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Research articles

Maker movement and perspectives on the 'Mais Ciência na Escola' Program

Movimento *maker* e perspectivas sobre o Programa Mais Ciência na Escola

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Abstract

This article evaluates the recently published announcement of the "Programa Mais Ciência na Escola" as a key component of the maker movement in the Global South, exploring whether it represents an opportunity to innovate educational practices or merely perpetuates existing power structures. The analysis focuses on the structure and objectives of the announcement, which proposes the creation of a thousand maker labs in Brazilian public schools. By contrasting Dale Dougherty's vision of a "society of creators" with Paulo Blikstein's critique, which stresses the need to contextualize maker practices, the article examines how the announcement aims to adapt these practices to Brazil's socioeconomic realities. The conclusion suggests that the success of this initiative in promoting significant educational change will depend on its ability to adapt to and address local challenges, emphasizing a transformative and inclusive approach.

Keywords: Maker movement; Southern Epistemologies; Social Inclusion; Transformative Education; Innovation.

Resumo

Este artigo avalia o recentemente publicado edital do "Programa Mais Ciência na Escola" como um componente significativo do movimento maker no contexto do Sul Global, explorando se ele representa uma oportunidade para inovar nas práticas educacionais ou se perpetua as estruturas de poder existentes. A análise se centra na estrutura e nos objetivos do edital, que propõe a criação de mil laboratórios makers em escolas públicas brasileiras. Confrontando as visões de Dale Dougherty, que promove uma "sociedade de criadores", com as críticas de Paulo Blikstein, que enfatiza a necessidade de contextualizar as práticas maker, o artigo discute como o edital procura adaptar estas práticas às realidades socioeconômicas do Brasil. A conclusão propõe que a eficácia desta iniciativa em promover uma mudança educacional significativa dependerá de sua capacidade de se adaptar e responder aos desafios e nuances locais, enfatizando uma abordagem que seja tanto transformadora quanto inclusiva.

Palavras-chave: Movimento *maker*; Epistemologias do Sul; Inclusão Social; Educação Transformadora; Inovação.

INTRODUCTION

The maker movement has gained international prominence as a phenomenon that redefines how we create, share, and learn. Based on ideals of innovation, hands-on manufacturing, and

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democratized access to advanced technologies, it aims to transform traditional practices of consumption and production. Leaders of this movement, such as Dale Dougherty, envision the emergence of a "society of creators" that could, in theory, transform existing economic and social models. However, critical analyses suggest that the reality of the movement may not be so homogeneous, varying significantly across different geographical and economic contexts.

In this context, Paulo Blikstein's proposal to integrate creative making into the school curriculum stands out for its approach, which, in addition to emphasizing students' technical skills, encourages the development of a critical awareness about the social implications of their creations. This approach seeks to cultivate an educational process where practice and theory complement each other, forming citizens capable of consciously contributing to society.

In response to the growing interest in the maker movement, the Brazilian government implemented Public Call No. 13/2024 – the "Mais Ciência na Escola" Program. With significant investment, the program aims to install 1,000 maker labs in public schools nationwide, intending to expand access to technological innovation and improve the quality of scientific and technological education.

The purpose of this article is to investigate how the maker movement is perceived and implemented in different contexts, with a particular focus on the Brazilian initiative "Mais Ciência na Escola." It aims to analyze the potential and challenges of adopting this movement in the country's educational practices, considering both the positive aspects and the critiques raised by scholars and practitioners.

The methodology employed includes a literature review on the maker movement and a critical discussion of Public Call No. 13/2024 (Conselho Nacional de Desenvolvimento Científico e Tecnológico, 2024), which establishes the "Mais Ciência na Escola" Program.

The article is organized into three parts: i) it explores the nature and foundations of the global maker movement and its promise to renew society; ii) it discusses critical perspectives and challenges faced, especially in educational contexts; and iii) it analyzes the proposition of the "Mais Ciência na Escola" Program as a case study of how the maker movement can, in theory, be adapted and applied in Brazil to promote inclusion and educational and social transformation.

WHAT IS THE MAKER MOVEMENT?

There is nothing new in talking about consumerism or a consumer society. In the first decade of this century, Zygmunt Bauman (2007) argued sharply that while consumption is an inherently individual activity, consumerism reflects a characteristic of society as a whole. In *Consuming Life*, Bauman explored how, in a consumer society, people become commodities. In other words, the sociologist investigated the dynamics by which the individual becomes a consumer and the object becomes a commodity within a peculiar arrangement of the Cartesian subject-object framework. Although Dale Dougherty's concern in promoting the maker movement may not delve into this level of complexity, it is against the backdrop of a consumer society that makers position themselves. Dougherty envisions a society of creators as an alternative to a society of consumers.

Today, no one really needs to make anything: you buy what someone else has made. Nevertheless, in the introduction to *Free to Make*, Dougherty and Conrad (2016) highlight a remarkable increase in the number of individuals choosing to create what they need. These individuals form a diverse community identifying as makers. Makers range from enthusiasts to professionals, all motivated by the desire to create and innovate. This dynamic suggests that the maker concept transcends traditional boundaries and promotes broad and inclusive participation. In this way, the maker movement emerges as a global reaction to the predominant consumerism and encourages active participation in creation and experimentation. The movement seeks to establish an alternative paradigm to the culture of consumption, which often defines us by what we own. On the other hand, Dougherty presents the possibility of recognizing ourselves as producers, capable of

learning and creating: a maker culture. By creating, makers challenge the passivity fostered by consumerism, while simultaneously valuing innovation and hands-on learning. The movement emphasizes the importance of reclaiming autonomy and creative ability. It offers an alternative to the mere acquisition of goods and fosters a source of joy and creative freedom contrary to the logic of consumption.

In *The Maker Mindset*, the desire of makers (and, in a way, of the maker movement itself) is summarized as follows:

> Together, makers seek an alternative to being considered consumers, rejecting the idea that you are defined by what you buy. Instead, makers have a sense of what they can do and what they can learn to do. Like artists, they are motivated by internal goals, not by external rewards. They draw inspiration from the work of others. More importantly, they do not wait for the future to create and make. They feel an urgency to do something now or risk completely missing the opportunity to do so (Dougherty, 2013, p. 7) [1].

Three elements form the maker movement: i) Creation: a set of activities with various learning objectives, carried out in spaces such as maker workshops, classrooms, museums, libraries, studios, homes, or garages; ii) Makerspaces[2]: communities of practice in physical spaces designated for the collective development of creative activities; and iii) Makers: individuals who adopt active participation identities in the movement, engaging in innovation practices, hands-on creation, and the use of technology. (Halverson; Sheridan, 2014).

As for the resources and characteristics seen in the maker movement, the practices rely on three fundamental pillars for implementation: i) Advanced Technical Equipment Support: makerspaces leverage the development of digital technology, notably through the use of open-source software and hardware like Arduino; ii) Open and Collaborative Maker Culture: more than their advanced equipment, makerspaces stand out for their culture of freedom, open source, and sharing. They foster a collaborative learning environment, where the use of open resources makes ideas into reality; and iii) Learning in Almost-Realistic Situations: inspired by situated learning theory, makerspaces provide environments that simulate real situations to maximize engagement and learning (Pei, 2018).

MAKER MOVIMENT: FROM THE NORTH TO THE SOUTH HEMISPHERE

Rodrigo Barbosa e Silva (2017), in his thesis *Para além do movimento maker: Um contraste de diferentes tendências em espaços de construção digital na Educação*, highlights that, contrary to a single vision of the maker movement – widely disseminated by Maker Media Inc. (Dale Dougherty's company) – there is significant diversity within the maker movement. Rodrigo Barbosa e Silva presents three main strands that offer different theoretical, technical, and practical approaches to digital fabrication in education: i) Maker Media Inc. Approach: This strand, promoted by Maker Media Inc., known for organizing the Maker Faire and publishing *Make: Magazine*, places a strong emphasis on techno-liberalism, highlighting technological innovation as a means to foster individual and collective development. It represents the most commercial and widely publicized view of the maker movement, emphasizing the potential of digital fabrication to democratize production and stimulate entrepreneurship.

[1] Juntos, os makers buscam uma alternativa a serem considerados consumidores, rejeitando a ideia de que você é definido pelo que compra. Em vez disso, os makers têm uma noção do que podem fazer e do que podem aprender a fazer. Como artistas, são motivados por objetivos internos, não por recompensas extrínsecas. Eles se inspiram no trabalho de outros. Mais importante ainda, eles não esperam até o futuro para criar e fazer. Sentem uma urgência de fazer algo agora ou perder a oportunidade de fazer completamente.

[2] Or, in Dale's own words: "[a] makerspace can be viewed as a combination of a mechanical workshop, an art studio, and a computer lab, but it is crucial to see it as a workspace, not just a place to spend time. [...] The presence of equipment is sometimes mistaken for the creation process, but modern machines do not sum up the goal of turning ideas and inspirations into something more." DOUGHERTY, Dale. Interview granted to Humberto Abdo and Luciana Amaral. Maker Movement: "I think of the maker movement as a kind of Renaissance," says Dale Dougherty. Estadão.

ii) Critiques of the "Californian Utopia": Represented by the works of Fonseca and Evangelista from the University of Campinas, this approach offers a critical view of the technological optimism associated with the maker movement. It questions the belief in technology's ability to automatically solve complex social issues, suggesting a deep reflection on the social and educational challenges in the context of digital fabrication. iii) FabLearn – Inspired by Paulo Blikstein: Based on the progressive ideas of Paulo Freire and Seymour Papert[3][4], this strand promotes active learning through digital fabrication. It emphasizes the construction of knowledge in a practical and investigative way, encouraging students to directly engage in the learning process through exploration and experimentation.

Beyond the perspective of Maker Media Inc., with Dale Dougherty as its leading figure, another key author must be considered to fully understand this approach: Chris Anderson (2012), with his book *Makers: The New Industrial Revolution*. Anderson describes the maker movement as a revolution blending traditional craftsmanship with technological innovation, shaped by three transformative aspects.

First, he highlights the use of digital tools for design and prototyping, enabling the creation of innovative products through what he calls "Medium-Scale Digital Manufacturing" (FVM Digital). Second, he emphasizes the culture of sharing and online collaboration, where makers exchange their creations, fostering continuous growth through "network effects," similar to what drove platforms like Facebook and Twitter (X). Lastly, he discusses the adoption of standardized file formats for projects, making it easier for anyone to manufacture their designs at different scales, bridging the gap between ideation and entrepreneurship.

Anderson (2012) compares the current stage of the maker movement to the personal computer revolution of the 1980s, envisioning a future where democratized manufacturing technology sparks a wave of global innovation and creativity, echoing the optimism and vision of pioneers like Steve Jobs.

Chris Anderson and Dale Dougherty, central figures in the maker movement narrative shaped by Maker Media Inc., embody a vision deeply rooted in techno-liberalism. While the movement claims to democratize innovation and production, its deeper implications often reinforce individualism and personal autonomy, hallmarks of dominant narratives on progress and technology. This perspective, though seemingly inclusive and transformative, tends to obscure the power dynamics and technological dependencies that sustain global inequalities. Anderson, for instance, highlights the democratizing potential of digital fabrication but does not fully address how these practices align with or clash against socio-economic and cultural realities outside major tech hubs. This approach hints at a form of digital colonialism, where certain practices and ideologies are exported as universal while overlooking local diversity and needs.

[3] By way of example, in Paulo Blikstein's text "Viagens em Troia com Freire: a tecnologia como um agente de emancipação" (2008), the contributions of Paulo Freire and Seymour Papert are examined as fundamental to pedagogical modernization through the integration of digital technologies. Blikstein combines Freire's critical pedagogy—centered on emancipation and critical questioning—with Papert's constructionism, which advocates active learning through the manipulation and interaction with tangible and digital materials. He proposes an educational model that identifies community-generating themes, is rooted in existing technological culture, and challenges traditional educational practices, demonstrating how digital technologies can be transformed into powerful tools of emancipation and student engagement, in accordance with the principles of both theorists.

[4] Continuing with Freire's influence on Blikstein's thinking (2021), in the article "Educação personalizada não é educação emancipadora: a apropriação do discurso de Paulo Freire pela indústria da tecnologia educacional," Paulo Blikstein critically examines how Paulo Freire's progressive discourse has been co-opted by the educational technology industry. Blikstein contrasts Freire's vision of emancipatory education—which promotes autonomy and social transformation—with "personalized education" practices that, in his view, merely entail superficial adjustments in the pace of learning, without addressing deeper issues of choice and the relevance of content for students. The text denounces the commodification of a false personalization that does not empower students, but rather keeps them within a system that prioritizes content consumption instead of critical and creative transformation. Blikstein calls for reflection on how technologies can truly be used as tools of emancipation, in line with Freire's ideals, especially through maker education, which enables students to actively engage with knowledge in a meaningful and transformative way.

Felipe Fonseca (2014), in his critical dialogue with Chris Anderson's ideas, challenges the revolutionary potential attributed to the maker movement. Anderson, former Wired editor and TED conference curator, sees digital fabrication as an expansion of technological innovation into the "world of atoms," opening the economy to commercially viable ideas much like digital startups. However, Fonseca points out a contradiction in this utopian vision: while the maker culture claims to foster decentralization and innovation, it often adopts the language and methods of traditional industrial production without fully questioning them. He illustrates this with the emphasis on prototyping, framing it as a way for inventors to access digital fabrication technologies more easily, allowing for low-cost testing before mass production. Fonseca challenges the notion that this approach brings any meaningful disruption to existing economic and production models and calls for a more critical reflection on the true impact of maker culture.

This "utopia" stems from Evangelista's interpretation of the Californian Ideology, a concept outlined by Richard Barbrook and Andy Cameron in August 1995. Their text presents a paradoxical vision of the future driven by the rise of the digital age. This ideology blends San Francisco's cultural bohemianism with Silicon Valley's technological innovation, creating an optimistic fusion of hippie freedom and yuppie entrepreneurialism rooted in an unwavering belief in the transformative power of information technology. Its advocates envision a digital utopia where technological progress ensures prosperity and artistic freedom for all, an idea that resonated with a broad spectrum of American society, from computer enthusiasts and capitalists to academics.

Despite its widespread appeal, the Californian Ideology faces criticism for promoting a form of libertarian politics that champions individual expression in cyberspace while overlooking persistent social issues like racism, poverty, and environmental degradation in California. Grounded in technological determinism, it assumes that the convergence of media, computing, and telecommunications will not only revolutionize work and leisure but also sustain past economic liberalism, favoring an electronic marketplace over a truly democratic digital public sphere. As a result, the Californian Ideology emerges as a complex and contradictory belief system that encapsulates both the hopes and blind spots of its era. It envisions a future where technology is the pathway to both personal freedom and market expansion, potentially at the expense of addressing deeper social challenges.

Evangelista (2011), in *Singularity, Transhumanism, and the Californian Ideology*, builds on this critique, arguing that both the Californian Ideology and singularitarian utopianism reflect the fusion of 1960s counterculture with Silicon Valley's corporate ethos. This fusion gives rise to a neoliberal worldview that champions technological innovation as the solution to social problems while fostering an extreme form of individualism. At its core, this ideology treats technology as an emancipatory force, promising a hyperconnected and economically thriving society. However, critics argue that this perspective is superficial, excluding those who do not fit into its technological ideal and further entrenching existing inequalities.

Silicon Valley entrepreneurs and executives actively embrace this ideology, investing vast sums in institutions that promote transhumanism and singularity. Evangelista sees this as an attempt to build personal "lifeboats," a way for the elite to insulate themselves from the world's pressing issues rather than engaging with them. His critique highlights the contradictions of the Californian Ideology, which, despite its rhetoric of freedom and empowerment, ultimately reinforces an elitist, individualistic worldview detached from the realities faced by most people. It overlooks critical social issues and promotes a utopia that remains out of reach for the vast majority.

The critique of the Californian Ideology and singularitarian utopianism extends seamlessly to the maker movement. Often idealized as a pure expression of creativity and accessible innovation, the movement can obscure the reality that access to the tools and knowledge required for full participation is frequently limited to those with substantial financial and educational resources. As a result, it risks perpetuating the very inequalities criticized in the Californian Ideology. In other words, it is misguided to assume that technology alone can democratize production and innovation without addressing the socioeconomic barriers

that exclude many from the maker movement. This distorted perception risks reinforcing a technological elite where only a privileged few can afford to "create," while many remain excluded from this utopian narrative.

Shifting to a third perspective, *Maker Education: Where Is the Curriculum?*, Paulo Blikstein, José Valente, and Éliton Moura (Blikstein; Valente; Moura, 2020) offer an alternative take on the maker movement—one that arguably aligns more closely with a Global South narrative[5]. These authors critique the tendency to treat maker education as a superficial novelty or an optional curriculum add-on, warning that such an approach can undermine its transformative potential. Instead, they argue for the careful and deliberate integration of maker technologies and practices into the curriculum, ensuring they enhance learning objectives rather than becoming mere gimmicks.

Without meaningful integration, maker education risks being absorbed into traditional teaching methods or reduced to an empty buzzword—used more for marketing than for educational empowerment. The authors stress the importance of maintaining pedagogical intentionality, using educational theories as guiding principles for activity design, ensuring equitable access, and recognizing technology as a tool that mediates and amplifies learning rather than serving as an end in itself. In short, they view the maker movement as a crucial opportunity for educational transformation, but only if implemented in a way that fosters meaningful, curriculum-driven learning rather than being dismissed as a passing trend or a decorative technological add-on.

Dougherty paints a picture where creativity and innovation are intrinsic to human nature and - in all fairness - inspires an overly romanticized view of the maker movement as a space of freedom and limitless potential. However, this perspective needs to be counterbalanced by a more critical view of makers. It's in this sense that Blikstein offers a necessary counterpoint and introduces a view that considers the challenges, limitations, and complex realities faced by makers.

At the SXSWedu event in Austin, Texas, from March 9–12, 2015, Paulo Blikstein made a notable contribution during a panel that brought together educators and industry experts on March 10. Although Stanford did not release information about the other panelists, Blikstein's contributions gained attention in eSchoolNews, a U.S. news service. This coverage was later echoed by the Stanford Graduate School of Education. According to eSchoolNews' report, confirmed by Stanford, Blikstein exposed "four myths" associated with the maker movement:

Blikstein points out that making is not a new practice, despite the growing popularity of the term in recent times. He refers to a historical tradition of constructivist learning, suggesting that the current excitement for the maker movement may be more of a rediscovery and renaming of established educational practices than a true innovation. Secondly, he questions the myth that all students are natural hackers. Contrary to the romantic view that every child has an innate ability to innovate uniquely and independently, Blikstein highlights that the reality is much more complex. He argues that most students need guidance and structure to develop innovative skills, stressing that success in maker activities is not guaranteed for all without proper educational intervention. Moreover, Blikstein challenges the myth that the primary goal of the maker movement is to steer young people toward STEM careers. He argues that, just as physical education and music are valued for their cultural significance, science, engineering, and programming should be seen as tools to expose students to transformative ideas and foster critical thinking, rather than merely preparing them for the global job market. Finally, Blikstein tackles the

[5] The concept of "epistemologies of the South" sheds light on a variety of critical perspectives that denounce the harm caused by colonialism and capitalism on a global scale. The notion of the "South" here is broadened to include not only countries that were directly colonized and still face development challenges, but also systematically marginalized segments of the population within developed countries, such as workers, women, Indigenous peoples, people of African descent, and Muslims. This approach confronts the eradication of forms of knowledge and cultural practices, one of the most profound expressions of domination. Epistemologies of the South seek to recover these neglected knowledges and establish a truly egalitarian dialogue among different knowledge traditions—an interchange that Boaventura de Sousa Santos describes as "ecologies of knowledges" (Santos, 2009, p. 12).

myth of automatic diversity in maker spaces, emphasizing the need for proactive efforts to ensure inclusion. The barriers faced by low-income students and underrepresented groups require a conscious, deliberate strategy to foster true diversity within the movement.

"MAIS CIÊNCIA NA ESCOLA" PROGRAM: A TURN TOWARDS INCLUSION?

In response to the growing interest in the maker movement and its transformative potential in education, the "CNPq/MCTI/FNDCT PUBLIC CALL CONNECTS AND EMPOWERS No. 13/2024 – "MAIS CIÊNCIA NA ESCOLA" stands out as a promising initiative. With around 100 million reais invested in building 1,000 maker labs across public schools nationwide, the program demonstrates a strong commitment to democratizing technological innovation and social inclusion. However, to ensure meaningful and lasting change, the labs must be set up with considerable awareness regarding the different educational realities and needs of each school community. This involves not only providing access to advanced technologies but also integrating traditional knowledge and sustainable practices, ensuring that innovation is relevant and accessible to all students, regardless of their socioeconomic or cultural background.

The program focuses on promoting STEAM (Science, Technology, Engineering, Arts, and Mathematics) education and preparing students for productive inclusion in the digital world. Scientific, technological, and innovation institutions (ICTs) are encouraged to submit proposals for state networks, which must include detailed plans for implementing the labs, aligned with national education policies and local education department partnerships. The 100 million reais allocated to build these labs also requires equitable distribution, with at least 30% of the funds directed to Brazilian regions like the North, Northeast, and Central-West, ensuring broader coverage and focusing on areas with greater educational and technological needs. The proposals will be evaluated by both a technical-scientific merit committee and a social relevance committee. During evaluation, factors like the merit and originality of the proposal, its alignment with the program's objectives, local partnerships, and the feasibility of implementation will be considered.

The program aims to significantly contribute to modernizing and internationalizing basic education in Brazil. Expected outcomes include improving the quality of science education, increasing students' digital inclusion, and fostering a new generation of scientists and technologists. These improvements are essential to strengthening education as a tool for social and technological transformation.

The initiative aligns with national guidelines, referencing legislation like the Decree No. 11.754 (National Program for the Popularization of Science) and Law No. 14.640 (Full-Time School Program), among others. Proposals must form state networks with at least 70% of schools in the final years of primary education, focus on full-time learning, and ensure internet access. Partnerships with local education departments are required, reinforcing the integration of educational policies with the development of the labs.

The program includes a two-phase evaluation process, starting with the Technical-Scientific Merit Committee and followed by the Social Relevance Committee. Proposals must score at least 7.0 in both committees before approval. This evaluation ensures equitable distribution of resources and strengthens educational practices.

The Technical-Scientific Merit Committee assesses aspects like originality, alignment with program objectives, technical feasibility, and sustainability after funding. The team's prior experience and the effectiveness of local partnerships are also considered. The Social Relevance Committee evaluates the proposal's ability to promote critical and creative digital literacy, its impact on school practices, and its alignment with the needs of full-time schools and vulnerable populations. The consistency of scientific education activities and affirmative action policies is also important for ensuring inclusive maker labs.

This public call could represent a significant epistemological breakthrough within the maker movement in Brazil, challenging traditional views often promoted by figures like Dale Dougherty. Through this initiative, the maker movement has the chance to reshape

its practices in a way that is more inclusive and tailored to the realities of public schools in Brazil. By focusing on the establishment of maker labs in schools across various contexts and integrating local knowledge with advanced technologies, the program holds the potential to make creativity and innovation more accessible. This new approach could shift the conventional idea of simply transferring technological knowledge, instead fostering a practice that acknowledges and incorporates the unique challenges and realities of school communities within the national education system. In turn, this would promote a maker movement that is both locally meaningful and globally connected.

However, it's crucial to note that the success of this program doesn't just depend on advanced equipment or expanded infrastructure. As Paulo Blikstein argues, the real effectiveness of the movement lies in thoughtfully integrating maker practices into the curriculum. Blikstein advocates for a pedagogy that not only teaches technical skills but also fosters critical thinking about the social, economic, and environmental impact of maker activities. The goal is to develop not just innovators but responsible citizens who can apply their knowledge ethically and effectively.

Therefore, the challenge is to ensure the "Mais Ciência na Escola" program doesn't follow a techno-utopian path that overlooks social complexities and existing inequalities. Implementation should involve continuous reflection, ensuring the maker labs become genuine, inclusive learning spaces. This means adapting practices to local needs, incorporating the values and culture of the communities where schools are located.

FINAL CONSIDERATIONS

The "CNPq/MCTI/FNDCT CONNECT AND CAPACITATE Call for Proposals No. 13/2024 - MAIS CIÊNCIA NA ESCOLA PROGRAM" marks a significant step in integrating the maker movement into Brazil's educational landscape. This initiative aims to establish maker labs in 1,000 public schools, democratizing access to advanced technology while also committing to social inclusion and educational transformation by incorporating maker practices into school curricula, as advocated by Paulo Blikstein. This approach fosters an education that values both innovation and critical thinking, preparing students to become thoughtful creators within their communities.

The discussion in this article highlights two contrasting perspectives within the maker movement. On one hand, figures like Dale Dougherty and Chris Anderson emphasize technology democratization and individual innovation driven by techno-liberalism. However, this view may unintentionally reinforce existing power structures, neglecting global inequalities. It can be seen as an extension of the "California Ideology," which champions autonomy and individualism but overlooks the needs and challenges faced by communities outside major tech hubs.

On the other hand, Paulo Blikstein and José Valente present a more reflective and critical perspective, arguing that for maker education to be effective—particularly in countries like Brazil—maker practices must be integrated into the curriculum in a way that promotes not only innovation but also social inclusion. They advocate for education that not only teaches technology but also encourages students to consider the social, economic, and environmental implications of their creations, influenced by thinkers like Freire and Papert—ideas that will be further explored in future work.

Therefore, the implementation of "Mais Ciência na Escola" should go beyond just installing technology infrastructure. Maker labs should be spaces where students can learn to navigate and shape the technological world ethically and responsibly, considering both local and global realities. This requires a pedagogical approach that meaningfully integrates theory and practice, ensuring that technological innovation benefits everyone and contributes to a more just and equitable society.

In summary, the program has a unique opportunity to move beyond mere technology transfer, fostering a critical and reflective understanding of how these technologies are used. By doing so, it can avoid perpetuating inequalities and empower students to use

technological innovation in ethical and transformative ways. Thus, more than adopting emerging technologies, "Mais Ciência na Escola" should focus on creating an educational environment that prepares students to think critically and act consciously in an increasingly technological world. In this sense, the program can gain quality by engaging with areas of knowledge, particularly philosophy, which focuses on developing thought and ethics.

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