities.

The adoption of hybrid models intersects with social and political dimensions, particularly regarding the inclusion of higher education students. For this, adequate access to the internet, updated equipment, and qualified academic support are sine qua non conditions, although frequently unequal, which require financial investment, effective public policies, and institutional restructuring.

Furthermore, transformations in academic culture — historically marked by traditional practices — are essential for consolidating innovative educational proposals. An institutional culture that values pedagogical innovation can articulate teacher education policies, infrastructure expansion, and the intentional use of active methodologies, thus strengthening the hybridization of teaching.

FINAL CONSIDERATIONS

From the systematic review conducted, it was possible to gather consistent evidence on the contributions and challenges of implementing HE in public universities, with special emphasis on teacher education programs. The analysis of 78 scientific articles, organized into four major dimensions — teacher training, academic culture, implementation challenges, and technological infrastructure — allowed for a comprehensive, critical, and contextualized understanding of the topic.

Among the main findings, teacher training stands out as the most recurrent and relevant axis in the analyzed literature. The quality of hybrid practices is directly linked to teachers' pedagogical, technological, and methodological preparation. Several studies reinforce the urgency of investing in continuous, collaborative training processes integrated into curricula, surpassing occasional and disconnected initiatives.

Another important point concerns changes in academic culture. More than simply inserting digital technologies, the studies point to the need for profound institutional change that values curricular flexibility, student protagonism, and innovation in pedagogical practices. Nonetheless, this change faces barriers within historically conservative academic structures, requiring active institutional leadership committed to dialogue and collective participation.

The challenges faced in implementing HE also deserve emphasis. The absence of clear public policies, insufficient institutional planning, pedagogical and cultural resistance, as well as socioeconomic and technological inequalities, compose a complex scenario that demands integrated and coordinated responses across different sectors of education.

Regarding technological infrastructure, the data are alarming: unstable connectivity, scarcity of equipment, and lack of technical support compromise the effectiveness of hybrid practices. These elements cannot be analyzed in isolation but rather as part of a broader educational policy involving regular investments, strategic planning, and consistent institutional support.

Despite the obstacles, the literature also pointed to successful HE experiences, especially in contexts where effective teacher training, adequate infrastructure, well-defined institutional policies, and an organizational culture geared toward innovation were articulated. These experiences represent promising pathways for the institutionalization of HE in public higher education institutions.

The main contribution of this study lies in highlighting the importance of understanding HE as a complex phenomenon that requires coordinated actions on multiple fronts. More than a methodological strategy, it represents a pedagogical and institutional approach capable of promoting more inclusive, meaningful educational practices aligned with the demands of Digital Culture.

Finally, it is recommended that future research deepen investigations into the positive impacts of HE on students' learning processes and on the evaluation of institutional policies in the medium and long term. These studies are fundamental for consolidating HE as an important and sustainable educational methodology within the context of public universities.

REFERENCES

ARRUDA, J. S.; SIQUEIRA, L. M. R. **Práticas educativas, memórias e oralidades.** Rev. Pemo, Fortaleza, v. 3, n. 1, e314292, 2021.

BACICH, L.; MORAN, J. **Metodologias ativas para uma educação inovadora: uma abordagem teórico-prática** [recurso eletrônico]. Porto Alegre: Penso, 2018.

BARDIN, L. **Análise de conteúdo.** Lisboa: Edições 70, 1977.

BRAZIL, V. T. F.; ALMEIDA, G. B. de; VASCONCELOS, F. H. L.; LIMA, L.; SANTANA, J. R. **Perfil dos professores em formação remota durante a pandemia de COVID-19 em 2021: uma caracterização dos alunos do curso de tecnologia educacional, ensino híbrido e inovação pedagógica.** Research, Society and Development, v. 11, n. 4, e28811427172, 2022.

CAMARGO, F.; DAROS, T. **A sala de aula inovadora: estratégias pedagógicas para fomentar o aprendizado ativo.** Porto Alegre: Penso, 2018.

CARMONA, F.; BOLLELA, V. R. **Desenvolvimento docente para educação remota emergencial em 2020: a experiência da Faculdade de Medicina de Ribeirão Preto da Universidade de São Paulo (FMRP-USP).** Medicina, v. 54, n. 1, 2021.

CARO TORRES, M. C.; PARRA PEREZ, D. A.; AVERANGA M., A. J.; CORREDOR PLAZAS, N. J.; MEDINA RIVEROS, R. A. **Modelo instruccional blended-flipped: personalización, flexibilización y metacognición para la nivelación en inglés en la educación superior.** Folios, n. 53, p. 107–121, 2020.

CASTELLS, M. **A sociedade em rede.** São Paulo: Paz e Terra, 2009.

CASTIONI, R.; MELO, A. A. S. de; NASCIMENTO, P. M.; RAMOS, D. L. **Universidades federais na pandemia da Covid-19: acesso discente à internet e ensino remoto emergencial. Ensaio: Avaliação e Políticas Públicas em Educação**, Rio de Janeiro, v. 29, n. 111, p. 399–419, 2021.

CAVALCANTE, H. M.; DAL MOLIN, B. H. **Medindo um território: a modalidade de Educação Mediada no contexto do NEaDUNI.** Travessias, v. 15, n. 2, p. 389–403, 31 ago. 2021.

CHERUBIM, D. O.; RIBEIRO, P. de L.; LANGERDORF, T. F.; PAULA, C. C. de; PADOIN, S. M. de M. **Avaliação de tecnologia educacional de fisiologia da lactação por estudantes da saúde**. Revista Brasileira de Enfermagem, v. 77, n. 2, e20230252, 2024.

CHOW, F.; CALIXTO, C. P. G.; MELLO, M. A. R. **Do ensino remoto emergencial ao ensino híbrido no curso de Ciências Biológicas: a nossa visão a partir do Instituto de Biociências da Universidade de São Paulo (IB-USP)**. Medicina (Ribeirão Preto), 2021.

CORDEIRO, P. A. S.; LEÃO, A. M. A. C.; COUTO, J. A. **Ação pedagógica pautada numa abordagem híbrida à luz da Aprendizagem Baseada em Projetos. Revista Docência do Ensino Superior**, Belo Horizonte, v. 11, e024721, p. 1–21, 2021.

ECHALAR, A.; ALONSO FERREIRA, M. L. **Educação superior pública e o ensino remoto emergencial: desafios, dilemas e possibilidades.** Roteiro, v. 47, n. 1, p. 31, 2022.

FELIX, V. P. P.; SILVA, I. P. da. **Experiências com o ensino híbrido a partir de seminários virtuais assíncronos: contribuições para um cenário de mudanças.** Ensino em Re-Vista, Uberlândia, v. 28, e049, p. 1–24, 2021.

FERREIRA, D. M.; OLIVEIRA, J. L.; BARBOSA, N. G.; LETTIERE-VIANA, A.; ZANETTI, A. C. G.; SOUZA, J. **Influência do ambiente virtual de aprendizagem no desempenho acadêmico de estudantes de Enfermagem.** Acta Paulista de Enfermagem, v. 35, 2022.

FERRER, R. L.; ROBERT, Y. C.; SANCHEZ, Y. T.; LUGO, N. T.; FERRER, M. L.; ARRIEN, J. C. P. **Entorno virtual de aprendizaje de Genética Médica en tiempos de la COVID-19 en la Facultad de Medicina Finlay-Albarrán.** Revista Cubana de Informática Médica, v. 13, 2021.

FIELD'S, K. A. P.; RIBEIRO, K. D. F.; SOUZA, R. A. **Utilização de metodologias ativas apoiadas em tecnologias digitais para o ensino de Química: um relato de experiência**. Revista REAMEC – Rede Amazônica de Educação em Ciências e Matemática, v. 9, n. 2, e21052, maio–ago. 2021.

FRANÇA, L. R. S.; COSTA, C. J. S. A.; FREITAS, M. A. S. **Avaliação da aprendizagem em contextos híbridos educacionais: compartilhando experiências sobre a utilização do mapa conceitual como recurso avaliativo no ensino superior.** Revista Devir Educação, Lavras, v. 3, n. 2, p. 136–155, 2019.

FREIRE, P. **Pedagogia do Oprimido.** Rio de Janeiro: Paz e Terra, 1987.

HORN, M. B.; STAKER, H. **Blended: usando a inovação disruptiva para aprimorar a educação.** Porto Alegre: Penso, 2015.

JUCA MALDONADO, F.; CARRIÓN GONZÁLEZ, J.; ABRIL, A. J. **B-learning y Moodle como estrategia en la educación universitaria.** Revista Conrado, v. 16, n. 76, p. 215–220, 2020.

LIMA, R. M. F. S.; VIANA, M. A. P. **Educação personalizada e avaliação formativa em ecossistemas de aprendizagem digitais no ensino superior: articulando currículo digital e diversidade cultural.** Revista e-Curriculum, São Paulo, v. 20, n. 3, p. 1043–1063, jul./set. 2022.

LIMA, R. M. F. S.; COSTA, C. J. S. A.; LIMA, J. R. **Educação personalizada e avaliação para aprendizagem em ecossistemas digitais: análise de um curso de formação docente em contexto pandêmico sob a ótica do professor formador.** EaD em Foco, v. 12, n. 3, e1920, 2022.

LOPES, R.; CORDEIRO, L. Z. **Uma experiência de educação híbrida no interior da Amazônia: entre práticas, aprendizagens e contradições**. Revista Prâksis, Novo Hamburgo, a. 17, n. 2, 2020.

LOTÚMOLO JÚNIOR, J.; MILL, D. **Reflexões sobre as metodologias ativas como abordagem pedagógica no contexto brasileiro. Conjectura: Filosofia e Educação**, Caxias do Sul, v. 25, n. 1, p. 1–29, 2020.

MATTAR, J. **Educação a distância no Brasil: retrocesso no marco regulatório ou futuro híbrido?** EaD em Foco, v. 14, n. 2, e2259, 2024.

MARQUES, A. L. dos S. **Competências digitais e práticas de ensino de PLE a hispanofalantes em contexto universitário online de emergência**. Signo, Santa Cruz do Sul, v. 46, n. 85, p. 70–82, jan. 2021.

MÁRQUEZ, R. C. **Análisis teóricos de los modelos propuestos en la educación universitaria para la educación virtual.** Revista Universidad y Sociedad, v. 14, p. 34–44, 2022.

MARTÍN GARCÍA, A.; GUTIÉRREZ PEREZ, B. M.; MARTÍN-LUCAS, J. **Fases de implementación de blended learning en las universidades españolas: estudio basado en análisis de segmentación.** Revista Portuguesa de Educação, v. 34, n. 1, p. 28–49, 2021.

MAURICIO, G. C. **Institucionalização da educação híbrida: um estudo sobre o uso de tecnologias digitais em instituições públicas de ensino superior.** 2024. Dissertação (Mestrado em Educação) – Universidade Federal de São Carlos, São Carlos, 2024. Disponível em: https://repositorio.ufscar.br/handle/20.500.14289/21272.

MILL, D.; CHAQUIME, L. P. **Educação híbrida como estratégia educacional.** São Carlos: Sead-UFSCar, 2021.

MILL, D. Revisão sistemática de literatura como estratégia de pesquisa: apontamentos e roteiro para sua elaboração. In: MILL, D. *et al.* **Diálogos sobre educação a distância, presencial e híbrida**: reflexões, estratégias e proposições. São Paulo: Artesanato Educacional, 2023.

MOORE, M. G.; KEARSLEY, G. **Uma visão integrada**. São Paulo: Thompson Learning, 2008.

MORAN, J. Educação híbrida: um conceito-chave para a educação, hoje. In: BACICH, L.; TANZI NETO, A.; TREVISANI, F. M. (org.). **Ensino híbrido: personalização e tecnologia na educação.** Porto Alegre: Penso, 2015. p. 27–45.

NUNES, A. F. P.; CASTRO, B. L. G. de; PONTELLI, G. E.; COSTA, V. M. F.; KNEIPP, J. M. **Saúde emocional e pandemia: percepção docente e discente do curso de Administração**. Revista GUAL, Florianópolis, v. 16, n. 1, p. 165–187, 2023.

NUNES, M. B.; BARCELLOS, P. S. C. C. **Rumo a um ensino superior 4.0: uma experiência com fórum on-line síncrono para ensino de língua inglesa na perspectiva das metodologias ativas.** Revista do GEL, v. 17, n. 3, p. 216–233, 2020.

OLIVEIRA, A. A.; LACERDA SANTOS, G. **Percepções discentes sobre novas configurações espaçotemporais no ensino: aspectos para o planejamento e a mediação docente na cultura digital.** EaD em Foco, v. 14, n. 2, e2234, 2024.

OLIVEIRA, K. S.; MÉXAS, M. P.; DRUMOND, G. M. **Percepção dos discentes sobre as modalidades de ensino em uma instituição de educação superior brasileira.** Perspectivas em Diálogo: Revista de Educação e Sociedade, v. 10, n. 25, p. 242–266, out./dez. 2023.

RIBEIRO, L. H. de F.; AUGUSTO, M. F.; DANTAS, L. D. O.; SOUTO, M. E. V. C.; NASCIMENTO, E. G. C. do; FERNANDES, T. A. A. de M. **Transição do ensino remoto para o presencial: perspectivas de estudantes de medicina após a pandemia de COVID-19.** Revista Brasileira de Educação Médica, Mossoró, v. 49, n. 1, e009, 2024.

ROATTA, S.; TEDINI, D. **La pandemia del Covid-19 y el aprendizaje semipresencial en la educación superior.** Revista Iberoamericana de Tecnología en Educación y Educación en Tecnología, n. 28, p. 318–323, 2021.

ROCHA, T. B. O. **Plano de aula para educação on-line na pandemia de Covid-19.** EaD em Foco, v. 11, n. 2, e1460, 2021.

RODRÍGUEZ REVELO, E.; VELASTEGUÍ LÓPEZ, L. E.; RODRÍGUEZ GONZÁLEZ, R.; RODRÍGUEZ LÓPEZ, W. A.; LA O MENDOZA, Y. **Potencialidades didácticas de las redes sociales en la formación universitaria: percepciones de los estudiantes.** Revista Universidad y Sociedad, v. 13, n. 5, p. 154–164, 2021.

SANTINELLO, J.; COSTA, M. L. F.; SANTOS, R. O. dos. **A virtualização do ensino superior: reflexões sobre políticas públicas e educação híbrida.** Educar em Revista, Curitiba, v. 36, e76042, 2020.

SANTOS, G. C.; CARPES, P. P. G. **Ensino superior e a disciplina de Bases Matemáticas: possibilidades via o ensino híbrido.** REMAT – Revista Eletrônica de Matemática, Bento Gonçalves, RS, v. 8, n. 2, 2022.

SANTOS, S. F.; BARCELLOS, G. F.; RANGEL, A. M. **Uso do ensino híbrido na disciplina Teorias de Aprendizagem: uma experiência do curso de Pedagogia.** Revista Educação Santa Maria, v. 46, 2021.

SEGENREICH, S. C. D.; MEDEIROS, L. **Trajetória da educação a distância na educação superior pública do Brasil e o impacto do ensino remoto na docência: o caso da UFPA.** Revelli, v. 13, 2021.

SILVA, L. C. S.; LIMA, V. de O.; CALDEIRA, R. T.; ZAPAROLI, D.; PESSOA, D. L. R. **Perspectivas e possibilidades do ensino híbrido na educação superior no contexto pós-pandemia Covid-19 no Brasil.** Revista Gestão e Secretariado (GeSec), São Paulo, SP, v. 14, n. 5, p. 7787–7808, 2023.

SILVA, C. L. **O ensino ofertado na pandemia de Covid-19: como nomear?** Plurais - Revista Multidisciplinar, Salvador, v. 7, n. 00, e023005. 2023.

SILVA, F. F. da.; LARRÉ, J. M. R. G. M. **Ensino híbrido: um estudo de caso acerca das experiências vivenciadas por professores e estudantes de cursos de nível superior de uma instituição pública da rede federal.** EaD em Foco, v. 14, n. 1, e2072, 2024.

SILVEIRA, R. F. **O papel da aprendizagem ativa no ensino híbrido em um mundo pós-pandemia: reflexões e perspectivas.** Revista Brasileira de Aprendizagem Aberta e a Distância, v. 2, n. especial, 2020.

VALENTE, J. A.; ALMEIDA, M. E. B.; GERALDINI, A. F. S. **Metodologias ativas: das concepções às práticas em distintos níveis de ensino.** Revista Diálogo Educacional, v. 17, n. 52, p. 455–478, 2017.

VELOSO, B.; MILL, D. **Educação a distância e ensino remoto: oposição pelo vértice.** Revista Portuguesa de Educação, v. 37, n. 1, p. e24011, 2024.

VELOSO, B.; MILL, D.; MOREIRA, J. A. **Educação híbrida como tendência histórica: análise das realidades brasileira e portuguesa.** Dialogia, n. 44, p. 1–18, 2023.

VIEIRA, M.; PEDRO, N. O. **O perfil do docente on-line no contexto da educação superior: um estudo no Brasil e em Portugal.** Revista e-Curriculum, São Paulo, v. 19, n. 1, p. 10–33, jan./mar. 2021.

ZENHA, L. F.; LOPES, R. **Entre rios, veredas e florestas: educação a distância e acesso à formação superior na Amazônia.** Educação e Sociedade, Campinas, v. 45, e284669, 2024.

ZAPANA, E. B.; MACHACA, J. E. C.; GARCIA, A. J. M.; APAZA, M. L. P. **In-person and hybrid learning in the training of professionals in higher education: an ICT-centric approach.** Revista de Gestão Social e Ambiental, Miami, v. 18, n. 4, p. 1–11, 2024.