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A study on the (im)possibilities of Inclusive Teaching Practices in a context of platformization and the challenge of planning[1]

Um estudo sobre as (im)possibilidades de Práticas Docentes Inclusivas em um contexto de plataformização e o desafio do planejamento

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ABSTRACT
This study aims to discuss possibilities for inclusive teaching practices in a context marked by systemic barriers, such as platformization in São Paulo's state public schools, from the perspective of the Historical-Cultural Theory. Through qualitative research, it integrates theoretical discussions with a narrative analysis of practical experiences in a hybrid Lesson Study (LSH) training process, developed within a collaborative community. From the historical-cultural perspective, digital technologies (DT) are understood as cultural instruments that mediate human activity and carry historically constructed meanings, requiring intentional pedagogical choices in their production and use. Given the difficulty of ensuring this mediation within the logic of platformization, it becomes evident that the inclusive perspective emerges from planning when indirect barriers are addressed with the intent to ensure the participation of all students. In this sense, understanding the classroom's conditions enables a multifaceted and essential planning process for promoting inclusion in teaching practices. The LSH

RESUMO
Este estudo tem o objetivo de discutir possibilidades de práticas docentes inclusivas em um contexto marcado por barreiras sistêmicas, como a plataformização nas escolas públicas estaduais de São Paulo, sob a ótica da teoria Histórico-Cultural. Por meio de uma pesquisa qualitativa, integra discussões teóricas com uma análise narrativa de experiências práticas em um processo formativo *Lesson Study* Híbrido (*LS*H), desenvolvido em uma comunidade colaborativa. Sob a perspectiva histórico-cultural, tecnologias digitais (TD) são compreendidos como instrumentos culturais que medeiam a atividade humana e carregam significados historicamente construídos, exigindo escolhas pedagógicas intencionais em sua produção e uso. Diante da dificuldade de assegurar essa mediação na lógica da plataformização, evidencia-se que a perspectiva inclusiva emerge desde o planejamento quando barreiras indiretas são enfrentadas com a intencionalidade de assegurar a participação de todos(as) os(as) estudantes. Nesse sentido, compreender as condições da sala de aula possibilita um planejamento multifacetado e fundamental para a promoção da inclusão em práticas docentes. O *LS*H mostrou-se eficaz para o enfrentamento das barreiras sistêmicas da

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proved effective in addressing the systemic barriers of platformization, facilitating the planning and development of lessons in a hybrid environment that fostered inclusive practices. This led to resignifications in teaching with digital technologies and a deeper teacher understanding of education committed to the inclusion of people with disabilities. Finally, the study highlights the need for curriculum policies that encourage participatory teacher planning.

Keywords: Classroom as a Complex System. Platformization.Inclusion of people with disabilities. Lesson Study. Collaborative Community.

plataformização, facilitando o planejamento e o desenvolvimento de aulas em um ambiente híbrido que promoveu práticas inclusivas. Isso gerou ressignificações no ensino com TD e uma compreensão docente mais profunda sobre um ensino comprometido com a inclusão da pessoa com deficiência. Por fim, o estudo aponta para a necessidade de políticas de currículo que incentivem o planejamento participativo de professores(as).

Palavras-chave: Sala de aula como sistema complexo. Plataformização. Inclusão da pessoa com deficiência. *Lesson Study*. Comunidade colaborativa.

1 Initial Problematization on Inclusive Practices

The Brazilian Law for the Inclusion of Persons with Disabilities (LBI), Law No. 13.146, which establishes the Statute of Persons with Disabilities in Brazil (Brazil, 2015), represents a significant advancement in favor of inclusion by establishing guarantees of rights and duties for the construction of a more accessible society. Despite this, challenges and barriers persist, such as teacher training, improvement of school infrastructure, and technological access to ensure the inclusion of all individuals (Narciso et al., 2024). It is necessary to eliminate attitudinal, pedagogical, architectural, and communication barriers in order to foster truly inclusive school environments (Garcia; Michels, 2011).

It is within this challenging scenario that this article is situated, seeking to deepen the discussion on inclusive teaching practices through the lens of Historical-Cultural Theory (HCT). We base our work on the understanding that inclusion transcends mere physical accessibility or the provision of resources; it also requires a profound understanding of the processes of human development and the historical-social conditions that shape them.

Based on Vygotsky's (2014, Volume V) studies on "defectology," disability can be understood as a socio-historically mediated condition. For the author, a "defect" does not necessarily result in "defective" development. On the contrary, biological causes (primary disability), when interacting with the environment, generate what he terms

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"indirect defeats," which are social and cultural barriers that can be overcome through the mobilization of new developmental pathways, the creation of alternative routes, and the establishment of cultural compensations.

In the Historical-Cultural Theory, the notion of "indirect defeats" presupposes that the development of a person with disabilities, although it may follow a different course, remains a rich and complex process. The difficulties arising from the interaction between the individual's conditions and the social environment motivate the restructuring of activity and the formation of new higher psychological functions, intentionally mediated by society and culture. Rodrigues (2018) adopts the term "indirect barriers" to emphasize that disabilities result from interaction with barriers imposed by the educational system, society, and policies. In doing so, the author does not deny the concept of "indirect defeats," aligning with the Convention on the Rights of Persons with Disabilities (UN, 2006), in accordance with the LBI:

> Person with disability: someone who has a long-term impairment of a physical, mental, intellectual, or sensory nature which, when interacting with one or more barriers, may hinder their full and effective participation in society on an equal basis with others (Brazil, 2015, Art. 2).

On the other hand, we agree with Giest (2018) that the term "defectology" suggests the opposite of its real meaning, as it does not seek reasons for disability in purely biological causes. Vygotsky, instead, discovered that these reasons were primarily socially determined limitations. Therefore, we distance ourselves from a reductionist interpretation of the term, which, according to the author, is mistaken for being limited to psychic functions and biological conditions. For this reason, we adopt the term "indirect barriers," introduced by Rodrigues (2018), which expands the concept by exemplifying barriers such as inflexible curricula or lack of teacher training.

In line with the ideas presented by this author, we highlight that social barriers, such as exclusion and deprivation of participation in collective activities, prevent the individual from benefiting from the cultural instruments necessary for full participation in social life, as established by the Brazilian Law for the Inclusion

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of Persons with Disabilities (LBI). Unlike the medical model of inclusion, where the barrier is centered on the individual, the social model focuses on the societal barriers imposed by society itself, which hinder the participation of persons with disabilities on equal terms (Almeida, 2022). From this perspective, the attempt to break down this type of barrier can contribute to the effective use of cultural instruments that promote the inclusion of persons with disabilities within the pedagogical context (Almeida; Barros; Ramos, 2024).

Thus, pedagogical intervention, instead of focusing on the correction of a deficiency, is redirected toward the creation of conditions that allow the individual to construct these indirect pathways of development, enhancing their strengths and meaningful interactions with the social and cultural environment. This humanistic perspective informs our analysis of systemic barriers, such as those imposed by the phenomenon of the platformization of public state schools in São Paulo.

Although the barriers produced by platformization limit and condition interactive actions between teachers and students, hindering their access and full participation in the educational process, they are not static or immutable. They are artifacts of a specific educational and cultural context that can and should be adapted and transformed according to educational needs and purposes. It is precisely at this point that indirect barriers become a key concept for rethinking inclusive pedagogical innovation.

In light of this issue, this article aims to discuss possibilities for inclusive teaching practices within a context marked by such systemic barriers. We argue that these barriers, produced by the phenomenon of platformization, manifest themselves in attitudinal limitations of teachers and students, as well as difficulties in accessing and fully participating in educational processes.

This qualitative and interpretative study (Bogdan; Biklen, 1994) thus seeks to connect theoretical discussions with the analysis of practical experiences, considering the urgency of addressing these systemic barriers to enable the emergence of truly inclusive pedagogical practices. To this end, this work draws on the foundations of Historical-Cultural Theory to understand how human development, learning, and, above all, inclusion occur as social and historical

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processes mediated by cultural tools. Recognizing the need to address the challenges of contemporary education, we also seek to engage in dialogue with recent authors of Historical-Cultural Theory who, grounded in this perspective, develop studies to understand the complexity of current educational practices, especially those mediated by digital technologies and concerned with inclusion.

The structure of this article unfolds into two complementary discussions. *In the first*, we consider the phenomenon of platformization, the role of digital technologies (DT) in this context, classroom conditions, and the importance of planning. In the second, based on a narrative analysis (Riessman, 2008) of episodes from practical experiences of a formative process — Hybrid Lesson Study (HLS) — developed by the Saturday Group (GdS), we discuss the inclusive teaching practices that emerge in this process. The results arise from the dialogical and complementary relationship established between these two moments, especially observed in the narrative analysis. Through this, we seek to construct understandings, from a historical-cultural perspective, about inclusive practices, recognizing the classroom as a complex system of human activity mediated by cultural tools.

2 The Phenomenon of Platformization as a Systemic Barrier

The changes brought about by the High School Reform occurred in a context of a weakened State, influenced by political-ideological strategies, the precarization of teaching work, and partnerships with the private sector. Thus, the growth of private provision in Basic Education revealed ideological and political trends present in other countries, which reinforces "pressures in favor of the privatization of educational provision funded with public resources or of deschooling measures" (Adrião, 2018, p. 23).

In this context, we observe the intensification of platformization in Education, driven by partnerships with Big Tech companies, raising concerns within the academic community (Evangelista, 2024). This dynamic implies the standardization of teaching and curriculum, resulting in equally standardized teacher training proposals, aligned with corporate interests and dominant methodologies (Hypolito, 2021). This process advances "in the service of

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standardization and the strengthening of evaluative interventions and management by results" (Barbosa; Alves, 2023, p. 22), which disqualifies and precarizes teaching work, leading to a scientific and pedagogical emptying of formative processes.

In the state of São Paulo, Santos and Barros (2025) highlight that the proposed implementation of digital platforms restricts teachers' actions to the use of prescriptive materials provided by the State Department of Education of São Paulo (Seduc-SP), thereby limiting the emergence of practices that go beyond standardized lessons. This reality is also evidenced by Silva and Carolei (2024), who observe that, although the platforms Matific and Khan Academy offer gamification and progress tracking, they operate with control and data collection systems, reducing teacher autonomy and hindering inclusion. In terms of accessibility, they do not promote open spaces for classroom dialogue.

These aspects align with the concept of platform(ford)ization, which, according to Santos and Souza (2024), refers to an approach inspired by the Fordist model. This model prioritizes techniques aimed at preparing students to achieve good performance on standardized tests but limits the development of critical thinking. Thus, the platformization of education raises concerns that directly affect the classroom, such as the dehumanization of pedagogical relationships, the loss of teacher autonomy, and the deepening of inequalities in access to technology (Miranda; Carneiro, 2024).

These concerns are not merely functional consequences; they represent a direct attack on the social and mediated nature of human development, as postulated by the Historical-Cultural Theory (HCT). The imposition of standardized materials and methodologies, as evidenced by Santos and Barros (2025) and Silva and Carolei (2024), restricts the teacher's object-oriented activity, transforming them from a creative and mediating subject into an executor of algorithms and external directives.

This restriction compromises the teachers' actions in organizing the social environment for the students' development, which is fundamental for the appropriation of cultural instruments and the formation of higher psychological

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functions (Vygotski, 2014, Vol. II). Platformization prevents teachers from creating the necessary conditions for the emergence of indirect barriers for students with disabilities, as it limits the flexibility and sensitivity to the students' sociocultural context, which represents a fundamental aspect for the development and formation of students' mental actions in a context mediated by technological tools (Silva, 2023).

Thus, instead of seeking culturally rich compensatory pathways, teachers are forced to adapt to a single model, which deepens barriers and denies the diversity of development. Such barriers materialize in the rules that regulate the use of platforms and in the number of platforms per subject (Santos; Barros, 2025), compromising the construction of a truly inclusive educational system, where digital technologies are leveraged for learning that is centered on the students' needs (Maltempi, 2008).

3 From Technologies to the Need to Understand the Classroom

Evidently, our personal experiences lead us to question the role of DT in teaching, revealing the inherent complexity of their multiple facets. The emergence of computers and the widespread availability of books, for example, are not merely technical advances; they are historical milestones that have profoundly impacted teaching praxis (Bruner, 2013).

However, beyond their instrumental function of promoting teaching and learning processes, THC provides a robust conceptual framework that allows us to understand DT as elements intrinsically intertwined with human activities, present in our relationship with the world and in mediation with other human beings.

From this perspective, DT take on a dual role: they can be understood both as psychological instruments and as cultural instruments (or tools). When DT mediate the subject's thinking, assisting in the organization of behavior and social interaction, they function as psychological instruments, transforming consciousness itself and higher cognitive processes. On the other hand, when they operate directly in the transformation of the physical environment or in material production, they are configured as cultural instruments (Vygotski, 2014, Vol. II).

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Both types of instruments — cultural and psychological — coexist and interpenetrate with language in the constitution of human activity (Leontiev, 1976). Language is a higher psychological function fundamental to the formation and mediation of thought. It operates in an intrinsic relationship with cultural artifacts (Silva, 2024).

As Daniels (2003) elucidates, artifacts are "imbued with meaning and value by their existence in a field of human activity" (p. 25). This definition underscores that digital technologies (DT) are not neutral; they carry within them the marks of the social and cultural relationships that produced and use them, with these meanings and values being extensively mediated by language within a cultural environment.

The conception of the human being as a continuously developing historical-cultural being (Vygotsky, 2014, Vols. I, II, III, IV, V, VI) allows us to understand the dynamic nature of the signs and meanings attributed to DT as artifacts. As humanity evolves and new forms of social organization are established, new ways of thinking and acting with DT emerge, demonstrating that they are active and constitutive participants in the teaching and learning processes (Souza; Rosa, 2021).

From the perspective of Activity Theory, as developed by Leontiev (1976), cultural artifacts are central to understanding human activity. They play an essential role in mediating interactions between the subject (individual or collective) and the object of the activity. For Leontiev (1976), artifacts are not static elements; on the contrary, they are dynamic, transforming and being transformed by social practice. This constant interrelationship between subject, object, and artifact is what drives the development of new practices aimed at the teaching and learning process, generating changes in the activity system itself (Engeström, 2013).

The relevance of Digital Technologies (DT) in this context can be better understood when we consider the complex nature of the formation of higher psychological functions. Vygotsky (2014, Vol. I, II, III, IV, V, VI), Leontiev (1976), and Galperin (1986), as well as Silva (2023), lead us to reflect that DT, as cultural instruments, not only facilitate but also shape and organize cognitive activity. They can be seen as tools that allow the subject to expand their capabilities, internalize new operations, and, consequently, restructure their mental actions (Silva, 2024).

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This instrumental mediation is fundamental for the gradual formation of mental actions, according to Galperin (1986), since the use of DT can assist in the transition from external and material actions to internalized and mental actions (Silva, 2024). In this way, DT are not mere additions to the learning process; they are constitutive of development, integrating into human activity in such a way that they become extensions of the individual's capacity.

This understanding highlights the importance of making appropriate pedagogical choices for digital technologies (DT), a premise reinforced by Silva (2025), who emphasizes the need for planned pedagogical actions that take into account the students' sociocultural context and promote a critical culture in the construction of knowledge.

Given the current scenario of the platformization of education, urgent questions arise regarding the possibilities and relevance of the teacher's choices so that lesson planning can effectively promote the formation of critical thinking and mediate the development of all students. In light of the Historical-Cultural Theory (HCT), it becomes imperative that decisions concerning the use of digital technologies (DT) consider the mediated activity in its entirety, with a primary focus on the full development of individuals, and not merely on technical efficiency or the simple replication of content. A deep understanding of DT as psychological tools is essential not only theoretically but also for a truly transformative pedagogical praxis.

The contemporary cultural reality is increasingly shaped by the phenomenon of platformization (Hypolito, 2021; Evangelista, 2024), which imposes new dynamics and challenges on education. Predefined pedagogical materials and rigid curricula, combined with teachers' perceived lack of preparation to address the inclusion of students with disabilities and inadequate continuing education (Rosa, 2017), reinforce existing systemic barriers.

In the Historical-Cultural Theory (HCT), culture is intrinsically understood as a product of social relations, a social practice continuously constructed and reconstructed through human interactions (Pino, 2000; Novaes, 2024). Thus, the challenging experiences with DTs during the pandemic (Barros; Fiorentini;

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Honorato, 2023) and others in the context of platformization (Silva; Carolei, 2024; Santos; Barros, 2024) cannot be interpreted as mere isolated technical or pedagogical incidents. They are, above all, cultural phenomena that profoundly impacted the activity and subjectivity of teachers.

When conceived in its fullness as a complex social practice, pedagogical practice demands formative action that studies and problematizes the multiple teaching activities, their knowledge, and the intricate relationships that constitute them (Fiorentini; Oliveira, 2013). This implies a stance in which theory does not overshadow practice, nor is practice reduced to mere methodologies, technologies, or standardized pedagogical materials.

In a context marked by increasing impositions and demands, the classroom must be redefined as a broader and more complex space, where the knowledge mobilized and produced is inherently marked and shaped by cultural values and diverse realities.

4 Systemic barriers in the classroom and the search for inclusive teaching practices

The classroom has always been a setting to be observed, and the advancement of technologies has facilitated this. Despite the reconfiguration of the classroom and the practices driven by the Covid-19 pandemic for remote teaching, the advances in technology and the internet highlight demands for changes and continuous evolutions for the future (Piontkewicz; Freitas; Mendes, 2023; Engelbrecht; Linhares; Borba, 2020).

The event of the internet, which marks cyberculture in cyberspaces, reveals how included—or not—we are regarding the use of digital technologies (DT), representing a new segment of social exclusion (Santos, 2009). In classrooms, something similar happens, as the mere presence of DT or platforms is not enough; we must also be concerned with each student's access conditions.

Inclusion requires valuing diversity and ensuring, with the necessary support, the right of everyone to learn. Rosa (2017), while recognizing the potential for autonomy offered by some technologies, identified that many platforms are not

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accessible to all students, as evidenced by the narratives of families of students with disabilities, who point out the lack of resources for access and the inadequate use of existing resources, including digital platforms and assistive technologies.

The Salamanca Declaration (UNESCO, 1994), which fought discriminatory attitudes in favor of an inclusive society, influenced legislation such as the LBI, which defines universal design as the "conception of products, environments, programs, and services to be used by all people, without the need for adaptation or specific design, including assistive technology resources" (Brazil, 2015, art. 3, section II). The LBI also considers assistive technologies as resources that promote autonomy, independence, quality of life, and social inclusion for people with disabilities or reduced mobility (Brazil, 2015, art. 3, section III). However, Rosa (2017) criticizes the separation between universal design and assistive technologies in the LBI, arguing that inclusion should be planned from the outset, without the need for adaptations. We agree with the author but highlight the importance of adapting ready-made pedagogical materials, such as books and digital resources, to ensure the participation of everyone.

This need becomes more urgent when facing materials that are (im)posed to be applied by teachers in the classroom, often aiming for good student performance in external assessments while ignoring the real demands of the students. This scenario represents a systemic barrier to the inclusion of all. Hence, there is a need for a responsible and creative subversive teaching stance that values reflective practice, professional autonomy, and collaboration in the work environment (D'Ambrosio; Lopes, 2015). It is clear that many decisions depend on changes in different spheres: school, municipal, state, federal, or private management; political-pedagogical; financial; among others. However, let us focus on the step that the teacher can take in the process of planning a lesson. But first and foremost, it is necessary to have a clear understanding of what constitutes a classroom with the potential to promote inclusion.

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4.1 Inclusive Planning in the Face of Classroom Complexity

Davis and Sumara (2006) present Complexity Science as an interdisciplinary field that studies collective phenomena that demonstrate self-organization, emergence, and adaptation. The term emergence is interpreted as something new, random, and unpredictable (Almeida, 2010). Thus, simple, complicated, and complex systems are differentiated, with the first two being describable and reasonably predictable, while complex systems can vary due to the emergence of phenomena (Davis; Sumara, 2006).

Therefore, complex systems emerge from relationships and interactions among parts, resulting in an observable transformation as a new unit that cannot be explained by the sum of its parts (Davis; Simmt, 2014). For this reason, a complex system learns (Davis; Sumara, 2006) and continuously self-eco-organizes (Morin, 2009).

Thus, Barros, Simmt, and Maltempi (2017) conceive the classroom as a complex system, viewing it as a unit that emerges from the collective interactions among the agents of a class. These agents may include students, teachers, shared knowledge, materials, methodologies, among others. The classroom "is a community characterized by its complexity, given the emergence of practices that reverberate from (and are produced by) different cultures" (Barros; Maltempi, 2022, p. 604). For this reason, these authors refer to the teaching and learning practices that emerge in the classroom as cultural practices.

By understanding the intelligence of the classroom, we reinforce that individuals, communities, and organizations learn (Wenger, 2013). According to Wenger (2013), this type of learning that takes place is not an isolated activity. We can establish a connection with expansive learning, which encompasses the entire system as an object of learning, producing culturally new patterns (Engeström, 2013).

Considering this system-level learning, we take a closer look at the five minimum conditions of a complex system, discussed by Davis and Simmt (2003), in order to contribute to the design of proscriptive pedagogical actions so that the complexity of the classroom is not overlooked. Prescriptive actions define what

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must be done, while proscriptive actions establish boundaries without restricting possibilities, opening space for creativity and diverse paths (Davis; Simmt, 2003).

From this perspective, not ignoring the complexity of the classroom means making decisions that nurture its organic dynamics. Therefore, based on each condition discussed by Davis and Simmt (2003), we present and reflect on inclusive actions that can be considered in lesson planning.

Internal diversity is the ability of a system to maintain its viability and adaptability through interactions among diverse agents (Davis; Simmt, 2003). Thus, a class can become more inclusive when proposals and tasks recognize the plurality of the group, valuing interactive dynamics among students and between students and teachers, while considering the diversity of ideas and interests of the students.

Redundancy: necessary to compensate for failures, allowing interactions in which agents mutually support each other (Davis; Simmt, 2003). This "redundancy" is not in the pejorative sense of the word. For example, a lesson plan may include the possibility for a student to repeat, in more accessible language that makes more sense to them and their peers, instructions for a task or explanations given by the teacher. In this way, group dynamics that allow for negotiation of meaning among students can enable some of them to be supported through peer exchanges.

Decentralized control refers to the idea that control is based on local interactions rather than the direction of a central agent, allowing patterns of activity and acceptable responses to emerge (Davis; Simmt, 2003). In this sense, lesson plans can include tasks that encourage autonomy and the active participation of all students, either individually or in groups, so that learning does not depend solely on the teacher's centralized knowledge.

Organized randomness refers to the idea of flexible boundaries that allow for diverse contributions, reinforcing the distinction between proscription and prescription (Davis; Simmt, 2003). Investigation scenarios that focus on constructing meanings through exploration and problematization, in contrast to the exercise paradigm (Alrø; Skovsmose, 2021), are alternatives. Similarly,

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exploratory-investigative tasks promote open-ended and non-directive activities, enabling multiple ways of problematizing, negotiating, and constructing meanings, thus fostering emancipation and school inclusion (Fiorentini, 2006; Cristovão; Fiorentini, 2023).

These approaches establish a balance between prescription and proscription, allowing teachers to value the abilities and respect the limits of all students in what is proposed for the investigative process. It is important to emphasize that the goal is not to lead everyone to the same result, but to create conditions for all to participate, producing meaningful knowledge based on their own engagement with the task. This contrasts with the idea that leveling practices are inherently inclusive.

Neighbor interactions refer to the way units of knowledge interact in spaces dedicated to the collective construction of knowledge (Davis; Simmt, 2003). In the classroom, these "neighbors" can be ideas, hypotheses, questions, or other agents. One example to foster this condition is the creation of spaces where shared ideas can be recorded and revisited. Barros and Maltempi (2022) illustrate this with an online discussion space, in which students exchange ideas and interact with their peers' contributions, leading to the emergence of new units of knowledge. However, this interaction does not need to be restricted to the online environment. Conversation circles, with video recordings and posters, can also promote interactions, making exchange spaces more inclusive.

The conditions of complexity contribute to ensuring that interactions among teachers, students, curriculum, school context, textbooks, and culture (Davis; Simmt, 2014) are valued in lesson planning. If this does not occur, classes tend to focus solely on the teacher, assuming a technicist character, with practices that disregard the diverse realities of the students. We believe that this differentiated perspective on the classroom enhances the possibilities of teaching practices aimed at inclusion. However, it is evident that when teaching practices emerge from collaboration, these possibilities are greatly expanded.

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5 Tasks, from na Inclusive Perspective, Resulting from Collaboration

In recent decades, the research-training process of *Lesson Study* (LS), originating from Japanese culture, has been appropriated in different ways by researchers worldwide (Grimsæth; Hallås, 2015). These appropriations correspond to the cultural, social, and political conditions of each country and community, influencing collaboration and investigation between universities and schools (Gonçalves; Fiorentini, 2023). LS organizes collaborative cycles among teachers, involving the study and planning of lessons, followed by collective observations and reflections, aiming to improve the tasks.

When the lesson study was introduced in Brazil in 2008, its potential for designing and developing mathematics lessons and equipping teachers to manage students' learning became evident. On the other hand, it was noticeable that teachers found it difficult to engage in this process, possibly due to their lack of habit (or culture) of working collectively, observing lessons and being observed, and analyzing their own practice (Felix, 2010).

The GdS, being a community that already had a collaborative culture, did not face the same challenge identified by Felix (2010). The GdS began its experiences with LS by developing a project between 2017 and 2019, appropriating the Japanese model through a combination and integration with its own Teacher Professional Development model (DPD-GdS), which had been historically built by the group over 17 years of research-training. The DPD-GdS included the writing of narratives as a way for teachers to investigate their exploratory and investigative practices, which were developed and adapted to Brazilian public schools. From this, the group coined a new term to designate this new research-training process — Hybrid Lesson Study (LSH). This approach combined practices appropriated from LS, originated in Japan, with cultural practices of DPD-GdS, characterizing a methodological hybridity in the formative process (Crecci; De Paula; Fiorentini, 2019; Fiorentini; Honorato; De Paula, 2023; Losano; Fiorentini, 2024).

Between 2023 and 2025, the GdS participated in the project of the Basic Education Research Program (PROEDUCA), "Professional development of teachers who teach mathematics through collaborative and investigative dialogue between

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university and school," carrying out three semester cycles, each containing four phases: delimitation of the problem and constitution of the Study and Work Groups (GET); problematization and planning; implementation and observation; and reflection and systematization. The fourth semester was reserved for the production of narrative analyses of the lived experience, under the responsibility of the GET. The learnings of the GdS members highlight the collaboration between teachers from different schools and the knowledge from DPD, evidencing the LSH as a fruitful formative process (Losano; Fiorentini, 2024).

At each new LSH cycle, during the problem delimitation phase, three GETs were formed based on the teachers' topics of interest and the school level: early years (GETAI), final years of Elementary School (GETAF), and High School (GETEM). Each group included at least one coordinator and two scholarship and collaborating teachers. The configuration of each group was flexible and could be adjusted at the beginning of each cycle, according to the thematic interests of the teachers and the classes under their responsibility.

In the problematization and planning phase, each GET carried out theoretical studies and consulted curriculum documents, aiming to design exploratory-investigative tasks with the collaboration of other GETs and the teachers from the schools where these tasks would be implemented. During the implementation and observation phase, the teacher responsible for the class conducted the lesson, while the other GET members recorded their observations and provided interventions when necessary. These records were used for reflections between implementations at different schools, allowing the group to improve the task. Finally, in the reflection and systematization phase, scholarship teachers and coordinators wrote narratives about the experiences of the cycle. At the end of the third cycle, a book was produced containing various narratives about the learnings that occurred throughout the three cycles.

Given the objective of this study, we narrate and analyze below some episodes from the second and third cycles of GETEM.

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5.1 Facing systemic barriers in planning

In the second cycle of the project, GETEM began the problematization and planning phase with the task of designing one or two activities for Professor Vinícius's and Professor Salgado's classes—1st and 3rd year of high school, respectively—on the topic of ratio and proportion, as agreed upon in the previous phase. To address this initial challenge, the group decided to plan a single task that could be applied to both classes.

To achieve this, the group engaged in readings and discussions on the topic and examined the reality of each class, based on the information provided by the teachers about their students and considering how the topic was approached in the BNCC, the São Paulo state curriculum, and SEDUC-SP's digital materials. Within this context, the group identified a reduction of proportionality studies to the exclusive use of the rule of three, which neglected the fundamental relationship between quantities (Menduni-Bortoloti; Barbosa, 2017).

They also recognized the need to plan tasks that would be meaningful to heterogeneous classes. Professors Vinícius and Salgado concluded, based on their previous experiences, that the students struggled to reason proportionally when dealing with real-world problems (Ben-Chaim; Ilany; Keret, 2008). Furthermore, they agreed that it would be interesting to explore proportionality through the model of linear functions, where invariance is represented by the slope (Menduni-Bortoloti; Barbosa, 2017).

The content on functions was not initially planned for either class, but the actual demand observed by the teachers could not be ignored by the group. It was necessary to confront the systemic barrier represented by what was imposed in the curricular materials.

Professor Salgado pointed out the lack of understanding of the meaning of the slope as a common difficulty among the students and expressed interest in revisiting this topic so that students could make sense of the slope as a ratio of proportionality. Professor Vinícius, considering this weak point in the teaching of functions, wanted students to gain a deeper understanding of proportionality as represented by the slope.

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Given this, and thinking creatively (D'Ambrosio; Lopes, 2015), the group decided to prioritize teaching the slope as a ratio of proportionality, thus meeting the guidelines of the São Paulo Curriculum. In this context:

> *Vinícius suggested relating a person's height to their shoe size, aiming to arrive at a proportionality constant close to four. Immediately, Carol and I [Salgado] measured our feet with a ruler and made the calculations to find the proportionality constant mentioned by Vinícius, but it didn't work. Faced with the situation, we realized that to get close to the number four, it was necessary to consider the shoe size. Therefore, we should divide the height, in centimeters, by the shoe size number. The group was delighted with this suggestion, which, in just a few minutes, sparked our curiosity and placed us in an investigative process—something the entire team had been striving for. [Salgado, narrative of the second cycle]*

Motivated to work on the proportionality ratio, using the relationship between height (cm) and foot size (shoe number) as a context for meaning-making, the group discussed several ideas for an exploratory-investigative task. Then, Professor Salgado suggested working with stations, given that she had previously experienced, in one of her classes, a hybrid environment in a collaborative project that was part of Ana Paula's doctoral research (Barros, 2019). Ana Paula agreed with Salgado's proposal but, concerned about the possibility that the group might lack critical reflection on hybrid models, suggested new readings, which sparked further discussions.

In these readings, the hybrid environment is understood as one that considers the complexity of the classroom as a premise, incorporating the fusion of hybrid models and the combination of online teaching (synchronous or asynchronous) with in-person teaching. This fusion seeks to harness the essence of these models to provide students with greater freedom in their learning processes, resulting in a hybrid pedagogical action aligned with the complex conditions of the classroom, rather than the application of a ready-made model (Barros, 2019; Barros; Maltempi, 2022). From this perspective, the hybrid environment aims to meet the demands of the classroom by valuing the potential of online teaching to combine actions that enable the production and negotiation of meanings through interactions among students (Lave; Wenger, 2002). In this way, cultural practices

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of teaching and learning emerge as organic responses from the classroom itself, reflecting cultures produced in dialogical relationships with the diversity of the system (Barros; Maltempi, 2022).

Thus, GETEM made the decision to plan the creation of a hybrid environment to explore the concept of proportionality ratio. Taking as a premise the complexity conditions of the classroom (Davis; Simmt, 2003; Barros; Simmt; Maltempi, 2017), the group designed the task considering the use of simple and accessible language, so that the students could work in groups with the greatest possible autonomy. To achieve this, in each class, a dynamic was planned so that, for each group of four to six students, there would be two or three notebooks provided by the schools, with the aim of fostering discussion among them rather than individual work. With this in mind, each student had to answer on their own sheet to encourage everyone to engage in group discussions (or pairs within the group, which was also anticipated), thus avoiding a division of tasks within the group. GETEM deemed it appropriate not to require students to remain in the same groups until the end of the class, granting them the freedom to exchange ideas and questions according to the meaning-making process occurring in their interactions with peers.

A set of activities was planned for the task, complementary to each other, involving different skills, aiming to mobilize and develop proportional thinking. During the planning phase, every effort was made to ensure that the students had the autonomy to solve the task according to their own paths, time, and pace, without having to follow a fixed sequence. To support this, an *online* environment was created using *Padlet*, a tool that allows teachers to manage content collaboratively and interactively. In this space, created for each class, videos produced by Professor Vinícius and Professor Salgado were shared with their respective classes, proposing a forum for student responses and dynamic graphs built in GeoGebra. All of this could be accessed by the students at any time, allowing them to share responses with one another, explore content, and negotiate meanings for the answers recorded on paper.

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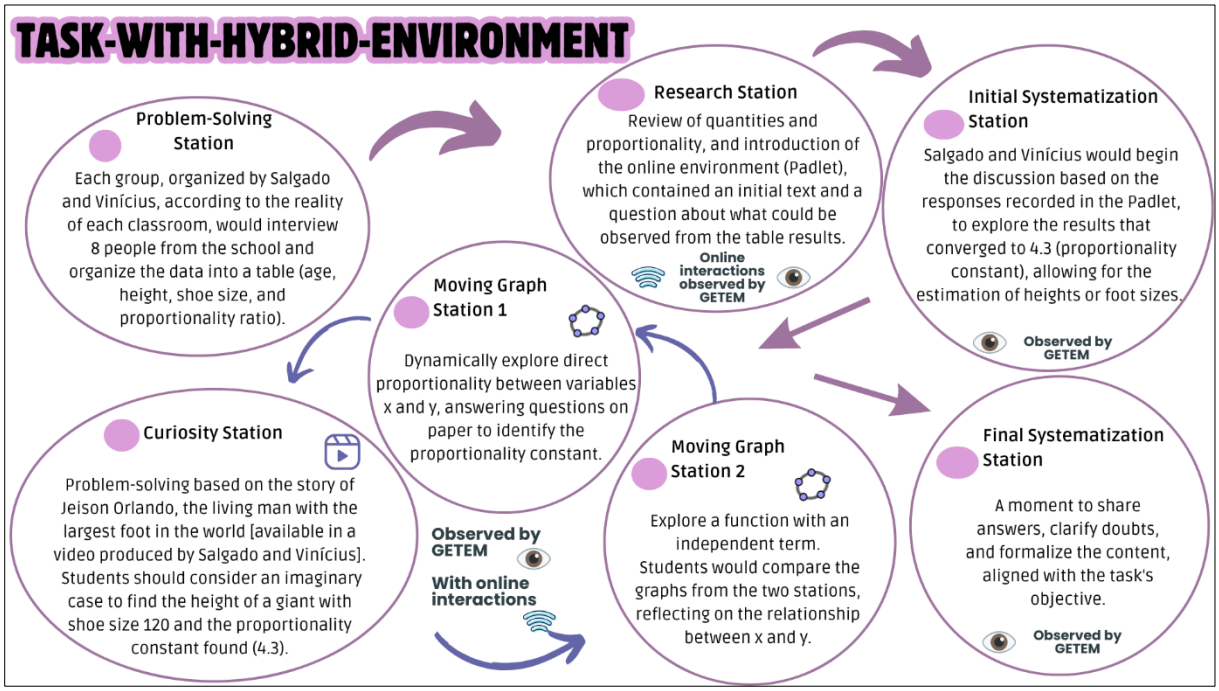
The activities of the task were the stations themselves, and it was not about planning a task to be applied in a hybrid environment, nor vice versa. Therefore, it was characterized as a task-with-hybrid-environment (Barros; Fiorentini; Souza, 2025). The concept of a "task-with-hybrid-environment" is not merely a methodological innovation; it represents a materialization of the principles of the Historical-Cultural Theory (HCT) for promoting development and inclusive learning. By intrinsically integrating digital technologies (DT), concrete materials, and diverse interactions, the task fostered a genuine joint activity in which social interaction and the negotiation of meanings among students became the driving force behind knowledge construction, as postulated by Vygotsky (2014, Vol. II, V) regarding the fundamental role of interaction in the development of higher psychological functions. This understanding resulted in a task consisting of seven stations aimed at developing proportional reasoning so that the student could build meaning for the concept of ratio and be prepared for the study of functions (Figure 1).

Figure 1- Overview of the task-with-hybrid-environment



Source: Own production

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The research carried out at the problematization station was conducted by the students without the presence of the GETEM team, and its organization was adapted to each class. Although it was a single task, the specific demands of the students required different actions for each group. This station concluded with answers provided by the students in the online environment, which characterized the research station uniquely for each class.

The beginning of the lesson observed by GETEM, at the initial systematization station, also differed according to each group, depending on the responses previously shared by the students in Padlet. Students were given the freedom to complete the curiosity station, moving graph 1, and moving graph 2 in any order they preferred.

It was also planned that the final systematization station would need to continue in subsequent lessons, allowing Salgado and Vinícius to engage with their respective classes and clarify any doubts that might arise. As a result, in Professor Vinícius's class, the hybrid-environment task was developed over six lessons across three days, while in Professor Salgado's class, it took place over five lessons across four days.

The flexibility in the order of the stations and the autonomy granted to the students in the hybrid environment expanded the possibilities within each individual's Zone of Proximal Development (ZPD), allowing each participant, in their uniqueness, to construct their own learning pathways with the support of peers and available resources. This intentional approach reflects the understanding that meaningful learning emerges from the activity of the individual, mediated by artifacts and social interaction (Leontiev, 1976; Vygotsky, 2014, Vol. II).

Furthermore, it reveals that the planned task valued the complexity of the classroom, facilitating interactions among neighbors (Davis; Simmt, 2003)—such as students, teachers, and both physical and online resources—resulting in diverse forms of participation and making the lesson more inclusive.

The reflections on collaborative task planning within the context of the Hybrid Lesson Study (LSH) demonstrate how the teacher community itself, acting

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as a collective subject, creates an environment conducive to the development of pedagogical artifacts that address the diverse needs of students. This collective effort not only overcomes indirect barriers but also fosters the development of new capacities, promoting meaningful learning and inclusion.

5.2 Reverberations of Teacher Learning on Inclusive Planning

The potential of the task to engage all students was one of the first lessons observed in practice by the GETEM members (Honorato; Fiorentini, 2025):

> [...] overall, the task ensured that the groups engaged in a highly collaborative and autonomous investigation. One of the students, who usually says she does not like mathematics, even expressed her happiness by saying that she could become a mathematics teacher [Prof. Salgado - Narrative of the 2nd cycle].

Salgado's perspective reflects what GETEM highlighted about the implementation in both classes: there was engagement from all the students in the task. During the planning phase, mutual support among students was anticipated, which, from an inclusive perspective, is essential to ensure that a student's individual conditions do not prevent them from participating.

> [...] The freedom provided to the students was made possible by several factors: online exploration; the use of accessible language by the group in the task instructions; and the possibility to revisit the content as many times as needed. The students felt free to explore numerous paths, which prevented them from becoming dependent on the teacher to clarify their doubts at every moment [Prof. Vinícius - Narrative of the 2nd cycle].

The autonomy observed by Vinícius is the result of planning designed specifically for those students, taking into account the complexity conditions of the classroom in the constitution of the hybrid environment, and this suggested that the same outcome could occur if there were any students with disabilities. In this sense, we understand that the LSH formative process helped GETEM realize that the task was planned for everyone from the very beginning, that is, it had inclusive potential (Rosa, 2019).

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This general perspective was a major learning experience for GETEM, generating valuable insights for the third cycle of the project. In the second semester of 2024, in a process similar to planning a task and going through all the phases of a new LSH cycle, the group planned a task with the following objective: to reflect on the relationships between different representations of functions through the study of a realistic situation (that makes sense to the student) in order to understand the concept of functions. However, the problematization and planning phase was marked by a 2nd-year high school class, for which Professor Salgado was responsible, which included a student with Intellectual Disability (ID).

When the experience of the 2nd cycle was studied and analyzed, it generated practical learning that quickly led the group to consider the establishment of a hybrid environment to address the particularities of the student with ID in the stations. In this sense, the task-with-hybrid-environment involved four stations: square numbers, triangular numbers (tables and algebraic representation), graphing, and immersion in history (historical context of figurate numbers). The square numbers station, in particular, was designed to enable Pedro's participation, aiming to explore the pictorial representation of functions using concrete materials (colored buttons). This was fundamental for Pedro's participation:

> I observed Pedro's active participation, despite all his limitations. He explored group work, where he relied on the collaboration of his partner. His classmate naturally helped him. [...] When Pedro understood, he wanted to work a little on his own, and I thought that was really nice. He went on doing the calculations and completed the calculations for figure 12 on his own. [...] Pedro found the result before his classmate and was very happy. [...] Shortly afterward, he called me again to ask a question related to triangular numbers in GeoGebra. [Ana Paula, observation notes]

Pedro surprised everyone at GETEM by managing to go beyond the square numbers station. His participation resulted in valuable insights about the importance of designing a lesson for everyone, starting from the planning stage:

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> He [Pedro] demonstrated an understanding of the construction process required by the Square Figurate Numbers activity. [...] I realized the importance of preparing a task with the intention of including those who may have greater difficulty in traditional classes. The task allowed me to see another side of Pedro. I only knew the one who didn't care about participating in class. [Prof. Salgado, narrative of the 3rd cycle]

The opportunity to reflect both in and on practice was fundamental for Professor Salgado's learning about the need to intentionally plan a task with everyone's participation in mind. Pedro's active engagement in the square numbers station is an example of overcoming indirect barriers (Rodrigues, 2018). By offering multiple means of mediation and an alternative pathway — pictorial and concrete — the task allowed Pedro not only to participate but also to construct meaning and overcome limitations that would be insurmountable in traditional teaching. The natural collaboration with his peer highlighted the power of social interaction in building the Zone of Proximal Development (ZPD), where the one at a higher stage of development assists the one at a lower stage with a particular object or concept, enabling the appropriation of new knowledge.

Pedro's joy in achieving the result is not merely an emotional reaction; it is an indication of the meaningfulness of the activity, which mobilizes awareness and genuine development. On the other hand, we highlight the change in Professor Salgado's perception as she came to understand the importance of preparing a task with the intention of including those who may face greater difficulties in traditional classes. Thus, Salgado reveals a restructuring of her own teaching activity. The LSH formative process, by promoting reflection and collaboration, also enabled teachers to reframe their use of digital technologies (DTs), transforming them from mere impositions (as in the context of platformization) into effective psychological tools for promoting inclusive development.

It was extremely important for the group to intentionally consider the complexity of the classroom, addressing the systemic barrier of the platformization context when constituting the hybrid environment. This made it possible to value the emergence of cultural practices in teaching and learning processes (Barros;

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Maltempi, 2022). Furthermore, the LSH formative process allowed teachers to experience digital technologies (DTs) integrated into the hybrid environment without resistance, unlike the negative feelings they carried from the context of platformization: "I felt out of place and somewhat repulsed by the new technologies, as every day I heard the complaints of countless students about the requirement to use digital platforms for all school activities" [Professor Vinícius, narrative of the 2nd cycle]. This feeling reveals a systemic barrier faced in planning, which is not limited to the DTs themselves, but rather to the impact of platformization on teaching.

The constitution of a task-with-hybrid-environment involved digital technologies (DTs), concrete materials, and other artifacts in a natural process that made sense for the reality of each class involved. Thus, the stations and the hybrid pedagogical actions emerged without the obligation to follow a pre-established model, allowing for the re-signification of teaching experiences with DTs and lessons from an inclusive perspective.

6 The Emergence of Inclusive Practices as a Response to Confronting Systemic Barriers

The theoretical discussions and analyses of teaching experiences in contexts marked by systemic barriers, conducted in this study, highlight the possibility of the emergence of inclusive teaching practices, especially when teachers have opportunities and conditions to plan curricular practices relevant to the reality of the school where they work, being able to teach with digital technologies (DT) without it being a mandatory requirement. Thus, from a historical-cultural perspective, DT are viewed as artifacts that carry meanings, emphasizing the importance of the context in which they are produced.

Therefore, understanding the classroom as a complex system—a living system—implies the need for planning that does not ignore the occurrence of culturally embedded teaching and learning practices marked by diversity, in contrast to the imposition of standardized teaching materials, methodologies, or technologies. This approach ensures that the different realities of the students can be acknowledged and addressed.

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We therefore argue that a lesson, from an inclusive perspective, emerges from pedagogical intentionality starting in the planning phase. To this end, systemic barriers, such as those imposed by the platformization of education, must be questioned and confronted. Although we recognize that overcoming such barriers is not the sole responsibility of teachers, as it requires political action from the State and other sectors of society, the theoretical discussions in this study contribute reflections on possible pathways to promote inclusive practices.

Furthermore, the LSH training process proved to be effective in confronting the systemic barriers of platformization through the collaborative practices of the DPD, such as those that occur within the GdS. The analysis of practical experiences carried out in this study highlighted the process of planning an exploratory-investigative task with a hybrid environment, combining online teaching (either in-person or remote) with face-to-face instruction. This approach was committed to addressing the conditions of classroom complexity, demonstrating the possibility of developing practices focused on ensuring the participation of all students.

In this training process, the entire High School study and work group reflected and collaborated, taking on their commitment to inclusion from the planning phase. This was especially true for Professor Salgado and Professor Vinícius, who faced, on a daily basis at school, the challenges imposed by the platformization of education in the state school system of São Paulo and who were well aware of the realities of their respective students. Thanks to the collaboration between the university and the school, which takes place within the GdS, they were able to experience and reframe the possibility of carrying out inclusive pedagogical practices through the use of digital technologies (DT), in a hybrid environment built by them, rather than imposed upon them.

In summary, the LSH training process proved to be essential in addressing the systemic barriers of platformization. By promoting collaborative and reflective practices within the scope of professional teacher development, it enabled teachers, as subjects of the activity, to reconfigure their practices as well as the developmental conditions of their students. Students from different cultural

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backgrounds and circumstances, such as Pedro, a student with intellectual disabilities, actively participated in the lessons, making sense of school mathematics and establishing a productive dialogue with the mathematics drawn from their social and cultural practices. This process not only promoted content learning but, more fundamentally, fostered the development of new higher psychological functions and the overcoming of challenges related to indirect barriers encountered. The reframing of teaching with digital technologies by Professor Vinícius and Professor Salgado, who faced the impositions of platformization, serves as a testament to the human capacity to transform adverse conditions into opportunities for development, for both teachers and students alike.

Hence, the importance of designing other curriculum policies that create space for participatory teacher planning, ensuring conditions and opportunities for them to make choices and adaptations of teaching materials to plan lessons that allow everyone to participate, especially when considering students with disabilities, who must be guaranteed the right to access and participation, as provided for in the LBI (Brazil, 2015). However, this has not been occurring with the current public curriculum policies in force in the states of São Paulo and Paraná, where platformization aims to standardize teaching practices through the use of ready-made slides, restricting teacher autonomy. This scenario becomes even more critical when the process of curriculum imposition does not offer space or time for teachers to discuss and adapt the pedagogical proposals they receive, disregarding the specificities and demands of school communities.

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Un estudio sobre las (im)posibilidades de las Prácticas Docentes Inclusivas en un contexto de plataformización y el desafío de la planificación

RESUMEN
Este estudio tiene como objetivo discutir las posibilidades de prácticas docentes inclusivas en un contexto marcado por barreras sistémicas, como la plataformización en las escuelas públicas estatales de São Paulo, desde la perspectiva de la teoría Histórico-Cultural. A través de una investigación cualitativa, integra discusiones teóricas con un análisis narrativo de experiencias prácticas en un proceso formativo Lesson Study Híbrido (LSH), desarrollado en una comunidad colaborativa. Desde la perspectiva histórico-cultural, las tecnologías digitales (TD) se comprenden como instrumentos culturales que median la actividad humana y portan significados construidos históricamente, requiriendo elecciones pedagógicas intencionadas en su producción y uso. Ante la dificultad de asegurar esta mediación en la lógica de la plataformización, se evidencia que la perspectiva inclusiva surge desde la planificación cuando se enfrentan barreras indirectas con la intención de garantizar la participación de todos(as) los(as) estudiantes. En este sentido, comprender las condiciones del aula posibilita una planificación multifacética y fundamental para la promoción de la inclusión en las prácticas docentes. El LSH se mostró eficaz para enfrentar las barreras sistémicas de la plataformización, facilitando la planificación y el desarrollo de clases en un entorno híbrido que promovió prácticas inclusivas. Esto generó resignificaciones en la enseñanza con TD y una comprensión docente más profunda sobre una enseñanza comprometida con la inclusión de la persona con discapacidad. Por último, el estudio señala la necesidad de políticas curriculares que fomenten la planificación participativa de los(as) docentes.

Palabras clave: Aula como sistema complejo. Plataformización. Inclusión de la persona con discapacidad. Lesson Study. Comunidad colaborativa.

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